The European **e-Business Market Watch**

Special Report (September 2005)

e-Business Interoperability and Standards

A Cross-Sector Perspective and Outlook

e-business w@tch

European Commission
Enterprise & Industry Directorate General

The *e-Business W@tch*

The European Commission, Enterprise & Industry Directorate General, launched the *e-Business W@tch* to monitor the growing maturity of electronic business across different sectors of the economy in the enlarged European Union, EEA and Accession countries. Since January 2002 the *e-Business W@tch* has analysed e-business developments and impacts in manufacturing, financial and service sectors. Results are continuously being published on the Internet and can be accessed or ordered via the Europa server or directly at the *e-Business W@tch* website (www.europa.eu.int/comm/enterprise/ict/policy/watch/index.htm or www.ebusiness-watch.org).

This report is a Special Issue Study on e-Business Interoperability and Standards. It provides a cross-sector perspective on e-business interoperability requirements and standards in the context of relevant public business policy issues. The synthesis is based on the *e-Business W@tch* survey, specific business case examples and desk research. The report is intended, in particular, for SME business managers and public policy strategists.

Disclaimer

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Introduction to the *e-Business W@tch*

e-Business W@tch – observatory and intermediary since late 2001

The European Commission's *e-Business W@tch* monitors the adoption, development and impact of electronic business practices in different sectors of the economy in the enlarged European Union. The background of this initiative was the eEurope 2002 Action Plan, which provided the basis for targeted actions to stimulate the use of the Internet for accelerating e-commerce, acknowledging that "*electronic commerce is already developing dynamically in inter-business trading*" and that "*it is important for SMEs not to be left behind in this process*." The eEurope 2005 Action Plan confirmed and built further upon these objectives with Action 3.1.2 "A dynamic e-business environment", which defined the goal "*to promote take-up of e-business with the aim of increasing the competitiveness of European enterprises and raising productivity and growth through investment in information and communication technologies, human resources (notably e-skills) and new business models*".

It is against this background that the European Commission, Enterprise Directorate General, launched the *e-Business W@tch* in late 2001. The objective of this initiative is to provide sectoral analysis based on empirical research, including representative enterprise surveys in countries of the European Union, the EEA and Accession States, with special emphasis on the implications for small and medium-sized enterprises (SMEs).

Since its launch, the *e-Business W@tch* has published more than 60 e-Business Sector Studies on 17 different sectors of the European economy, three comprehensive synthesis reports about the status of electronic business in the European Union, three statistical pocketbooks and various other resources (newsletters, special issue reports, etc). These are all available on the website at www.ebusiness-watch.org ('resources').

The quantitative analysis about the diffusion of ICT and e-business is based to a large extent on regular representative surveys among decision-makers in European enterprises. The e-Business Survey 2005 covers more than 5000 enterprises from 10 different sectors across 7 EU member states. In addition, more than 70 case studies on e-business activity in enterprises from all EU, EEA and Accession countries are carried out, to complement the statistical picture by a more detailed analysis of current e-business practices.

Survey results of the previous years have confirmed the initial assumption and rationale of the *e-Business W@tch* that the sector in which a firm operates and the size of a company, rather than its location, are the main determinants of its e-business activity. The large demand for the various publications and statistics provided by the *e-Business W@tch*, and their exploitation by other research institutions (for example, in the EITO Yearbook 2003 and in the OECD Information Technology Outlook 2004), document the demand for sectoral e-business analysis. Facilitated by positive responses and the growing interest in its analysis, the *e-Business W@tch* is increasingly developing from an observatory into a think-tank and intermediary, stimulating the debate about the economic and policy implications of e-business among stakeholders at an international level.

The wide-angle perspective: *e-Business W@tch* provides the "big picture" as a basis for further research

The mission of the *e-Business W@tch* is to present a "wide-angle" perspective on e-business developments and practices in the sectors covered. This has important implications regarding the level of detail in which various issues can be explored, both in terms of the quantitative picture (survey) and in terms of the qualitative assessment and background research.

Over the past 10 years, "*electronic business*" has increased from a very specific to a very broad topic to be studied. The OECD proposes a definition of e-business as "*automated business processes (both intra-and inter-firm) over computer mediated networks*". This definition is useful as it makes clear that

e-business is more than e-commerce (which focuses on commercial transactions between companies and their customers, be it consumers or other companies) and that e-business includes internal processes within the company as well as processes between companies. Furthermore, the OECD definition implicitly indicates that the focus and main objective of electronic business is to be found in business process automation and integration, and the impacts thereof.

This implies that the potential scope for e-business analyses has also broadened. The measurement of e-commerce transactions (the volume of goods and services traded online) can and should be complemented by studies analysing the degree to which business processes, including intra-firm processes, are electronically linked to each other and have become digitally integrated. Hence, it becomes practically impossible to cover in depth all areas and facets of e-business in one study. Thus, study scope needs to be carefully defined.

The *e-Business W@tch* Sector Studies apply a wide-angle perspective and zoom into selected aspects of electronic business only. In general, studies with a wide-angle approach allow for a wider range of issues to be covered and investigated at the same time. This, however, necessarily limits the level of detail in which each single issue is explored. This must be considered when using the Sector Studies prepared by the *e-Business W@tch*.

The role of economic analysis in the Sector Reports

In addition to the analysis of e-business developments, the *e-Business W@tch* Sector Studies also provide some background information on the respective sector. Following the configuration of the sector (on the basis of NACE Rev. 1.1 classification) at the introduction of each study, this overview includes some basic industry statistics, as well as information about the latest trends and challenges concerning the specific sector. Readers should not mistake this background information, however, as the main topic of analysis. An *e-Business W@tch* "sector report" is not a piece of economic research on the sector itself, but **a study focusing on the use of ICT and e-business** in that particular sector. The introduction to the sector is neither intended to be, nor could it be a substitute for more detailed and specific industrial analysis.

The data presented in each sector's overview are mainly derived from official statistics prepared by Eurostat, but are processed and refined by DIW Berlin. The purpose is to close the many gaps that occur in the official statistics, with missing data being imputed on the basis of extrapolations and own calculations.

> The **mission** of the *e-Business W@tch* is to monitor, analyse and compare the development of e-business in different sectors of the European economy – not the sectors themselves.
>
> Its **objective** is to provide reliable results, based on commonly accepted methodologies, which are not readily available from other sources and would trigger the interest of policy-makers, researchers, and other e-business stakeholders for more in depth analyses (or statistical surveys).
>
> The *e-Business W@tch* has adopted a "wide-angle" perspective in its **approach** and the necessary trade-offs are transparently depicted in all its deliverables.

The definition of sectors and the adequate level of aggregation

Economic sectors constitute the main level of analysis for *e-Business W@tch*. In 2005, the sample consists of ten sectors. Their configuration and definition are based on the NACE Rev. 1.1 classification of business activities.

The rather broad aggregation of different business activities into sectors in 2002-2004 made it possible to cover a broad spectrum of the economy, but also caused some challenges for the analysis of e-business developments. For instance, it was hardly possible to focus on individual sub-sectors in much detail within a single sector report. The selection and definition of sectors proposed for 2005

reflect these concerns. Six out of the ten sectors proposed are sub-sectors that were part of (aggregated) sectors analysed in 2002-2004. The rationale for "zooming in" on former sub-sectors is that the broad picture for the whole sector is now available from previous sector studies, and that this seems to be the right time within the prospective life-cycle of the *e-Business W@tch* to focus the analysis on more specific business activities.

The 10 sectors covered in 2005 were selected on the basis of the following considerations:

- The current dynamics of electronic business in the sector and the impact of ICT and electronic business, as derived from earlier *e-Business W@tch* sector studies.
- Interest articulated by the industry in previous years on studies of this type.
- Policy relevance of the sector from the perspective of DG Enterprise & Industry.
- Roll-out strategy of 2003: New sectors (not covered in 2002/03 and/or 2003/04) have been added, as well as specific industries which have only been covered as part of a larger sector in the past

In 2005, the *e-Business W@tch* will also deliver four cross-sector studies. These Special Reports will focus on a particular e-business topic of interest across different sectors rather than on a single sector.

The 10 sectors and 4 topics analysed in 2005

The 10 sectors which are being monitored and studied in 2004/05 include seven manufacturing, construction and two service sectors. Four of these sectors (namely food and beverages, textile, machinery and equipment and tourism) were also covered in the previous years of implementation, while the other six were covered as part of (aggregated) sectors analysed during 2002-2004.

Exhibit: Sectors and topics covered by *e-Business W@tch* in 2005

	Sector Studies	NACE Rev. 1	Publication date(s) *	
1	Food and beverages	15	July 2005	Sep. 2005
2	Textile industry	17, 18	July 2005	
3	Publishing and printing	22	July 2005	Sep. 2005
4	Pharmaceutical industry	24.4	July 2005	Sep. 2005
5	Machinery and equipment	29	July 2005	Sep. 2005
6	Automotive industry	34	July 2005	
7	Aerospace	35.3	Sep. 2005	
8	Construction	45	July 2005	Sep. 2005
9	Tourism	55, 62.1+3, 92.3+5	Sep. 2005	
10	IT services	72	July 2005	Sep. 2005
	Special Topic Reports			
A	A User's Guide to ICT Indicators: Definitions, sources, data collection		July 2005	
B	Overview of International e-Business Developments		July 2005	
C	e-Business Standards and Interoperability Issues		Sep. 2005	
D	ICT Security and Electronic Payments		Sep. 2005	

* There will be 1 report (in 2005) on 4 of the 10 sectors, and 2 reports on the other six.

Executive Summary

Objectives of this study

This report is one of four special studies published by *e-Business W@tch* in 2005, in addition to its sector studies. While sector studies present e-business developments from a specific industry's perspective, special studies focus on a particular ICT related topic, across sectors. This study focuses on the concepts, application and adoption of e-business interoperability and standards. It is intended as a sourcebook of reliable current background information, source data and indicative findings for SME business managers and public policy strategists.

Interoperability and Standards

Business interoperability between different companies is gradually being enabled by more sophisticated, and yet easier to manage, internet based systems. Systems such as ebXML have reached a point where they are now ready for full scale deployment. The lure of instant "plug and play" web and grid services is allegedly not far away. Behind these powerful new tools is a myriad of standards and standards development organisations, some proprietary and others more open. All are seeking their rightful place in the emerging Business Interoperability Frameworks. To make sense of all this, work is constantly underway to rationalise the standards maze, by selecting the best technologies, proving them in pilots and introducing mechanisms to eliminate duplication and manage conflicts among standards developers.

Europe has a role to play, primarily to ensure that the needs and requirements of the European SMEs are met as quickly and as efficiently as possible. However, Europe too must contribute its fair share to the international initiatives on standards convergence and interoperability testing.

Companies are expected to innovate regularly and continually. The same expectation should be placed on our standards development organisations and to the ways in which companies develop, select and implement B2B standards.

Enterprise Size-bands

SMEs are not a homogenous set. This study in its analysis of the take up of standards and technology clearly shows that the adoption rates and future plans are highly dependent both on the sectors and the size of the companies involved. One of the basic premises underlying the research is that a sector led approach to implementation, that meets national business and cultural requirements, is required to achieve the maximum benefits. This must include mechanisms to help SMEs set challenging and realistic targets for their B2B implementations, for accelerated development and harmonisation of sectoral standard roadmaps, and for the adoption of all relevant business and technology agreements.

National Initiatives

The sector independent characteristics of national interoperability initiatives in Luxembourg and Australia, which focus on methods to encourage and enable implementation of e-business standards by and for SMEs, are summarised and proposed for consideration as models for similar initiatives in other sectors and geographies.

The following observations have been noted from the survey analysis and the national initiatives:

- There is evidence, of a high level of commitment and practice across all of the enterprise size-bands, that standards play a critical role and are taken into account when making decisions on what technology and data to use in the introduction of new products, services and processes. This focus on innovation is continued in the case study on the CRP Henri Tudor collaborative approach to e-business implementation within the construction sector in Luxembourg.
- When studied by enterprise size-band, interoperability with companies outside their own sector is most important for medium sized enterprises, irrespective of their sector.
- Subject to the absolute recognition of open voluntary participation, the role of a national or regional standards body can usefully include application of industrial strength project initiation criteria, coordination and management processes designed to assist small and medium enterprises (SMEs) move to and benefit from online trading operations.
- The longer term requirements for sustainable agile manufacturing and flexible service delivery in B2B networks can be best met by using open, flexible and efficient business trading frameworks. Interoperability, enabled by appropriate standards development and testing environments, is essential.

The comparative cross-sectoral data and conclusions from the e-Business Survey 2005 indicate that the pace and direction of e-business development differs considerably between sectors and between types of enterprise. In some sectors, internet based e-business is already significantly changing the way companies interact with their customers and business partners. Nonetheless, despite the apparent differences in take up, there are commonalities when viewed in the context of an e-Business Interoperability Framework: all sectors utilise similar core business processes and share the need for agreed cross-partner trading profiles.

Policy conclusions

The study recommendations focus on medium term actions which could directly contribute to implementation of common standards based solutions in all sectors. For long term value, transparent fairness and maximum impact (relative also to the additional goal of movement towards standards convergence) the proposed actions are suggested to be focused primarily at the sectoral, cross-sectoral, and standards policy levels. The study results are fully consistent with, and actively complement, the practical focus on increased implementation and use of technology proposed in support of the i2010 Action Plan[1].

[1] See http://europe.eu.int/i2010

Policy Objective	Suggestion for policy	Potential Initiator(s)
Sector level interoperability	Increase awareness and support mechanisms, at sectoral level, with emphasis on SMEs: • encourage sector led initiatives, ideally led by respected neutral organisations, similar to that conducted by CRP Henri Tudor as a way to accelerate the pre-competitive business and technology agreements required for effective national and regional implementation of existing and emerging sectoral e-business standards and guide-lines;	• ICT Innovation Centres • Sector Industry Associations • National Standards Bodies • Member state business development agencies • proposed new High Level ebXML Implementation Group
	• encourage and assist CEN/ISSS eBIF and EBES to jointly compile and distribute information on successful implementations of ebXML and Web Services by SMEs;	• ICT Innovation Centres • EU and national RTD projects
	• facilitate SME access (preferably free) to all strategic eBIF information documents.	• DG Enterprise and Industry • CEN/ISSS eBIF and EBES members
Cross-sector interoperability	Review the enterprise size-band data presented by sector and topic in this report in a cross-sectoral workshop and establish a process to: 1) assist typical SME enterprise size-band representatives establish and share appropriate targets and standards roadmaps for interoperable e-trade with their business partners; 2) establish formal BPI (Business Process Integration) mechanisms (e.g. piloting, training and model sharing) to encourage and assist SMEs integrate business processes into their B2B implementations; 3) look for cross-sector commonalities. Where relevant actively promote European common cross-sector interoperability standards and convergence; 4) improve European inputs to the global e-business ISO/IEC/ITU/CEFACT Business Standards Convergence framework and, in the global context, also collaborate with NIST eBSC Forum convergence activities.	• SME Associations • Sector Industry Associations • DG Enterprise & Industry • CEN/ISSS eBIF and EBES members
Standards Policy	Investigate the potential for developing a Bizdex[2] like approach to some forthcoming European or national standardisation and e-business implementation projects.	• National Standards Organisations • ICT vendors • DG Enterprise and industry

[2] BizDex(www.bizdex.com.au) is an example of a successful PPP (public private partnership) model where the standards body takes on a much greater role and responsibility for the costs, standards and integration tools developed. In effect it becomes part of a wider business partnership and assumes risks in taking this approach.

e-Business Interoperability & Standards: A Cross-Sector Perspective and Outlook

1 Introduction

Interoperability refers to the ability of ICT systems and applications to work seamlessly together, and for diverse information resources to be systematically and consistently accessible to applications, when required. Without standards there would be no inter-operability. This cross-sector study on e-business interoperability is intended as a timely contribution to standards based competitiveness policies, as seen from the viewpoint of SMEs, especially those operating in the manufacturing sectors.

1.1 Study structure

The study is organised in the following chapters and main sections:

- **Chapter 1** defines the background, objectives, scope and key terms including a cross-sector Open-edi framework perspective on B2B e-business interoperability, such as current XML-based approaches (ebXML, Web services). The main challenges and status of business interoperability from a standards perspective, are summarised by reference to relevant initiatives in Europe, and in the US.
- **Chapter 2** presents the interoperability and standards related findings from the e-Business Survey 2005. The summary and interpretation of the findings are used to facilitate identification and discussion of specific policy related conclusions, and specific actions that may be required, to improve the use and development value of standards to all concerned.
- **Chapter 3** focuses on the experiences, results and conclusions drawn from two significant and representative national examples:
  - A case study dealing with change in the construction industry in Luxembourg; and,
  - the story of Bizdex, the Australian standards policy initiative on B2B.

  A summary of lessons, potentially applicable to all sectors, is presented following analysis of these descriptions and their high level public policy implications.
- **Chapter 4** draws attention to public policy challenges and provides a synthesis and an outlook which dovetails with the priorities in the i2010 initiative, emerging standards policy and standards take-up objectives within European and national initiatives. Overall conclusions are drawn from evidence presented in the report.

1.2 Review of related *e-Business W@tch* findings

The *European e-Business W@tch Synthesis Reports*[3], and *Sector Impact Reports* provide extensive information, by sector and across countries in Europe, on the application of ICT to meet business objectives. These reports are framed within the concept of the extended enterprise, in the sense that a company is constituted not only by its management, employees and means of production, but also by a functioning network of business partners, including customers and suppliers.

In the *European e-Business Report* 2003, detailed information from extensive surveys is presented according to the following framework for electronic business:

- e-Readiness: ICT infrastructure and skills development
- e-Activity: e-Commerce (frequency and intensity)
- e-Integration: business processes within and between enterprises
- e-Impacts: effects of e-business activity on enterprises

The theme of e-Integration is continued in the *European e-Business Report* 2004, which confirms business process integration (BPI) as the big issue. The report observes that exchange of standardised data[4] is increasingly recognised as an important indicator of e-business activity. A special trend section, derived from the second part of the e-Business Survey 2003 (November) on the use of electronic data standards, notes the following:

- The share, of companies that exchange standardised data, increases with the size of the firm. More than 60% of the large firms interviewed said that they did so;
- EDI based standards are mainly used in manufacturing sectors and in retail. Sectors with a strong EDI legacy may be reluctant to switch to other standards;
- XML based standards appear to be widely used by firms in the business sector. It is possible that awareness for XML is particularly high among the knowledge- intensive sub-sectors of business services, where web-based services play a very important role in delivering services and information to customers. More predictably, XML based standards (including, for example, RosettaNet) are also used more than on average in high-tech sectors (electronics, ICT services);
- The STEP standard is used only by a minority of firms; its share was less than 10% in all of the sectors surveyed, even among the large companies.

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[3] *e-Business W@tch* / European Commission (2002/2003). *The European e-Business Report 2003. A portrait of e-business in 15 sectors of the EU economy*. Luxembourg: Office for Official Publications of the European Communities, 2003

e-Business W@tch / European Commission (2003). *The European e-Business Report 2003. A portrait of e-business in 15 sectors of the EU economy.* Luxembourg: Office for Official Publications of the European Communities, 2003

e-Business W@tch / European Commission (2004). *The European e-Business Report 2004. A portrait of e-business in 10 sectors of the EU economy.* Luxembourg: Office for Official Publications of the European Communities, 2004

[4] The survey question was: "*Are you exchanging standardised data with your buyers or sellers electronically? With standardised data we mean electronic product catalogues, orders, invoices, delivery notes and similar business documents. We do not mean plain e-mails.*"

Referring to the conclusions from the *e-Business W@tch* Workshop (Montpellier, November 19, 2003), held in conjunction with the IDATE Annual Conference, the same 2004 Synthesis Report noted the issue of interoperability and the success factors for implementation of e-standards in the following succinct paragraph:

> *Experts pointed at a number of important requirements for the successful implementation of e-standards. Success factors include community consensus on essential details and the successful implementation among early adopters, which normally results in a faster and broader adoption process. Progress in the interoperability between systems and components should promote better integration of front office and back office data information systems. However, it will be crucial to take into account sector-specific issues in technical aspects, organisational issues and semantics. Adopting a sectoral standardisation approach could ease development, but may lead to difficulties in cross-sectoral data exchanges.*

1.2.1 B2B Interoperability

Thus, in summary, B2B interoperability is seen as the central technical and business challenge that companies face in relation to conducting business as an extended enterprise. Bearing in mind that, ideally, B2B interoperability must at least have a common sectoral foundation, it is clear that the most important issue is the integration of business processes between business partners[5].

While the concept of business to business (B2B) interoperability is straightforward, its realisation in general has been costly, difficult and complex, and for a long time mainly confined to electronic data interchange (EDI) between the large industry players.

> *Because of the cost and complexity of EDI, benefits often were more confined to a limited group of large organisations and may have contributed mostly to consolidation rather than to other types of structural changes.*[6,7]

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[5] The successful introduction of integrated business processes between two companies, and realisation of the mutual benefits to be derived, will be influenced to an extent by whether they have already been successful in individually automating and standardising their own internal processes as well as the level of integration between their individual back and front office systems. As will be clear, later in this chapter, the same processes used for inter-business interoperability can be applied to ensuring proper understanding and description of internal business processes.

[6] Wigand, R., Steinfield, C., and Markus, M. L., *IT Standards Choices and Industry Structure Outcomes: The Case of the United States Home Mortgage Industry.* To appear in the Journal of Management Information Systems, 22 (2) Fall, 2005. (pre-publication version, last accessed August 23, 2005, http://ebusiness.tc.msu.edu/netindustry/page2/files/JMIS2005.pdf).

[7] Steinfield, C., Markus, M.L., and Wigand, R.T. *Exploring Interorganizational Systems at the Industry level of Analysis: Evidence from the U.S. Home Mortgage Industry*. To appear in Journal of Information Technology, 18 (4), December 2005 (pre-publication version last accessed August 23, 2005, http://ebusiness.tc.msu.edu/netindustry/page2/files/JIT2005.pdf).

1.2.2 Enterprise size-band

The *e-Business W@tch* reports continually confirm the differences shown by companies of different size-bands, even within the same sector. The results from the Business Survey 2003 (November) clearly show, for instance, that the perceived importance of specific emerging technologies increases almost linearly with firm-size, with large companies being particularly prominent. However, this finding is not consistent across all sectors.

In addition, the Pocketbook of e-Business Indicators (2005), drawn from the results of the e-Business Survey 2005, shows that the diffusion of advanced e-business software solutions for automating business processes increases steadily by company size. For example, in 2005, about 8-10% of small companies, more than 30% of medium-sized enterprises, and nearly 60% of large enterprises in the EU had an Enterprise Resource Planning (ERP) system.

Further study and analysis conducted via the new e-Business Survey 2005 has yielded more positive and robust survey results differentiating between enterprise size-bands as well as sectors. These findings are presented and discussed in this report (see Chapter 2).

1.3 Objectives and scope of this study

This special study examines the issues relating to interoperability and e-business standards that were outlined in the previous section. It uses the results of tailored questions, directed at the sectors targeted in the 2005 *e-Business W@tch* work, to see what, if anything, has changed in the intervening two years since the e-Business Survey 2003. The principal, firm level, data gathering mechanism is a cross-sectoral CATI survey on interoperability and standards. This is complemented by a case study on collaboration at national level and by an extensive desk research based description of the Standards Australia development of BizDex.

Items covered in the e-Business Survey 2005 include questions on whether standards are considered as critical (or not), and whether they are taken into account in development of new processes and products. The survey also seeks to assess the expressed attitudes within the sample population to intra- and inter-sector interoperability, the current and projected use of EDI/XML standards, the main gaps that are perceived in some critical e-business standards, current use of open source software (OSS), and the future importance of Web Services. The intention of the subsequent data analysis is to identify the primary factors that influence and direct the main attributes related to implementation of interoperable e-business standards, particularly those aspects that are independent of the specific sector chosen.

The case study on CRTI-B, and the description of BizDex (Standards Australia), address real live scenarios, and potential sectoral differences or similarities in technical, semantic and organisational systems, especially those that are of particular relevance to SMEs.

1.4 Definition of key terms

1.4.1 Interoperability

When discussing ways in which two systems, components or organisations can work together the terms interoperability, interface and integration frequently occur. A good practical definition of interoperability is cited in CEN Report CR 14300:1999 "Interoperability of healthcare multimedia report systems"[8], and repeated in the CEN/TC 251 "Short Strategic Study: Health Information Infrastructure"[9], published in 2005. This definition of interoperability, in its mention of a specific task, usefully distinguishes interoperability from integration. It also brings additional precision and operational clarity to the IEEE and ISO definition.

Interoperability (CEN Report CR 14300:1999)

> *a state which exists between two application entities when, with regard to a specific task, one application entity can accept data from the other and perform that task in an appropriate and satisfactory manner without the need for extra operator intervention*

Interoperability (IEEE and ISO)

> *the ability of two or more systems to exchange data, and to mutually use the information that has been exchanged*

Interoperability (IDAbc[10])

> *the ability of information and communication technology (ICT) systems and of the business processes they support to exchange data and to enable the sharing of information and knowledge.*

Interoperability (Miller[11])

> *the ongoing process of ensuring that the systems, procedures and culture of an organisation are managed in such a way as to maximise opportunities for exchange and re-use of information, whether internally or externally*

[8] CEN/TC251/WG IV Health Informatics. *Interoperability of Healthcare Multimedia Report Systems. Version 1.0.* (http://www.tc251wgiv.nhs.uk/pages/pdf/pt34fwd.pdf, last accessed August 23, 2005)

[9] CEN/TC251 Health Informatics (2005) – *Short Strategic Study – Health Information Infrastructure – working draft, interim report v0.4.* (http://www.centc251.org/TCMeet/doclist/TCdoc00/N00-074.pdf, last accessed August 23, 2005)

[10] IDAbc (2004) *European Interoperability Framework for pan-European eGovenment services.* Page 5

[11] *Interoperability* http://hylife.unn.ac.uk/toolkit/Interoperability.html (last accessed August 23, 2005)

1.4.2 Business Perspective

This study is conducted from a business perspective. In order to have a practical business meaning and interpretation, interoperability must be understood and expressed in the context of a business standards interoperability framework. The European Interoperability Framework (EIF)[12] for pan-European eGovernment Services, published in November 2004 by the IDA[13] defines an interoperability framework as follows:

> *An interoperability framework can be defined as a set of standards and guidelines that describes the way in which organisations have agreed, or should agree, to interact with each other. An interoperability framework is, therefore, not a static document and may have to be adapted over time as technologies, standards and administrative requirements change.*

It is therefore worthwhile to step back at the beginning and adopt a general picture as shown in the third and fourth definitions above. By so doing it is possible to better understand that:

- interoperability is not an end, in itself;
- standards while necessary are not sufficient for interoperability; and,
- any study of inter-enterprise interoperability and the standards that enable interoperability, must be based on an understanding of the business, social, cultural and political circumstances in which the enterprises operate.

In addition, it becomes clear that to be interoperable an organisation must be actively engaged in the ongoing process of ensuring that its systems, procedures and organisational culture are managed in a way that maximises opportunities for internal and external exchange and re-use of information, whether by means of automated processes using ICT or not. This is a fundamental issue.

1.4.3 Standards and Standardisation

The definition in Directive 98/34/EC is essential, because it underlies the New Approach and European standards policy. For completeness, other definitions are also included. The ISO/IEC definitions of a standard and of standardisation are particularly important, because of the global nature of B2B and the voluntary, open way in which ISO/IEC standards are developed.

The CRTI-B[14] definition of a standard is included because of the emphasis on implementation and on the importance of collaborative agreement between the parties of all doing things in a certain way. This definition also includes all 'technical specifications' that are produced by industry groups and other initiatives. The difference between a full consensus standard developed via an open and non-discriminatory process and a specifications delivered through other means is also of interest.

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[12] *European Interoperability Framework for pan-European eGovernment Services* (2004) (http://europa.eu.int/idabc/servlets/Doc?id=19528, last accessed August 23, 2005); see also the complete EIF specification (http://europa.eu.int/idabc/en/document/3473/5585, last accessed August 23, 2005)

[13] Interchange of Data between Administrations (IDA), is a Community Programme managed by the European Commission's Enterprise and Industry Directorate General. IDA supports the implementation of EU legislation, from internal market regulations to consumer and health policies, by facilitating the exchange of information between public administrations across Europe through the use of information technology.

[14] Centre de Ressources des Technologies de l'Information pour le Bâtiment (Luxembourg). See Section 3.1 of this report

standard (Directive 98/34/EC)

a technical specification approved by a recognised standardisation body for repeated or continuous application, with which compliance is not compulsory and which is one of the following:
— international standard: a standard adopted by an international standardisation organisation and made available to the public;
— European standard: a standard adopted by a European standardisation body and made available to the public;
— national standard: a standard adopted by a national standardisation body and made available to the public

standard (CRTI-B)

codified agreement between parties who recognise the advantage of all doing certain things in a certain way

standard (EN 45020; and ISO/IEC)

document, established by consensus and approved by a recognised body, that provides, for common and repeated use, rules guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context

standardisation (EN 45020; and ISO/IEC)

activity of establishing with regard to actual or potential problems, provisions for common and repeated use, aimed at the achievement of the optimum degree of order in a given context

1.4.4 Open Standards

Open standards of whatever flavour and source are favoured for sustainable e-business interoperability. However, despite the rhetoric that pervades the concept, there is no commonly accepted, universal definition of an 'open' standard.

A recent comprehensive attempt is outlined in Resolution GSC-10/04[15] of the 10th Global Standards Collaboration meeting (Sophia-Antipolis, September 2005) which defines as "open" a standard which meets the following fundamental elements:

(1) the standard is developed and/or approved, and maintained by a collaborative consensus-based process;

(2) such process is transparent;

(3) materially affected and interested parties are not excluded from such process;

(4) the standard is subject to RAND/FRAND[16] Intellectual Property Right (IPR) policies which do not mandate, but may permit, at the option of the IPR holder, licensing essential intellectual property without compensation; and,

(5) the standard is published and made available to the general public under reasonable terms (including for reasonable fee or for free).

[15] Global Standards Collaboration, 10th meeting Sophia Antipolis, September 2005. *Resolution GSC-10/04: (Joint) Open Standards* (http://portal.etsi.org/docbox/workshop/sos_interoperability/SOS2/SOS2_13 ANSI Views on open standards.ppt, last accessed 29 September 2005)

[16] Fair Reasonable and Non Discriminatory

Legislators have offered many definitions, and generally received strong reactions in return. Two specific instances include the Business Software Alliance[17] response to the IDAbc definition and the definition offered by the Danish Government[18]. More particularly, for example, the 5th paragraph of section 2.5 of the Initiative for Software report[19] refer to examples from France, Belgium, European Union, and the US and notes that these definitions have in common the following principles:

> *availability, non-discrimination, publication, low costs and protection of intellectual property rights (although in many cases there are no royalties due).*

The Initiative for Software Report further notes that, although open standards allow the implementation of open source software or proprietary software, an important principle is that in order to guarantee the flexibility in assessment of the best technological solution to enhance interoperability, the choice as to which standard and especially which software is to be used must not be imposed by the government. In other words, regulatory efforts to promote interoperability should be clearly separated from advocacy for open source software.

1.4.5 Scope of standardisation

Given the diverse range of elements that are important to enterprises, when they are establishing interoperable business, it is evident that the technology aspects of interoperability are invariably complex. Addressing technology interoperability issues via standards presents a range of challenges: one of the most important of these is the extent of the problem to focus on. Thus, some standards are created to solve relatively narrow specific technical infrastructure problems, while others address broad general and technical management issues:

- One distinction is whether the standardisation addresses components only, or whether it specifies a structure into which specific system wide solutions can be embedded. There is a practical outcome to the difference. Generally, the wider the problem scope addressed by a standard, the greater is the risk of producing over-specified, over-complicated, and under-performing standards;
- The narrow standards can sometimes be easier to deliver and adopt, and provided they fit into a workable functioning overall architecture, may as such have a relatively higher record of market success than broader standards. The latter usually also take longer to define and are thus potentially subject to more distractions and roadblocks along the way.

E-business interoperability requires both types of standards. This study therefore focuses on two exemplars of both types of standards:

- The system wide approach to interoperability and sets of e-business standards as shown for example in the developments associated with ebXML;
- The development of web services, in which the emphasis is on component standards and their integration within an overall architecture.

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[17] *Concerns raised over proposed definition of 'open standards'* http://europa.eu.int/idabc/en/document/4018/357, last accessed 29 September 2005)

[18] *Danish Government defines "open standards"* (http://europa.eu.int/idabc/en/document/3132/333, last accessed 29 September 2005)

[19] *Considerations on Interoperability and the Public Procurement of Software in Latin America 3/1/2005* (http://www.softwarechoice.org/download_files/Lat_Am_InteropWP.pdf, last accessed 29 September 2005)

1.5 The B2B cross-sector approach

During the design of the e-Business Survey 2005 questionnaire, attention was given to the Berlecon Research[20] report on e-business standards. That report, compiled on behalf of the German Federal Ministry of Economics and Labour, also used a user survey and addressed the topic in terms of the following standardisation issues:

- Identification and classification of products and components;
- Exchange of catalogue data;
- Synchronisation of data;
- Transactions, e.g. transactions of invoices or orders;
- Processes.

No attempt has been made to replicate the Berlecon Research study on a wider scale. Their work was based on extensive in-person interviews whereas, for practical purposes, the e-Business Survey 2005 questions are geared towards simple yes/no or Likert-type scale responses gathered in a twenty-minute computer-aided telephone interview (CATI). Thus, in order to build up a comparative analysis of the status within different sectors, the questions in the survey are framed, for instance, to determine:

- the attitude to standards importance and use;
- the level of satisfaction, or perceived gap, associated with the cross-sector facets, such as “catalogues and classification” and “messaging”.

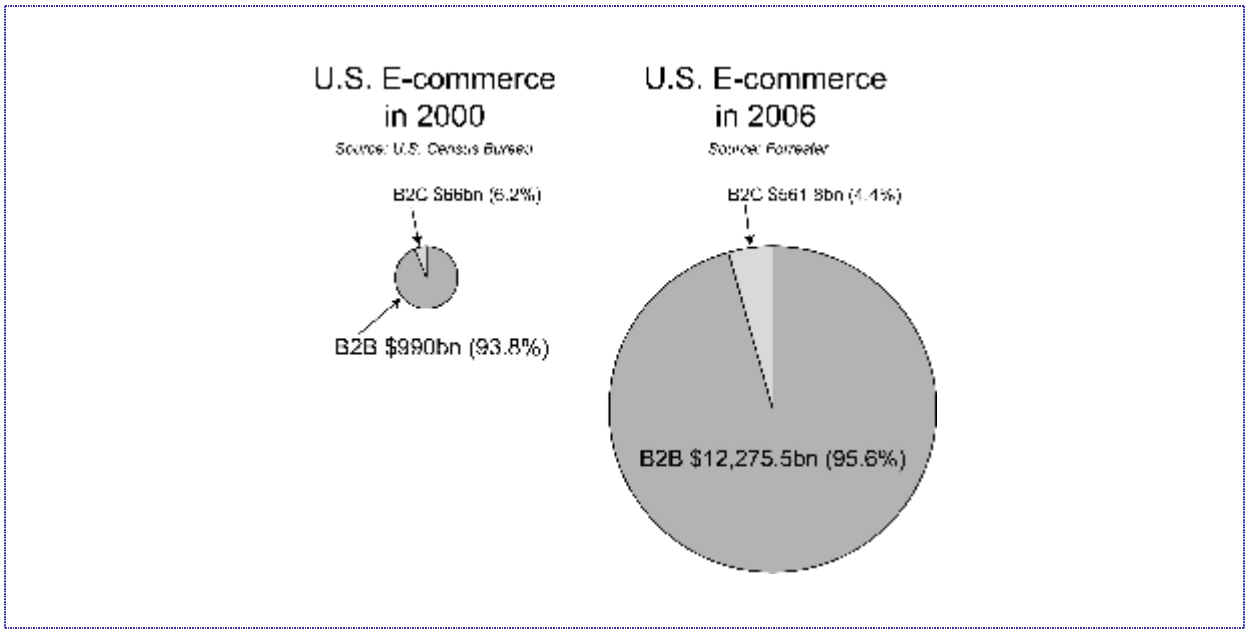
This study focuses specifically on B2B application-to-application trading and standards issues. The reasons for this focus are clear. The primary reasons are that the work is being conducted in the *e-Business W@tch* area and because of the availability of data from tailored questions included in the e-Business Survey 2005.

It is also relevant that B2B e-business involves vast sums of money, whereas B2C is still a small fraction of B2B. As quoted at the CSW Informatics XML Summer School, 28 July 2003[21] the size of the US B2B business alone, according to Forrester, will exceed 12 trillion dollars in 2006. This represents a huge B2B growth and the estimate is also greater by more than a factor of ten than the figures reported by US Census Bureau for 2000. Notwithstanding the possibility that the true 2006 figure will probably lie somewhere lower than the Forrester predictions, it is clear from widely accepted industry trends that the economic benefits to be gained by focusing on B2B e-trading are certain to be very worthwhile.

[20] Berlecon Research / BMWA (2003): *E-Business-Standards in Deutschland: Bestandsaufnahmen, Probleme, Perspektiven.* Report by Berlecon Research on behalf of the Bundesministerium für Wirtschaft und Arbeit (BMWA), April 2003 (http://www.berlecon.de/research/en/reports.php?we_objectID=125, last accessed August 23, 2005)

[21] Maler, E., *XML for e-business (2003).* (xml.coverpages.org/Maler-CSW-xml-for-ebusiness.pdf, last accessed August 23, 2005)

Exhibit 1-1: e-Business market opportunity



Source: XML for e-business
Eve Maler at CSW Informatics XML Summer School, 28 July 2003.

Sectors addressed

The ten sectors addressed in the e-Business Survey 2005 are listed in Exhibit 1-2. Abbreviations of the sector names, as shown in the second column of Exhibit 1-2, are used for convenience in the tables and charts in this report.

Exhibit 1-2: Sectors in the e-Business Survey 2005

Sectors Addressed in e-Business Survey 2005	Abbreviation
Food and beverages	Food
Textile industries	Textile
Publishing and printing	Publish
Manufacture of pharmaceuticals	Pharma
Manufacture of machinery and equipment	Machine
Automotive industry	Auto
Aerospace industry	Aero
Construction	Constr
Tourism	Tourism
IT Services	IT Serv

1.6 Architecture background

In general, the approach to achieving "Interoperability" depends on the context and the individual perspectives concerned. In the e-business context, there are two main facets:

- Technical Interoperability (TI), which determines how different software programs in different companies can interact; and
- Business Interoperability (BI). Also often known as 'Collaboration', BI concerns itself with the semantics and the agreements between companies acting in trading communities. It determines how different companies can align their respective business processes in order to do business electronically.

Neither is sufficient on their own; both are essential and must be simultaneously addressed, preferably within at least a common sector driven approach.

> *Business Interoperability is a far more complex issue than Technical Interoperability, since it not only involves semantics, but also culture, language, business practices, legislation and corporate politics. A necessary ingredient for doing business electronically is also the presence of up-to-date and correct product information with the partners in the Supply Chain. Product Catalogues, Data Alignment and Classification of products are topics related to this issue.* (Dick Raman, CEN/ISSS WS/EBES[22] Chairman, 23 March 2004)

Trading globally, over electronic networks, depends on the trust networks established between suppliers and purchasers and also on the enabling physical and logical infrastructures.

> *And all of this must be as easy as making a telephone call, even with trading partners who are complete strangers. After all, with one telephone call we nowadays already can place an order. Computerisation should make life easier, not harder.* [23]

1.6.1 EDI

Electronic Data Interchange (EDI) was first introduced more than 20 years ago and since standardised in United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT). Throughout that time, EDI has proven to be a successful long-standing and long-lasting technology standard for electronic trading transactions.

EDI techniques enable the exchange of transactional information between independent organisations based on standardised business documents. Traditional EDI systems employ specialised communications networks, value-added networks (VAN), to obtain enterprise qualities of service. Although EDI serves its particular task very well in the right set of circumstances, the cost of implementation per additional trading partner is expensive, the information itself is not human readable, and often the technologies require the use of private networks involving per-transaction costs.

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[22] The CEN/ISSS eBES (e-Business Board for European Standardisation) Workshop is a focal point within Europe for the standardisation of technologies to exchange electronic business data. WS/eBES is the "European Entry point" for the UN-ECE/CEFACT electronic business standardisation process. See also the Business Plan December 2004 (http://www.cenorm.be/cenorm/businessdomains/businessdomains/isss/activity/wsebes.asp, last accessed August 23, 2005)

[23] van Blommestein F.B.E. and P.G.L. Potgieser (2005). *ebXML for managers: a co-production of ECP.NL and Interpay*. p22. (http://www.ecp.nl/publications/ebXML_for_managers.pdf, last accessed August 23, 2005)

These characteristics of traditional EDI are summarised in the introduction to the Open-edi reference model:

> *The economic advantages of Electronic Data Interchange (EDI) are widely recognised. However, the cost of setting up an EDI relationship has been very high due to the need for detailed bilateral business and technical agreement between the involved business partners. The initial high cost of establishing such an agreement does not justify short term partnerships. It has also been found that implementations involving the management of a large number of partners and their associated agreements are not productive Consequently most EDI implementations have been successful only in long term partnerships, and between a limited number of partners*[24].

Open-edi lowers these barriers by introducing standardised business scenarios and the necessary services to support them.

Open-edi[25]

The ISO/IEC Open-edi Reference Model provides a reference framework for the identification, development, and co-ordination of Open-edi standards. This framework addresses separately the complementary business and technology perspectives of business transactions. These perspectives are defined as follows:

- **Business Operational View (BOV)**: a standards perspective on business transactions regarding the making of business decisions and commitments among organisations, limited to those aspects which are needed for the description of a business transaction;
- **Functional Service View (FSV)**: a standards perspective on business transactions limited to those information technology interoperability aspects of IT Systems needed to support the execution of Open-edi transactions.

These views are not independent. The FSV related standards must take into account the BOV related standards and vice-versa. As shown in Exhibit 1-3, the effective inter-relationship between these classes of standards is a critical factor of the Open-edi reference model.

The BOV related standards are tools and rules by which business users, who understand the operating aspects of a business domain, may create business trading scenarios. Registration authorities, for instance, will reference the BOV related standards when considering scenarios for registration.

The FSV related standards are used by the information technology experts to design and/or build IT systems which support the business needs. These experts produce products and services conforming to FSV related standards. These so-called “Open-edi systems” support the execution of Open-edi transactions.

Open-edi scenarios, built using BOV related standards, formulate requirements which are demands placed on the products and services conforming to FSV related standards executing the corresponding Open-edi transaction. These demands, which ultimately specify the required ICT system components, include:

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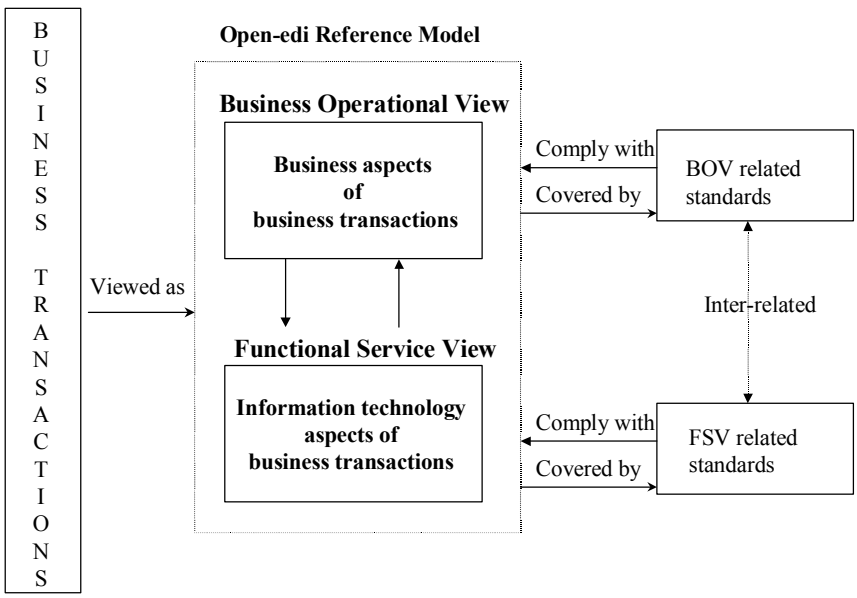
[24] ISO/IEC 14662:2004(E). *Information technology – Open-edi reference model. Introduction, Page v.* (http://isotc.iso.org/livelink/livelink/fetch/2000/2489/Ittf_Home/PubliclyAvailableStandards.htm, last accessed August 23, 2005)

[25] ISO/IEC 14662:2004(E). *Information technology – Open-edi reference model.* (http://isotc.iso.org/livelink/livelink/fetch/2000/2489/Ittf_Home/PubliclyAvailableStandards.htm, last accessed August 23, 2005)

- identification of the functional capabilities necessary to support Open-edi transactions;
- formal specification of these functional components developed using FSV related standards;
- specification and agreement on the quality of service required from the functional capabilities for these Open-edi transactions.

The primary benefit within the Open-edi scenario, is that there is in principle no need for prior agreement on technical and business details in order for two enterprises to engage directly in B2B. As long as both implementations conform to the FSV related standards, the Open-edi processes ensure acceptance and processing of that information, in the context of that scenario. In that case, by reference to the scenario and without the need for further agreement, one or more other Open-edi parties can start trading electronically. However, the legal requirements and/or liabilities resulting from the engagement of an organisation in any Open-edi transaction may be conditioned by the competent legal environment(s) or the formation of a legal interchange agreement between the participating organisations. Open-edi parties need to observe rule-based behaviour and possess the ability to make commitments in Open-edi (e.g. from business, operational, technical, legal and/or audit perspectives). Open-edi essentially remained a concept until the advent of internet EDI.

Exhibit 1-3: Open-edi Reference model



Internet EDI (XML/EDI)

Since the first appearance (1996) in Japan of Internet EDI, the simplicity of system configuration, low management costs and essentially no usage fees have made it an attractive proposition in comparison to traditional proprietary-EDI or EDI over private VANs (Value Added Networks). This and other aspects related to XML/EDI are well documented in the *Internet EDI (XML/EDI): introduction guidebook*[26], published by the Electronic Commerce Promotion Council of Japan.

[26] Electronic Commerce Promotion Council of Japan. *Internet EDI (XML/EDI): introduction guidebook*, March 2003 (http://www.ecom.jp/ecom_e/press/20030529/InternetEDIGuidebook.pdf, last accessed August 23, 2005).

1.6.2 XML – eXtensible Markup Language

The eXtensible Markup Language (XML) is a subset of SGML[27]. Its goal is to enable generic SGML to be served, received, and processed on the Web, in the way that is widely possible with HTML. XML has been designed for ease of implementation and for interoperability with both SGML and HTML.The XML specification[28] defines a standard way to identify structures by adding markup to documents containing structured information. Structured information contains both content (e.g. words, tables, graphics, pictures) and some indication of what role that content plays. The term "document" refers to traditional documents, like this one, and also to wide range of other XML "data formats". These include vector graphics, e-commerce transactions, mathematical equations, object meta-data, server APIs, and many other kinds of structured information. As a very general rule, few documents exhibit no structure. Thus practically all documents exhibit some structure and can be represented in XML.

Unlike HTML, which has fixed tag semantics and tag sets, XML specifies neither semantics nor a tag set. XML is a meta-language for describing markup languages and as such provides the flexibility to define tags and the structural relationships between them that are applicable to any domain of choice. Since there is no predefined tag set, there cannot be any preconceived semantics. All of the semantics of an XML document will be defined either by the applications that process them or by XML schemas or stylesheets. A convenient glossary of XML terms is available online via the XML Acronym Demystifier[29].

1.6.3 ebXML

The electronic Business using XML (ebXML) initiative began in November 1999 with the goal to "enable anyone, anywhere to do business with anyone else". The first complete specifications were delivered in May 2001 after extensive collaboration between members of UN/CEFACT and OASIS.

Fact Box:

*ebXML (electronic business using eXtensible Markup Language). A single set of internationally agreed upon technical specifications and common XML semantics to facilitate global trade. The ebXML framework for e-business is a joint initiative of UN/CEFACT and OASIS. (*www.ebxml.org).

UN/CEFACT is the United Nations Centre for Trade Facilitation and Electronic Business, the international body whose mandate covers worldwide policy and technical development in those areas. Headquartered in Geneva, it has developed and promoted many tools for the facilitation of global business processes including UN/EDIFACT, the United Nations Directories for Electronic Data Interchange for Administration, Commerce and Transport. Since 1999, it has collaborated with OASIS in the development of ebXML. (www.uncefact.org)

OASIS (Organization for the Advancement of Structured Information Standards) is a not-for-profit, global consortium that drives the development, convergence and adoption of e-business standards. (http://www.oasis-open.org)

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[27] *Standard Generalized Markup Language*, ISO/IEC 8879:1986(E)

[28] *Extensible Markup Language (XML) 1.0 (Third Edition)* W3C Recommendation 04 February 2004. (http://www.w3.org/TR/REC-xml/, last accessed August 25, 2005)

[29] *XML acronym demystifier* http://www.xml-acronym-demystifier.org/, last accessed August 23, 2005

ebXML is unique in the breadth of its standards vision and is built on the previous Open-edi standards efforts toward a shared global Internet-based B2B framework. ebXML is complementary to many existing standards, such as legacy EDI, XML-based business document standards, and Web Services.

The general technical and business design goals that underlie ebXML developments are outlined as follows[30] in the European ebXML Information Centre web pages:

- *Enable simple, easy and ubiquitous electronic business through the use of XML;*
- *Use W3C XML technical specifications holding recommended status to the maximum extent practicable;*
- *Provide a global cross-industry open, interoperable standard for business-to-business and business-to-consumer trade;*
- *Coalesce the structure and content components of divergent XML initiatives into a single usable XML business standard;*
- *Provide impetus so that common resources currently engaged in short-term vertical solutions may/can be marshalled to reach a common long-term, horizontal solution;*
- *Support vertical and horizontal segments of industry and business participants;*
- *Avoid proprietary solutions that impose financial or software requirements constraints on ebXML users to buy, install or programmatically support any ebXML unique software products in the conduct of business information exchange;*
- *Strive to minimize costs of doing business electronically;*
- *Provide multi-lingual support;*
- *Accommodate national and international trade requirements;*
- *Provide a migration path from accredited EDI and developing XML business standards to standards EDI/XML standards framework*

The first phase of the project was completed in May 2001 with the production of an architecture and other key specifications to allow e-Business. Using ebXML, companies now have a standard method to exchange business messages, conduct trading relationships, communicate data in common terms and define and register business processes. ebXML activity is still ongoing under the control of the two bodies, UN/CEFACT and OASIS, that oversaw the core project. The specifications are being refined and projects are underway that demonstrate the viability and real-world use of ebXML.

The ebXML initiative is clearly modelled on the Open-edi architecture. As shown by studies and reports[31], produced by amongst others the ebXML Marketing Group, it effectively meets the need of enterprises, of any size and in any geographical location, to be able to conduct business electronically in a simple, reliable and cost-effective manner. ebXML achieves this by providing companies with a standard method to exchange business messages, conduct trading relationships, communicate data in common terms and define and register business processes. It thereby makes it easier for organizations to interface with others within and outside their industry, open up new markets with less effort than before and, at the same time, cut costs and simplify process associated with traditional document exchange.

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[30] eBES has established a European web site http://www.ebxml.eu.org/about_ebxml.htm to complement the www.ebXML.org web site and provide key information focused on the particular needs of the European user community

[31] *ebXML Adoption Update, December 2003*. (http://www.ebxml.org/documents/ebxml_adopt_update_122203.pdf, last accessed August 23)

As a clear international acceptance that ebXML standards enable enterprises in any industry, of any size, anywhere in the world to conduct business over the internet, the International Standards Organisation (IS0) published a suite of four ebXML standards as ISO technical specifications, ISO/TS 15000[32]:

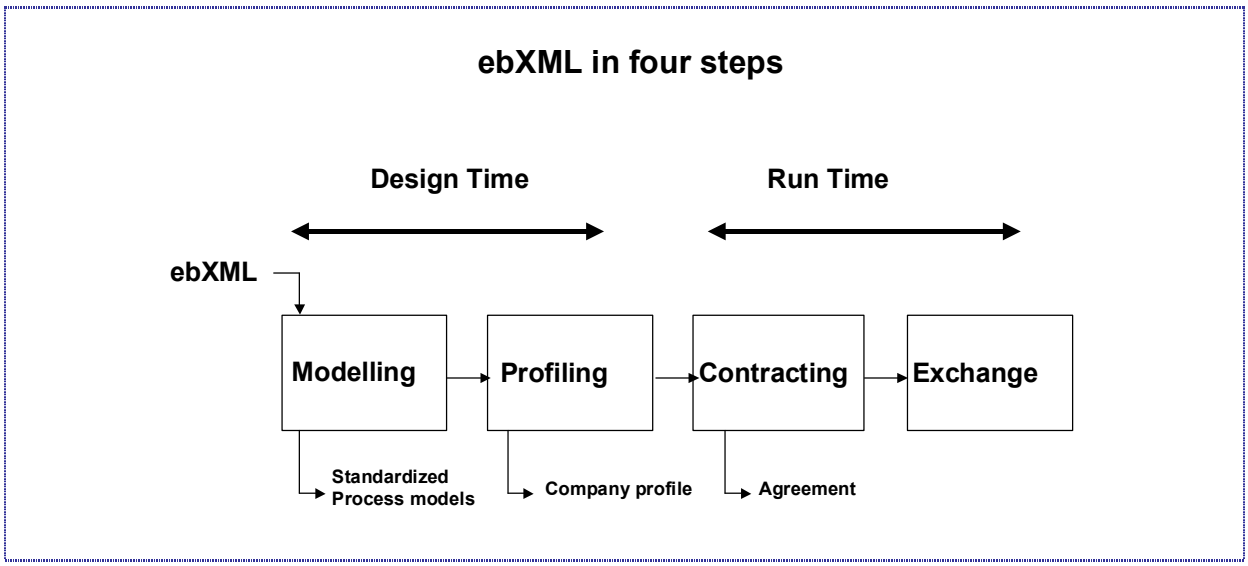
- ISO/TS 15000-1: ebXML Collaborative Partner Profile Agreement;
- ISO/TS 15000-2: ebXML Messaging Service Specification;
- ISO/TS 15000-3: ebXML Registry Information Model;
- ISO/TS 15000-4: ebXML Registry Services Specification.

ebXML for managers

'ebXML for managers' is the English version/translation of the original Dutch booklet 'ebXML voor managers'. Published and co-produced in December 2004 by Interpay and ECP.NL, the booklet explains ebXML from a business perspective. As the title indicates it is intended for use by business managers. It explains the EDI precursor background of ebXML, shows the application possibilities by use of concrete recent business examples and gives an indication of what companies should do to be able to use ebXML and to benefit from its use.

The booklet presents a 4-step process to describe ebXML and its introduction in a business context. The following text and Exhibit 1-4 are adapted from the booklet.

Exhibit 1-4: ebXML in four steps



Source: *ebXML for managers (2005)*

The Four Steps

In step 1 the business processes are analysed and modelled. The result is a set of diagrams and a number of candidate sub-processes and candidate data elements. These elements are then placed in the ebXML registry and harmonised by UN/CEFACT with the processes and data of other sectors. The aim is to reuse as many of the processes and data as possible so that they can be used for information between the sectors. In general, at present, data and processes are being modelled for many sectors, usually through trade associations or other national sectoral initiatives.

[32] *ebXML OASIS Standards Approved Under ISO/TS 15000 Designation, 29 March 2004* (http://xml.coverpages.org/ISO-ebXML.html, last accessed August 23)

In step 2 this data is made context dependent. Companies first determine in which context (sector, region, product types, etc.) they will operate. This will determine the kind of data they should use in their processes. For example a trader in perishable goods will include a *best before date* in his delivery message while a steel manufacturer will not. The profiling is performed entirely in the background. The only additional requirement is to add decisions that the ebXML software itself cannot decide on the basis of the stored information. These are typically the *company rules* that the trader must comply with, e.g. payment on delivery or afterwards by invoice.

While the first two steps involve manual modelling activities, step 3 can be fully automated. Companies that wish to do electronic business find each other's profiles in the ebXML Registry (or they simply send it to one another). If the two profiles match, they can be combined into an ebXML agreement. This is an XML file or a set of XML files that is used by the ebXML software in administration systems or web browser to control the collaboration between the companies.

In step 4, the actual electronic transactions based on ebXML can start. Governed by the agreement, the messages are extracted from the company applications, converted into XML messages, packaged in secure network envelopes and sent via the internet. At the receiving end the messages are unpacked, checked and confirmed. It is then read into the application. All of this takes place automatically within the framework of a monitored business process.

This ebXML approach is set to become the preferred solution worldwide for regulated e-business between partners. The approach is applicable to any business, and in any sector. Furthermore a wide range of commercial and open source software (see www.freebxml.org) is available to assist implementation and operation of the four steps.

The booklet also outlines how those who want to use ebXML in their sector should proceed. It highlights the need for knowledgeable and expert staff to ensure effective implementations. Another factor critical for success is that the ebXML infrastructure must be designed in accordance with the standard, and NOT specifically for any of the partners.

Using some additional ebXML terminology, the following stages apply in implementation and operation:

- Defining the company's Business Processes;
- Describing the Semantics in Core Components;
- Determining where in the company's process what information is needed from the partner;
- Defining how to allow partners access to the company's information (Messaging, Web Services);
- Using the company's Collaboration Protocol Profile (CPP);
- Storing the information in a Repository;
- On request by one or other partner, the CPPs of two trading partners that want to do business are then matched to produce a Collaboration Protocol Agreement (CPA).

Both the CPP and CPA are machine readable XML documents. The CPA can be directly used by middleware[33] or Enterprise Resource Planning (ERP)[34] systems to monitor and manage network traffic.

[33] Software that connects two otherwise separate applications: for example, there are a number of middleware products that link a database system to a Web server. This allows users to request data from the database using forms displayed on a Web browser, and it enables the Web server to return dynamic Web pages based on the user's requests and profile.

[34] ERP (Enterprise Resource Planning) is an industry term for the broad set of activities supported by multi-module application software that help a manufacturer or other business manage the important parts of its

Loosely bound

As part of the movement away from proprietary platforms, Web services rely on loose, rather than tight, couplings among Web components. According to Brian Travis, SOAP consultant and author, "Systems that rely on propriety objects are called tightly coupled because they rely on a well-defined but fragile interface. If any part of the communication between application and service object is disrupted, or if the call is not exactly right, unpredictable results may occur." Traditional EDI is an example of a tightly-coupled framework for doing electronic commerce. Loosely coupled systems allow for flexible and dynamic interchange in open, distributed Web environments.

e-Business interoperability framework (ebXML based)

A simple graphic model summarising the components of the ebXML architecture outlined in the previous section, together with additional considerations that need to be managed as part of an e-Business Interoperability Framework is Exhibit 1-5. The chart is a variation on the one presented by Schuldt[35] at the NIST e-Business Standards Convergence Forum meeting, May 29, 2003).

Exhibit 1-5: e-Business Interoperability Framework

<table>
<tr><td colspan="5">Business Applications (generally sector specific)</td></tr>
<tr><td>Partner
A</td><td>Outreach &
Policy</td><td>Business Processes
Component Elements
Registry & Repository
Trading Partner Profile
Transport & Package</td><td>Security</td><td>Partner
B</td></tr>
<tr><td colspan="5">Technical Environment (generally partner unique)</td></tr>
</table>

Adoption of ebXML

The OASIS ebXML Awareness Team, with the assistance from OASIS member organisations and partners, have compiled a report giving a global picture of the status of ebXML adoption[36]. This December 2003 report summarises the status of around a hundred completed, ongoing or planned ebXML-related projects. It also notes the increased awareness of the extensive ebXML-related implementations and other activity already in place across the globe.

The European Commission's Interchange of Data between Administrations (IDA) published a study in September 2003, "Business to Business Frameworks for IDA Networks," stating:

> *ebXML is the only framework that is at the same time generic and flexible, and can be used for inter-administrations relations. Moreover, ebXML is clearly the only trend for organised business communities. The general recommendation is to follow ebXML*

business, including product planning, parts purchasing, maintaining inventories, interacting with suppliers, providing customer service, and tracking orders. ERP can also include application modules for the finance and human resources aspects of a business. Typically, an ERP system uses or is integrated with a relational database system.

[35] Schuldt, Ron. *e-Business standards reuse, convergence, and deployment.* (http://www.mel.nist.gov/div826/msid/sima/ebsc/files/aia.pdf, last accessed August 23, 2005)

[36] *ebXML Adoption Update, December 2003.* (http://www.ebxml.org/documents/ebxml_adopt_update_122203.pdf, last accessed August 23)

standards as much as possible. This is coherent with the fact that many exchanges between European administrations reflect the interactions between those administrations and the national business world[37].

1.6.4 Web services

Web services are XML applications mapped to programs, objects, or databases or to comprehensive functions. Using an XML document created in the form of a message, a programme

- sends a request to a web service across a network; and,
- optionally, receives a reply, also in the form of an XML document.

Web services standards define the format of the message, specify the interface to which the message is sent, describe conventions for mapping the contents of the message into and out of the programmes implementing the service, and define mechanisms to publish and to discover web services interfaces.

ebXML relationship to Web Services and the Semantic Web

ebXML and Web services are complementary sets of service-oriented architecture technologies. In current practice, a number of their various elements are implemented in combination. Because of this, a natural cross-fertilisation has occurred between the technologies. For example, the ebXML Messaging Specification uses SOAP (Simple Object Access Protocol) message headers, while its reliability model is being set as the standard for Web services through the OASIS Web Service Reliable Messaging Technical Committee.

The complementarity of both ebXML and Web services is also mentioned in the previously referenced "Business-to-Business Frameworks for IDA Networks" study published in September 2003 by the European Commission's IDA (Interchange of Data between Administrations):

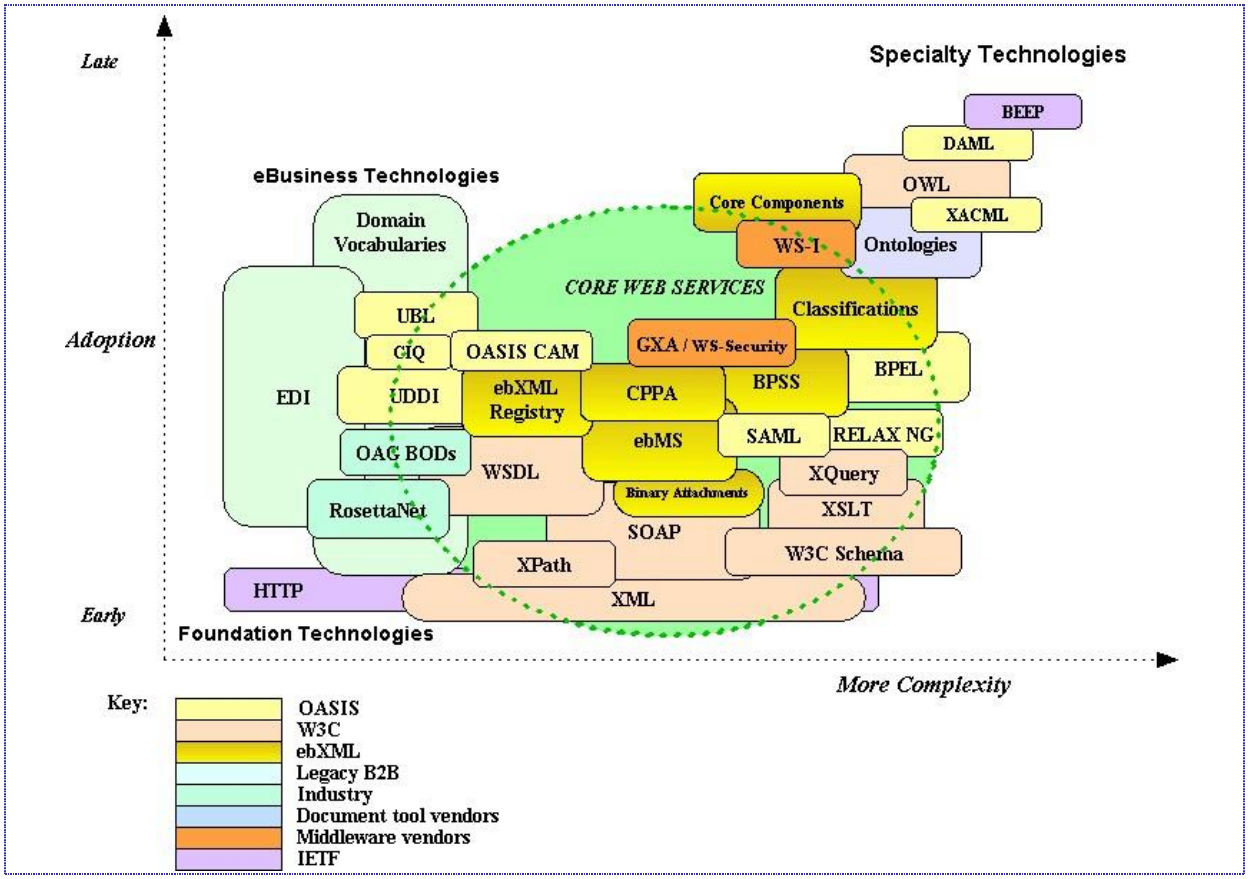
Web Services and ebXML are not competing frameworks. They can be viewed as serving two different B2B models and will continue to be used in parallel[36].

ebXML provides core web services for e-Business. Exhibit 1-6: Core services for e-Business shows how the ebXML specifications are positioned in the centre. The ebXML implementation foundation comprises four components: messaging (ebMS), collaboration profiles (CPPA), business process (BPSS) and metadata registry.

When considered as part of a wider component based web service offering, the technical details of the wide range of standards yet undecided and under development for Web Services becomes quite complex and diffuse. Many different proprietary offerings and groups are struggling for primacy. Details of these standards and discussions are outside the scope of this report as they are neither relevant nor required in this business perspective. Nonetheless, Exhibit 1-6 provides a brief glimpse at the complexity, and hence uncertainty, surrounding current web service standards. Thus, in general, when the choice permits and the business needs demand, it is considered a safer option to adopt the proven EDI/XML (ebXML) solutions now and to wait until web service standards settle into a more stable configuration. As both approaches will coexist for some considerable time, the investment in ebXML will continue to pay dividends for the foreseeable future.

[37] IDAbc. *Business to Business Frameworks for IDA Networks, September 2003* (http://europa.eu.int/idabc/en/document/1564/5587, last accessed August 23, 2005)

Exhibit 1-6: Core services for e-Business[38]



Source: Webber, David (20030909). *Q&A with David Webber, Co-chair of the ebXML Joint Marketing Team* (http://www.developer.com/xml/article.php/3074481, last accessed August 23, 2005)

1.6.5 Grid Services

Will there ever be stable Web Service standards[39]? Future interoperability capabilities will be greatly influenced by the transition from Web Services to Grid Services. Web Services connect applications across large heterogeneous networks. As Web Services become widely implemented and supplanted, the nature of applications will change to become more like virtual enterprises: drawing on distributed resources as and when required. Thus, many applications will be constructed dynamically from available services, depending on the functionality that is needed or available. The expectation is that the standards requirements focus will shift from application connectivity standards to infrastructure requirements, such as the need to communicate across different operating systems, access files that are managed by different file systems, operate in an environment where there are multiple administrative domains, each with its own security approach, and operate in an environment where individual resources can fail.

If, as some contend, the market for Web Services has peaked, and Grid Services are already the next big venture, it is likely that there will never be fully stable Web Service standards. In that event it is advisable for SME managers to be very cautious before risking their business on unproven Web Services. ebXML represents a far safer and more viable option at this time.

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[38] See Webber, David (20030909). *Q&A with David Webber, Co-chair of the ebXML Joint Marketing Team*

[39] *Grid computing - today and tomorrow: another view*. Grid Today Vol. 1 No. 9 August 12, 2002 (http://www.gridtoday.com/02/0812/100221.html, last accessed 23 August 2005)

1.7 European interoperability initiatives

The issue of interoperability has dominated standards work for well over a decade. For example, in the mid 90s, ISOIEC JTC 1 established a Special Working Group reporting directly to the JTC 1 plenary on Standards Conformance and Interoperability. While there was some interest in this work it was generally perceived as being an additional overhead and after 2-3 years the responsibilities of the group were evolved to the technical committees. More recently there has again been a surge in interest in interoperability within standards organisations.

European Standardisation organisations

Both CEN and ETSI have groups focused on interoperability. To a first approximation:

- CEN/ISSS Workshop eBIF[40] (e-Business Interoperability Forum) is a strategic policy group which addresses business interoperability issues. CEN/ISSS eBES (e-business Board for European Standardisation) Workshop, the "European Entry point" for the UN-ECE/CEFACT electronic business standardisation process, produces consensus pre-standards. The two groups are complementary and compatible.
- ETSI via its Interoperability PlugTests[41] and its recent focused conferences on interoperability[42] is geared to address the technical issues.

Fact Box:

CEN and ETSI – European standardisation and interoperability organisations

CEN is a multinational, multi-sector, highly decentralized organisation aimed primarily at facilitating the emergence of coherent consensus between economic partners who, within the framework of national delegation, or direct industry participation depending on the ultimate deliverable, involve themselves voluntarily in technical negotiations leading to the adoption of European Standards and other CEN deliverables.

CEN/ISSS (Information Society Standardisation System) provides market players with a comprehensive and integrated range of standardisation services and products, in order to contribute to the success of the Information Society in Europe. www.cenorm.be

ETSI, the European Telecommunications Standards Institute is an independent, non-profit organisation, whose mission is to produce telecommunications standards for today and for the future. Based in Sophia Antipolis (France), the ETSI unites 688 members from 55 countries inside and outside Europe, including manufacturers, network operators, administrations, service providers, research bodies and users. The activities in telecommunications, broadcasting and related standardisation are supplemented by interoperability testing services and other specialisms. ETSI's prime objective is to actively support global harmonisation. http://www.etsi.org

[40] http://www.cenorm.be/cenorm/businessdomains/businessdomains/isss/activity/ebif.asp, last accessed 29 September 2005

[41] http://www.etsi.org/plugtests/, last accessed 29 September 2005

[42] http://www.etsi.org/pressroom/Previous/2005/2005_05_sos.htm, last accessed 29 September 2005

The European ebXML Information Centre http://www.ebxml.eu.org/ was developed by eBES. It complements the www.ebXML.org web site by providing key information in several Community languages focused on the particular needs of the European user community and by providing guidance to users on related subjects such as "How to migrate to ebXML". Unfortunately, the ebXML Information Centre is a little out-dated. Information is not current, despite the fact that it is supposed to be maintained by eBES in collaboration with ebXML.org and the ebXML Joint Marketing Team.

The aim of the European ebXML Information Centre is to add value to the international ebXML deliverables by providing information in different European languages, adding a missing component to meet European requirements where needed. Through this it aims to assist in the education of user communities, developers and business experts on ebXML in a comprehensive yet understandable manner.

The specific objectives of the European ebXML Information Centre are to:

- Disseminate outputs from the ebXML project;
- Support the dissemination of emerging standards in ebXML, including the outputs from OASIS and UN/CEFACT, and also the outputs from the eBES workshop;
- Provide a central resource for organisations and individuals to access information on the current state of developments in ebXML, and in wider XML standardisation;
- Provide a reference repository for ebXML standardisation related resources;
- Provide information to help the migration of EDI standards and systems to XML.

Each of the above groups has been relatively successful in relation to their stated goals and individual schedules. In particular all have been very successful in bringing together technical experts and managers and in establishing an extensive body of literature, presentations and links to other organisations active in interoperability worldwide. This also includes two-way links to the FP7 projects Interop NOE, ATHENA IP and the eBSC (e-Business Standards Convergence) Forum based in US and for which NIST provides the Secretariat.

However successful eBIF has been for its current members, and the organisations they represent, the multiplier effect of the limited number of active participants and limited resources in eBIF is not sufficient to ensure that the information gathered is effectively disseminated to all of the European business and technical managers who can use it. This is effectively every SME manager in Europe. Both the frequency and content of dissemination, and the methods of reach need to be appropriately increased.

What is required for such a breakthrough in implementation rates of EDI/XML to occur? This is the key question. EDIFACT offered almost the same inter-company service level vista as, for instance, ebXML does. EDIFACT was picked up by the large companies, yet hardly ever by SMEs. In all probability, unless specific action is taken, the same could happen again and the question becomes moot. Active dissemination, increased awareness and visible leadership are required to show that ebXML is intuitively easier for SMEs to implement and use, with consequent benefits for their companies, customers and suppliers.

European Research and Technology Development Projects

Some highlights from the current active interoperability projects, especially any plans to work with or involve SMEs in implementations, are summarises in the following table, Exhibit 1-7.

Exhibit 1-7: European RTD Projects on Interoperability

INTEROP FP6 Network of Excellence www.interop-noe.org	The project is now entering the second half of its planned 36 month lifespan. The main work following the FP5 IDEAS project is on: - Architecture and platforms - Enterprise modelling - Enterprise ontologies The scientific value added resulting from the fusion of these three multi-disciplinary components has confirmed, to the consortium members, the potential of an emerging research topic and associated establishment in Europe of a virtual laboratory on Interoperability for Enterprise Software and Applications (IESA). A proposal for creation of a European Master's degree programme in interoperability, when implemented will add considerable value to the European Research Area. There is a good public release of approved documents. Deliverable 12.1 *Methodology to implement services and develop take up actions towards SMEs* is available from the site and outlines the proposed methodology to implement services and to develop take up actions towards SMEs. Note: CRP Henri Tudor, the source of the business case in this report, is a core member of the INTEROP NoE.
ATHENA FP6 Integrated project www.athena-ip.org	ATHENA builds upon the FP5 IDEAS project, with many of the original project partners continuing to work together. The main objectives are to lay down the foundation for long term research into interoperability from a business perspective. Deliverable 3.5 ATHENA Contribution to Interoperability Action Plan (Version 1, March 2005) identifies five initial key component areas for a business interoperability framework: value model, benchmarking, community and consensus building and e-business digital divide. The latter relates to addressing the gulf that is opening up between enterprises from different size-bands, and the assistance that can be given to help SMEs understand and achieve the benefits of e-business interoperability. ATHENA plans to work with some SMEs, for the establishment of an Enterprise Interoperability Centre (EIC), and for mechanisms to make the concept of interoperability meaningful in business terms to a business audience. The EIC will be terminated in 2007, based on current schedules, unless it is independently viable by then.

Each of these projects could contribute to increasing take up of e-business in all sectors across Europe. To do this credibly, they need access to, and support from, a wide range of companies. They also need to establish positive partnerships with standards development organisations and e-business interoperability standards policy groups in order to effectively avoid duplication and realise the potential synergies that exist. At present, however, it appears that a strong focus on collaboration with policy groups such as eBIF and contributions to e-business standards convergence is lacking. Perhaps there is an expectation that the work of UN/CEFACT Management Group Framework and eBSC Model/Framework will deliver the latter in due course (see next section).

1.8 Other interoperability initiatives

Two other major initiatives are of interest:

- ISO/IEC/ITU/CEFACT MoU Management Group Framework;
- NIST e-Business Standards Convergence (eBSC) model/framework.

ISO/IEC/ITU/CEFACT MoU Management Group Framework

http://www.itu.int/ITU-T/e-business/mou/ provides access to an April 2005 presentation which outlines the goals and achievements of the Memorandum of Understanding (MoU). The business requirement is clear: e-business is becoming a cornerstone of the world economy; full benefits for consumers, industry and government demand a coherent set of information and communication technology standards that are "open, interoperable and internationally accepted" so that they can:

- support dynamic development of e-business;
    - across the manufacturing and service industries;
    - along the global supply chain from supplier to consumer;
    - throughout the lifecycle of products, which may be decades;
- and, provide effective services to the citizen.

The basic requirement identified in the MoU is for a single clear and unambiguous set of data definitions and relationships as the basis for defining sharable sets of data for the different processes in electronic business. Using this it will be easier to achieve modularity, consistency and interoperability between the various standards used. The MoU Management Group is the coordination authority for developing an integrated, modular architecture of information for Electronic Business. The architecture must include as a minimum:

- clear, unambiguous definitions of the information, capable of interpretation into multiple languages;
- fixed relationships between elements of information;
- hierarchies of information elements;
- identification of information that should be maintained through registration authorities.

The MoU recognises the responsibility of the participating International User Groups for contributing to the specification of the requirements for standards for electronic business, although they do not have a unique responsibility. Within this context, an agreed and regularly updated division of responsibilities is issued. While most of the organisations participating are global, CEN/ISSS is a "user signatory" to the MoU and participates in Management Group activities.

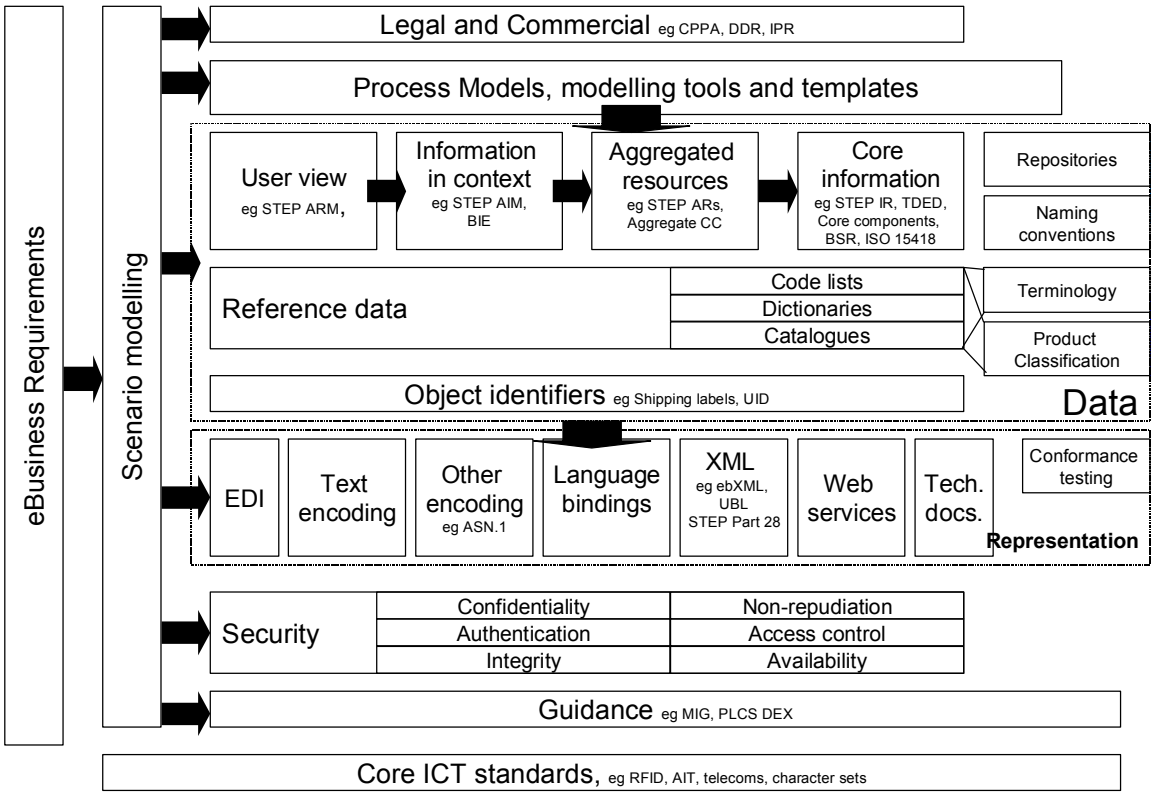
NIST e-Business Standards Convergence (eBSC) model/framework

The e-Business Standards Convergence (eBSC) Forum is a collaborative effort open to industry, government and global organisations and associations with active e-business initiatives, standards development, conformance or interoperability testing activities. Participants in the eBSC Forum are encouraged to work on the tasks defined by the Forum, contribute to achieving convergence of e-business standards and cross-industry inter-operability and champion these efforts in their industry and organisation. The results of the eBSC Forum will be made available to the public on a royalty-free basis.[43]

[43] http://www.mel.nist.gov/div826/msid/sima/ebsc/

Common framework

Exhibit 1-8: MoU Framework for e-business Standards



The MoU Framework for e-business standards is shown in Exhibit 1-8. It is aligned with the Open-edi model, includes CEFACT and OASIS models; and is actively supported by the NIST eBSC activity. Ideally the MoU Framework and the eBSC Framework/matrix will converge to a single model in the short term[44]. Any sector will then be able to use the converged framework model as a basis for e-Business Interoperability.

However, that is not an easy task. One of the difficulties in standards convergence is that few standards overlap 100%. There are aspects on each standard that might be ideal in a converged standard but then the problem of existing deployments of both standards remains. When the number of standards to be converged increases the number of inter-linkages to be managed grows much faster than just an n-squared problem as it could, for instance, be necessary to simultaneously combine and restructure several different standards from different sources. The challenge is that real convergence requires active good-will and participation, not only from the bodies that create the standards, but also from those who have created/deployed or are about to create/deploy existing or emerging standards. It is envisaged that the converged model will also include an open registry for e-business standards work. For this metadata and a federated update mechanism is expected to be put in place, with moderation for consistency.

[44] Aerospace Industries Association. *Presentation at eBSC Meeting on May 6, 2005* http://www.mel.nist.gov/div826/msid/sima/ebsc/files/aia_ebiz_interop_strategy.pdf

2 Survey results on Standards & Interoperability

This chapter presents the background to and the analysed results of some of the survey data. The intent is to accurately describe the results from the survey and to summarise and present these results in a readable and usable manner. To this end, as far as possible all results are expressed in terms of enterprise size-bands. No explicit reference is given to weighting the results for employment or national distributions.

The interpretation of the charts and tables included in this section would require extensive micro-analysis and details on the circumstances of the companies concerned. That is not the purpose of the report. The objective is to take a high-level view of e-business interoperability and standards issues and describe what is found. The following Socratic type dialog taken from Bruno Latour's unpublished draft *A prologue in the form of a dialog between a student and his (somewhat) Socratic Professor*[45] emphasises the importance of an accurate description. In the extract, S denotes the student and P denotes the professor:

> *S – But you always need to put things into a context, don't you?*
>
> *P — I have never understood what context meant, no. A frame makes a picture look nicer, it may direct the gaze better, increase the value, but it doesn't add anything to the picture. The frame, or the context, is precisely the sum of factors that make no difference to the data, what is common knowledge about it. If I were you, I would abstain from frameworks altogether. Just describe the state of affairs at hand.*
>
> *S — 'Just describe'. Sorry to ask: but is this not terribly naïve? Is this not exactly the sort of empiricism, or realism, that we have been warned against? I thought your argument was, how should I say? more sophisticated than that.*
>
> *P — Because you think description is easy? You must be confusing description, I guess, with strings of clichés. For every hundred books of commentaries, arguments, glosses, there is only one of description. To describe, to be attentive to the concrete states of affairs, to find the uniquely adequate account of a given situation-- I have, myself, always found this incredibly demanding.*

The underlining is not in the original extract. It has been added to emphasise the point being referenced for this report regarding the importance of accurate descriptions prior to any analysis and commentary.

The information about the attitude of companies in each of four enterprise size-bands across 9 sectors is an important asset. It is essential vital that the information be described and presented just as it is. The primary purpose of the following pages therefore is to present a rich summary of the information, in a format that is as readable and understandable as possible. There are commentaries in each sub-section. However the primary value of this chapter lies in the accuracy of the description. Only through that will it be possible to derive the true and uniquely adequate account of interoperability across the sectoral and enterprise size differences.

[45] Latour, Bruno. *A prologue in form of a dialog between a student and his (somewhat) Socratic professor* (www.ensmp.fr/~latour/articles/article/090.html, last accessed August 23, 2005)

2.1 The research questions

The application of technology to business must be driven by business strategy, not the other way around. ICT is just a tool. Standards and interoperability are each a means to an end. They are not ends in themselves. In this vein, interoperability is best viewed as a continuum. It is not a binary option: either 100% present or not. There are different levels and nuances of interoperability possible. Interoperability is generally a multi-layered service, with specific measurable value to the business partners involved, rather than solely an abstract idealised binary choice. The research questions addressed in the study are therefore:

- How do companies perceive the importance and role of standards for e-business interoperability, specifically application to application interoperability?
- What constitutes the essential cross-firm and cross-industry elements of EDI-based trading and its current successors? What interoperability elements of B2B ICT infrastructures need to be harmonized or standardized and what are the current perceptions regarding some specific standards issues? What are the implications for standards policy from the result?
- Are interoperability frameworks now the main driver in e-business standards activities? What are the overall implications, with particular relevance to implementation issues and SMEs?
- Do replies to the above questions imply a requirement for dramatic change and innovation in standards policy?

The responses to the e-Business Survey 2005 are analysed and presented according to firm-size and industry sector. Note that geographical region is not considered a major factor in B2B interoperability requirements, and thus the analysis and data presented makes no reference to national identities.

2.2 The e-Business Survey 2005

e-Business W@tch collects data on the use of ICT and e-business in European enterprises by means of representative surveys. The e-Business Survey 2005, which was the third survey after those of 2002 and 2003, had a scope of 5,218 telephone interviews with decision-makers in enterprises from seven EU countries (the **EU-7**, i.e. Czech Republic, France, Germany, Italy, Poland, Spain and the UK), which account for roughly 75% of the EU-25 population and GDP.

The survey was carried out as an enterprise survey: data collection and reporting focus on the enterprise, defined as a business organisation (legal unit) with one or more establishments. Interviews were carried out in January and February 2005. Except for the aeronautics industry, where only 163 company interviews could be realised due to the small universe of firms in this sector in the EU-7, about **560 interviews per sector** were conducted.[46]

In contrast to the surveys of 2002 and 2003, the survey of 2005 considered only **companies that used computers**. Thus, the highest level of the population ("base") was the set of all computer-using enterprises that were active within the national territory of one of the respective countries, and that had their primary business activity in one of the sectors specified by NACE Rev. 1.1 categories. Therefore it makes a difference if a figure represents a percentage of "*all companies*" (as in 2003) or a percentage of "*companies using*

[46] The survey was conducted using computer-aided telephone interview (CATI) technology. Field-work was coordinated by the German branch of Ipsos GmbH (www.ipsos.de) and conducted in co-operation with local partner organisations.

computers" (as in 2005). Differences are much less pronounced, though, when figures have been weighted by employment.[47] The second important difference between the 2003 and 2005 surveys concerns the configuration of sectors. Three very large sectors (retail, health, business services) that had a major impact on aggregate results in 2003 were not continued in 2005. Instead, another huge sector (construction) was introduced. For these reasons, direct comparisons of aggregate results should be cautiously made and only with explicit reference to these differences.

Sample Sizes

The sample size per sector and per enterprise size-band is shown in Exhibit 2-1.

Exhibit 2-1: e-Business Survey 2005: Sample Size per Sector per Enterprise size-band

Enterprise Size-band	Food	Textile	Publish	Pharma	Machine	Auto	Aero	Constr	Tourism	ITServ	Enterprise size-band Totals
s1-micro	194	188	192	182	192	179	88	192	193	196	**1796**
s2-small	145	146	148	160	147	149	42	145	145	146	**1373**
s3-medium	168	171	170	140	169	167	20	169	171	171	**1516**
s4-large	64	56	53	50	57	70	13	60	58	52	**533**
Sector Totals	571	561	563	532	565	565	163	566	567	565	**5218**

This special cross-sector study makes no reference to the country distributions. It is considered that while there may be cultural differences in the attitude to standards, and differences in attitudes to business collaboration and take-up of technology standards, the differences between countries also reflect the existing sector distributions.

Enterprise size-bands

This report concerns the status, attitude and behaviour of firms to e-business interoperability and standards. In view of this subject matter, the report uses unweighted data on the number of firms by sector. Where relevant and statistically correct, information is presented by enterprise size-band. Because of the low number of companies surveyed in the aerospace sector, caution is advised when working with enterprise size-band data for that sector.

Treatment of "don't know" answers

The replies to the questions in the e-Business Survey 2005, which provide the raw data for the analyses in this chapter, are generally answerable by a simple yes or no. In those cases the data presented first excludes the Don't Knows e.g. the fraction of those who reply in the affirmative are calculated (per enterprise size-band, per sector) by dividing the number who respond yes by the sum of the numbers who respond either with yes or no. This fraction is then converted directly into a percentage figure.

A "Don't Know" for direct questions, with an expected answer of yes/no, may arise due to lack of immediate knowledge on the part of the survey respondent, or may also be due for instance to uncertainty about the question, or indeed their company strategy in a particular area. In all cases it is possible for the reader of this report to make alternative calculations by

[47] Employment-weighted figures should be read as "*enterprises comprising x% of employees*" in the respective sector (or country). Employment weighting is useful because, due to the significantly greater number of micro- than non-micro-enterprises, un-weighted figures would effectively represent mainly the smallest sizes of firms.

combining the information given on the effective sample sizes in the analysis together with the data in Exhibit 2-1: e-Business Survey 2005 Sample Size per Sector per Enterprise size-band.

Exclusion of tourism sector

As this report is concentrating to a large extent on interoperability in the manufacturing sectors, the tourism sector was excluded from the standards questions. This means that, in most instances presented in this report, the overall survey population size is reduced by 567 i.e. from 5218 to 4651 companies.[48]

Further information

More detailed information about the survey methodology, including information about sampling and the business directories used, the number of interviews conducted in each country and sector, and data on non-response rates, are available in the Methodology Annex and on the *e-Business W@tch* website at www.ebusiness-watch.org/about/methodology.htm.

2.3 Do standards matter in innovation?

Although not the first question addressed as part of the "Standards Group" of questions in the e-business Survey 2005, the question on the importance attributed to standards in relation to innovation is one of the most important questions in the entire set. Thus the question and the responses to the question are addressed first in this analysis.

A steady stream of new products, services and business processes are pre-requisites for the jobs and sustainable growth envisaged in the Lisbon Agenda. Some innovations do not require consideration of existing or new standards. Some do. How can one distinguish between the two types?

This survey question was direct. It reads "*Does your company take into account industry standards and specifications when making decisions on what technology and data standards to use for new product, services or business processes*?" The spectrum of the response is clear, but complicated, as can be seen from Exhibit 2-2.

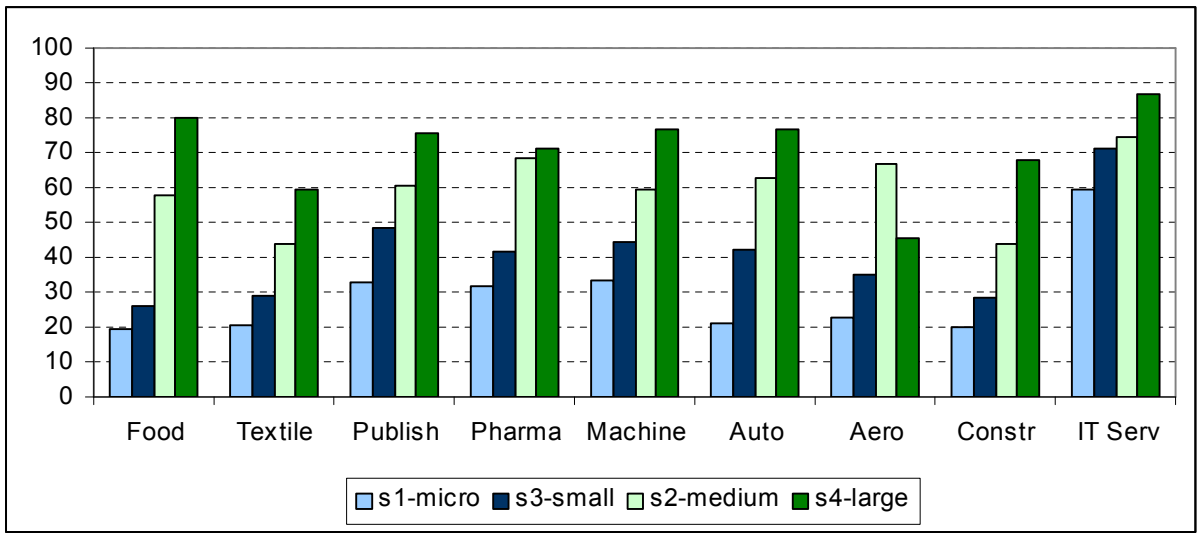
The resounding answer to this question is "Yes – standards do matter". The enterprise size-band trend is similar for all sectors. It should be noted that the lower value of the large companies in the Aerospace for medium and large enterprises is marked in red in the table. The number of observation points is low and this means that the associated error margins, and confidence intervals widen. Nonetheless, apart from these two elements the rest of the graphic is meaningful and can be considered as accurate.

The fundamental measure of the value of standards is the number of implementations or the number of enterprise strategies that explicitly include standards as a necessary critical element. Three quarters of all of the large enterprises across the companies confirm that they take standards into account, whereas the figure is much lower at between 20-30% for micro companies, with small and medium companies taking up intermediate positions in each of the sectors.

[48] The exclusion of the tourism sector from the standards questions was mistakenly not taken into account in compiling some of the tables in the *e-Business W@tch* publication "*A Pocketbook of e-Business Indicators 2005*". The corrected figures are contained in this report. Additional differences, if any, can be attributed to the exclusion of "Don't Knows" from the analysis for this report.

Full assessment of these results would require a panel of sector and standards experts who can compare their sectors with deep knowledge of the parameters that contribute to choice of standards. This could be a very simple task, but there is a distinct benefit for all from completing the business and technology views and documenting the findings for use by all companies within the sector and across sectors.

Exhibit 2-2: Do standards influence decisions on new products, services or processes?



	Food	Textile	Publish	Pharma	Machine	Auto	Aero	Constr	IT Serv	Size-band Avg
s1-micro	19.3 (187)	20.4 (181)	32.8 (180)	31.8 (170)	33.2 (187)	21.4 (173)	22.6 (84)	20.0 (180)	59.3 (189)	30 (1531)
s3-small	26.3 (133)	29.0 (138)	48.6 (140)	41.6 (154)	44.4 (142)	42.0 (143)	35.0 (40)	28.1 (139)	71.1 (142)	41 (1171)
s2-medium	57.8 (161)	43.7 (158)	60.5 (157)	8.2 (129)	59.5 (163)	62.7 (153)	66.7 (18)	44.0 (159)	74.7 (166)	59 (1264)
s4-large	80.0 (60)	59.3 (54)	75.5 (49)	71.1 (45)	76.8 (56)	76.5 (68)	45.5 (11)	67.9 (53)	86.5 (52)	74 (448)
SectorAvg	39 (541)	34 (531)	49 (526)	48 (498)	48 (548)	46 (537)	33 (153)	34 (531)	70 (549)	46 (4414)

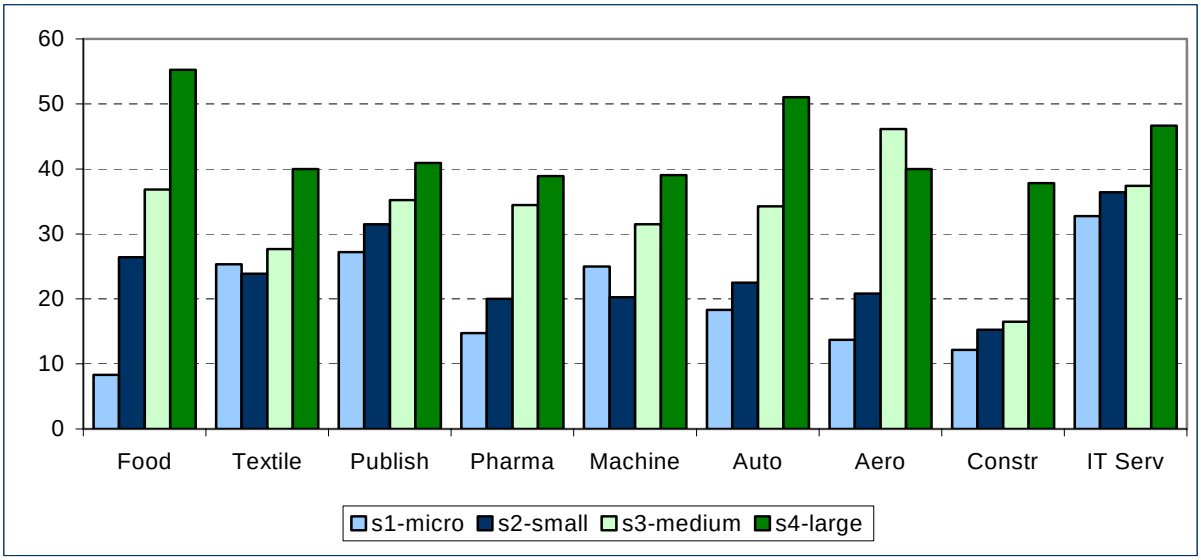
Graphic: Percentage of firms by size-band within sector that take technology or data standards into account in new product, service or process development. In % of firms. Base: All firms, excluding Tourism sector and Don't Knows.
Table cells : Percentage of firms within enterprise size-band, or column/row totals, and N data in round brackets.

Source: *e-Business W@tch* (e-Business Survey 2005)

2.3.1 Is intra-sectoral interoperability critical for e-business?

Again the answers are generally a resounding yes. Typically 40% of large firms across all sectors believe that intra-sectoral standards are critical for them to do business. At the same time there are possibly up to 60% of large companies that do not consider these standards to be essential. The picture is even more pronounced when micro companies are examined. The lowest micro company data figure is reported by the food sector. The percentage considering e-business standards as critical for success is less than 10%. The responses received relate to the demand for information on standards and to a lesser extent for participation and access to influencing the standards process.

Exhibit 2-3: Is interoperability within your sector critical for your e-business?



	Food	Textile	Publish	Pharma	Machine	Auto	Aero	Constr	IT Serv	Size-band Avg
s1-micro	8.3 (60)	25.3 (75)	27.2 (103)	14.8 (88)	25.0 (76)	18.3 (71)	13.7 (51)	12.2 (74)	32.7 (165)	21.9 (763)
s3-small	26.4 (53)	23.9 (67)	31.5 (89)	20.0 (95)	20.3 (79)	22.5 (80)	20.8 (24)	15.3 (59)	36.4 (129)	25.5 (675)
s2-medium	36.8 (95)	27.7 (94)	35.2 (125)	34.4 (90)	31.5 (108)	34.2 (111)	46.2 (13)	16.5 (97)	37.4 (139)	32.3 (872)
s4-large	55.3 (38)	40.0 (35)	40.9 (44)	38.9 (36)	39.0 (41)	51.0 (49)	40.0 (5)	37.8 (37)	46.7 (45)	43.9 (330)
SectorAvg	30.5 (246)	27.7 (271)	32.7 (361)	24.9 (309)	28.0 (304)	30.2 (311)	21.5 (93)	18.0 (267)	36.4 (478)	29.0 (2640)

Base: All firms, excluding Tourism sector. Analysis excludes Don't Knows and NULLS (current best case scenario)

Graphic: Percentage of firms by size-band within sector excluding Don't Knows and NULLs.
Table cells : Percentage of firms by size-band within sector, or column/row totals, and N data in round brackets.

To be read as "…% of enterprises excluding Don't Knows and NULLs, in the … size-band in the … sector, consider that interoperability is critical for e-business between their enterprise and other enterprises IN the same sector.

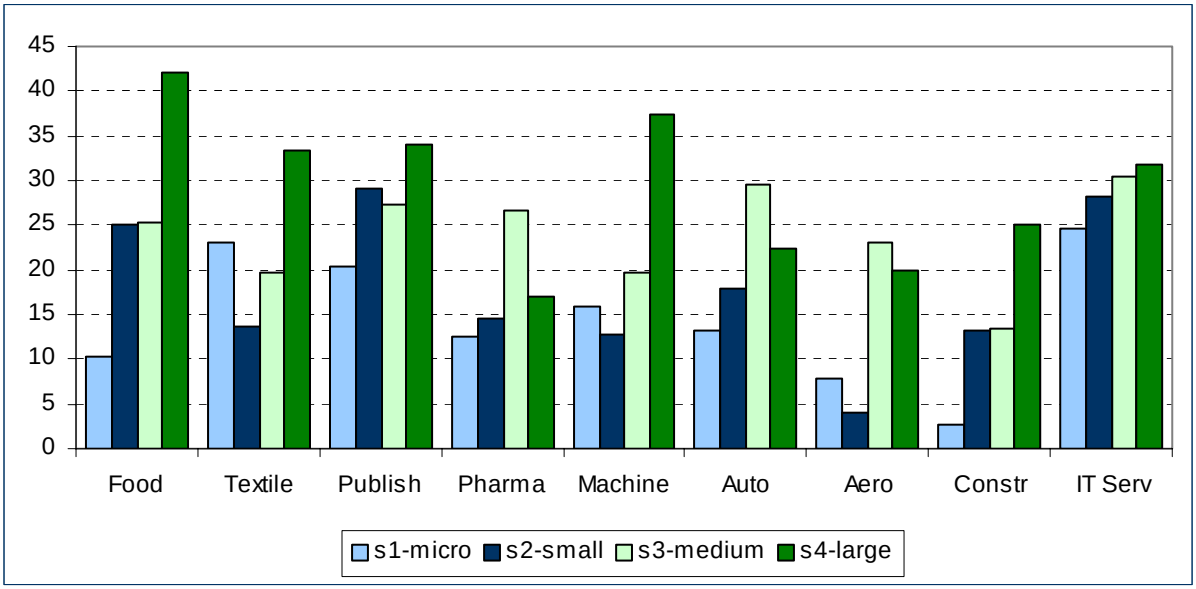
Source: *e-Business W@tch* (e-Business Survey 2005)

2.3.2 Is inter-sectoral interoperability critical for e-business?

First observation is that it is the large companies that have the biggest requirements for inter-sector interoperability. In some cases (pharmaceutical, automotive, and aeronautics) the expectations of the medium sized companies are seen to soar way beyond those of the other enterprise size classes. As previously observed the table data highlighted in red indicates that little confidence should be placed on those particular enterprise size-band data values for Aerospace.

A comparative analysis of the responses regarding inter- and intra-sector indicates a greater demand will be met for each of the 9 sectors, by focusing on convergence of standards within sectors. This is not surprising. Neither on reflection is the higher critical need expressed by SMEs for cross-sector standards. It is however unlikely without some direct action that the "tail (small companies) will ever wag the dog (large companies)".

Exhibit 2-4: Is interoperability with companies in other sectors critical for your e-business?



	Food	Textile	Publish	Pharma	Machine	Auto	Aero	Constr	IT Serv	Size-band Avg
s1-micro	10.2 (59)	23.0 (74)	20.4 (103)	12.6 (87)	16.0 (75)	13.2 (68)	7.8 (51)	2.7 (73)	24.7 (162)	16.2 (752)
s3-small	25.0 (52)	13.6 (66)	29.2 (89)	14.6 (96)	12.7 (79)	17.9 (78)	4.0 (25)	13.1 (61)	28.1 (128)	19.4 (674)
s2-medium	25.3 (95)	19.6 (92)	27.4 (124)	26.7 (90)	19.6 (107)	29.6 (108)	23.1 (13)	13.5 (96)	30.4 (138)	24.4 (863)
s4-large	42.1 (38)	33.3 (36)	34.1 (44)	17.1 (35)	37.5 (40)	22.4 (49)	20.0 (5)	25.0 (36)	31.8 (44)	30.3 (327)
SectorAvg	24.2 (244)	20.9 (268)	26.7 (360)	17.9 (308)	19.3 (301)	21.8 (303)	9.6 (94)	12.0 (266)	28.0 (472)	21.5 (2616)

Base: All firms, excluding Tourism sector. Analysis excludes Don't Knows and NULLS (current best case scenario)

Graphic: Percentage of firms by size-band within sector excluding Don't Knows and NULLs.
Table cells : Percentage of firms by size-band within sector, or column/row totals, and N data in round brackets.

To be read as "…% of enterprises excluding Don't Knows and NULLs, in the ... size-band in the ... sector, consider that interoperability is critical for e business between their enterprise and other enterprises IN the same sector.

Source: *e-Business W@tch* (e-Business Survey 2005)

Key messages from Section 2.3

***Common points in all discussions on the responses**:*

Looking at the data points for each sector, and the average values per sector and per enterprise size class for the entire sample, a set of questions can be addressed to many of the charts:

- *What is the appropriate target, and why should it be so, for the measured value per enterprise size-band?*
- *What circumstances will yield a basically identical percentage across all enterprise size-bands in a given sector (as shown most nearly for instance in the IT services sector)?*

*The answer to both questions is most likely to be strongly **sector structure dependent**. In that case, it is useful to understand the underlying driving forces and so help SMEs to set their own goals with a clear sector specific understanding of what standards must be taken into account in their work.*

*Such detailed sector level answers, to the range of the questions asked, would produce a set of powerful **sector specific standards roadmaps**, which depending on how the roadmap construction and maintenance processes are conducted could become a valuable resource for all enterprises in the sector.*

*Such roadmaps could also identify whether there were a characteristic signature in terms of the relative values of the average responses across sectors per standard area. The roadmap could also be the basis for **a cross-sectoral review of common standards** and potential for increased harmonisation between sectors.*

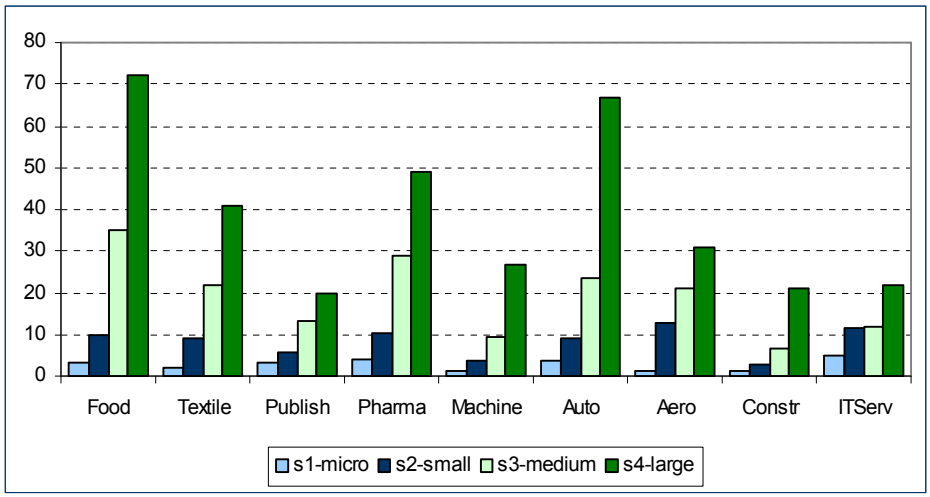
Taken in conjunction with other additional questions, such as those in the following sections, the roadmaps would acquire several dimensions which can be drilled down to get an overview on common interoperability practices and targets for all layers and levels of interoperability.

2.4 Current usage of EDI and plans for XML standards

There is nothing particularly exceptional about the figures shown Exhibits 2-5 and 2-6. Large companies dominate EDI usage, especially in the Food and Automotive sectors. The IT services sector is low in reported EDI usage, but the leader by far in the reported use of XML-based standards for EDI. The interesting question is what should the values be for a given enterprise size-band in a given sector (e.g. what values do the leaders in each of the size-bands achieve or aim to achieve?). In addition what is the rationale for the projections and how can the ideal figures be achieved? What collaboration is required to facilitate and accelerate the transition to XML?

A comparison of Exhibits 2-5 and 2-6 indicate that sectors with highest implementation of EDI (Food and Automotive) also have the lowest implementation level of XML. Construction is low on both categories.

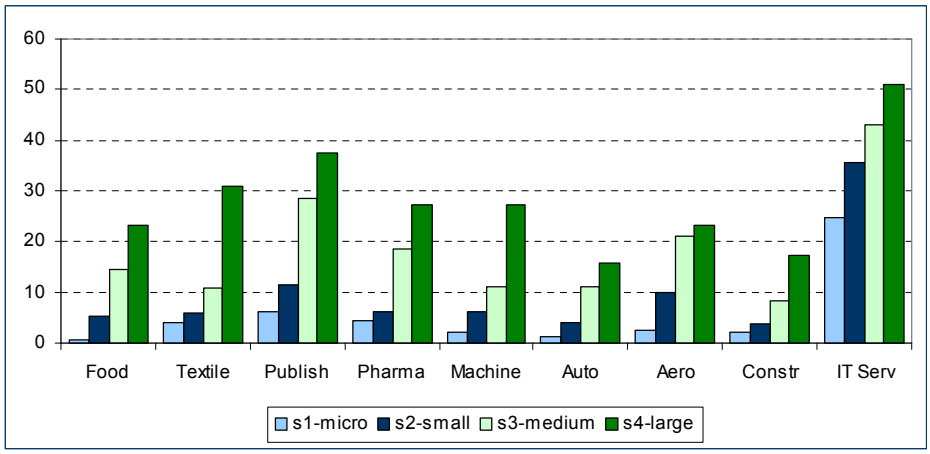
Exhibit 2-5: Use of EDI-based standards by enterprise size-band per sector



Base. All enterprises, excluding Tourism and Don't Knows (N=413,454,468,409,487,420,139,492,464)

Source: *e-Business W@tch* (e-Business Survey 2005)

Exhibit 2-6: Use of XML-based standards by enterprise size-band per sector



Base. All enterprises, excluding Tourism and Don't Knows (N=413,454,468,409,487,420,139,492,464)

Source: *e-Business W@tch* (e-Business Survey 2005)

A further series of Exhibits 2-7 to 2-10 provides a separate set of analyses of the percentage of types of EDI used by enterprise size-band and by sector. The tables are easy to read but are relatively unexceptional in the absence of the micro-level detail on the sectors and countries that would explain the figures. Having a view on the rate at which companies were planning to move from EDI to XML would be more interesting. This is provided in the following sub-section.

Exhibit 2-7: Use of EDI and types of EDI used per enterprise size-band

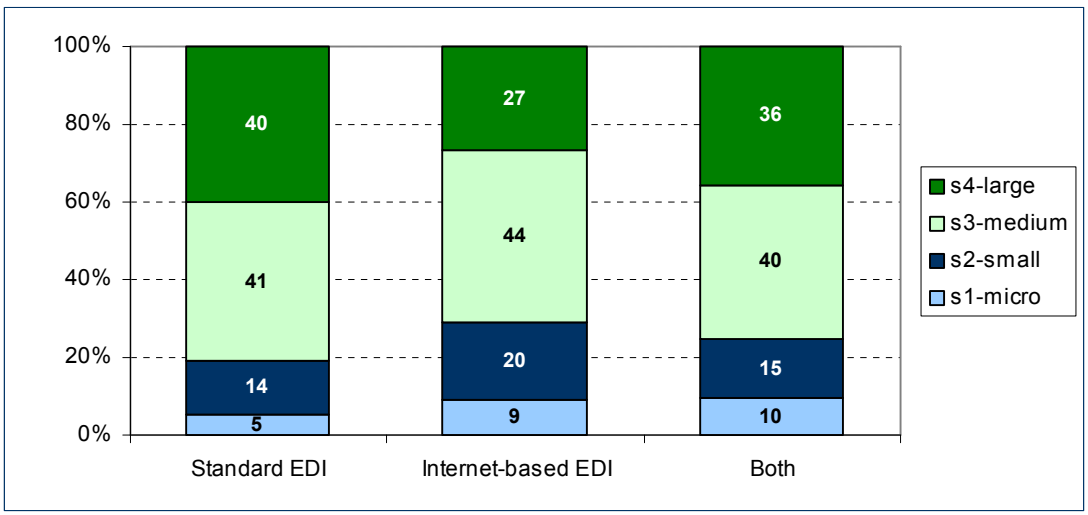
			Percentage usage by each type of EDI Horizontal (three) rows sum to 100 (N) data in last row		
% of Enterprise Size-band …	(N)	Use EDI	Of this size-band ...% use Standard EDI	Of this size-band ...% use Internet-based EDI	Of this size-band ...% use both standard and Internet-based EDI
Micro	(1498)	2.9	22	37	41
Small	(1122)	8.0	29	39	32
Medium	(1230)	18.6	33	34	33
Large	(440)	41.4	39	25	36
Average per sampled firm	(4290)	12.7	34	32	34
			(173)	**(164)**	**(177)**

Base: All firms, excluding Tourism sector and Don't Knows. N data in round brackets.
Table cells : Percentage of sampled firms by enterprise size-band that use EDI-standards. Within these the percentage by size-band that use specific types of EDI-standards.

Source: *e-Business W@tch* (e-Business Survey 2005)

Exhibit 2-8: Use of EDI and types of EDI used per Enterprise size-band

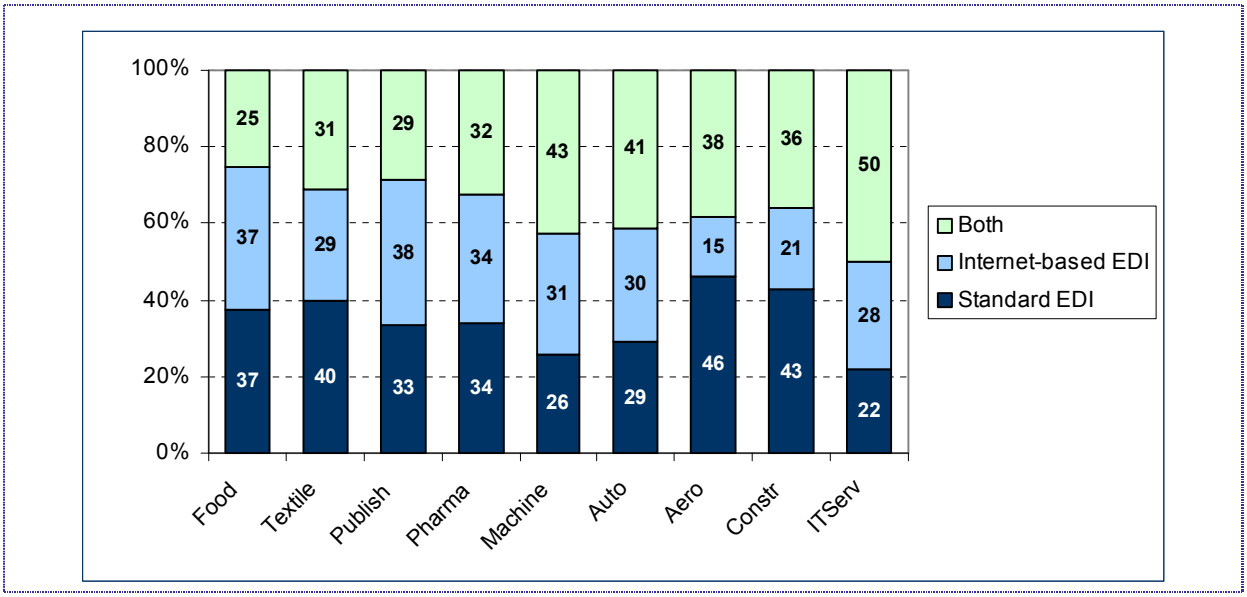
Enterprise Size-Band	%Firms that use EDI-standards		Of which …		
			%Firms that use Standard EDI	%Firms that use Internet-based EDI	%Firms that use both standard and Internet based EDI
Micro	7.9		5	9	10
Small	16.5		14	20	15
Medium	42.1		41	44	40
Large	33.5		40	27	36
(N)	**(544)**		**(173)**	**(164)**	**(177)**



Base: All firms, excluding Tourism sector and Don't Knows. N data in round brackets.
Table cells : Percentage of sampled firms by enterprise size-band that use EDI-standards. Within these the percentage by enterprise size-band that use specific types of EDI-standards.

Source: *e-Business W@tch* (e-Business Survey 2005)

Exhibit 2-9: Type of EDI use: percentage of each type of EDI per sector



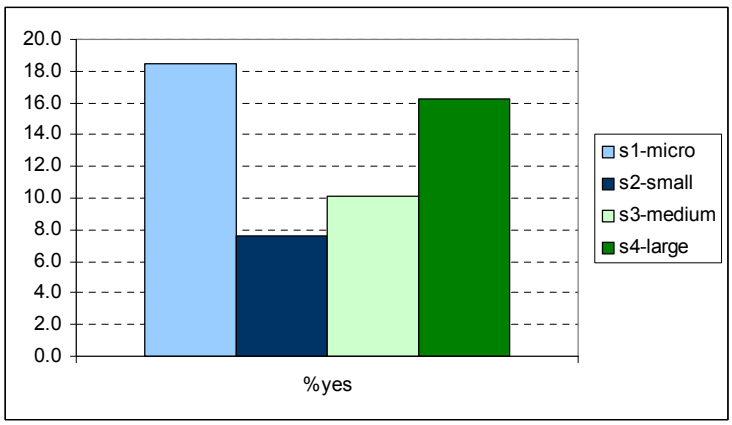
Base: All firms, excluding Tourism sector and Don't Knows.

Source: *e-Business W@tch* (e-Business Survey 2005)

Plans for move from EDI to XML standards

Approximately 10% (544) of the survey population indicated they would change from EDI to XML over the next 12 months. This number was not sufficient to do a meaningful sector based analysis. Therefore, the statistic presented here refers only to the enterprise size analysis.

Exhibit 2-10: Intends to replace EDI by XMl within the next 12 months



Base. Companies that use EDI. Excluding Tourism, NULLs and Don't Knows The full sample set was 544. Don't knows by size class (u,s,m,l) was 5, 11, 30, 22 hence N= 38, 79, 199, 160

To be read as …% of respondents per enterprise size-band … reported that they intended to replace EDI-based solutions for electronic data interchange with XML based solutions within 12 months.

Source: *e-Business W@tch* (e-Business Survey 2005

The micro-companies indicated the highest percentage of intention to move from EDI to XML. This is consistent with the lower running costs, and re-assuring to an extent that such a large proportion was prepared to make the move. It is possible of course, as there is no visibility on the sectoral de-composition that the small companies are moving in accordance with the similar type move indicated by the large companies.

2.5 Comparative data between e-Business Surveys 2003 and 2005

It is not usually easy to compile useful comparative data from different surveys. This is also true for comparisons between the results of the e-Business Surveys 2003 and 2005. The reasons are clear. The sectors included vary from survey to survey, in line with the policy areas that are uppermost at the time of design; and also the countries in which the survey is conducted change from survey to survey. Thus only limited comparability is possible as the configuration of countries differs by sector. In addition, the questions are not usually all kept constant. The matters raised depend on the requirements prevalent at the time of design.

However, in keeping with the contention that sectors tend to transcend the national perspectives in line with the European freedoms of movement and easier cross-country trading, it was decided to select a question that was common to both surveys and analyse the data returns for the same sectors in both surveys.

The chosen question, for comparison purposes, was practically identical in both surveys:

Please tell us which of the following standards your company uses. Do you use … (item a-e)

a) *EDI-based standards, for example EDIFACT, EANCOM, ANSI X12, or TRADCOM;*
b) *XML-based standards such as cXML, UBL, RosettaNet, xCBL;*
c) *the STEP standard for the exchange of product model and design data;*
d) *Proprietary standards agreed between you and your business partner*;
e) *Any other technical standards.*

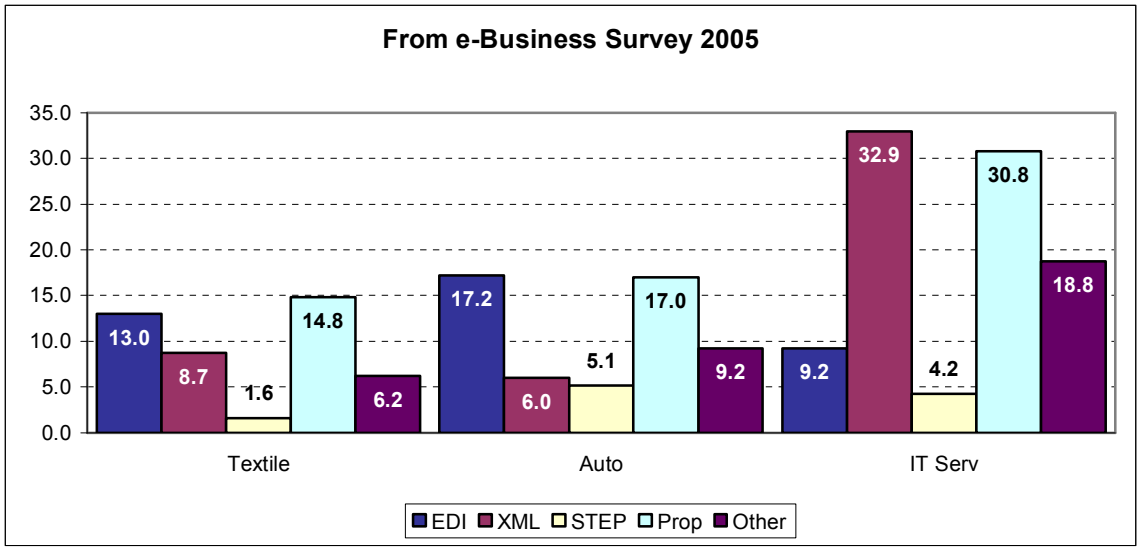
The resulting comparative data are presented in Exhibit 2-12.

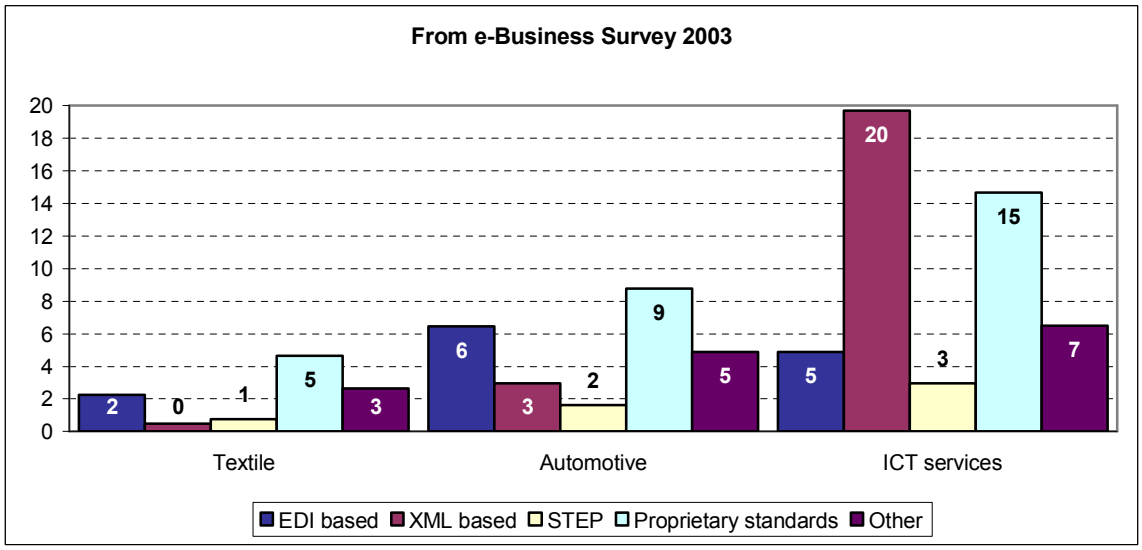
Moreover, two somewhat related sectors, namely ICT services and IT services were included in the comparison. Data for 2003 is in % of enterprises per enterprise size-band within sector. Likewise, data for 2005 is also in % of enterprises per enterprise size-band within the same or directly related sector. For comparative purposes, both charts include "*Don't Knows*" in the calculations. Data presented represent the arithmetic mean of all countries surveyed in the sector. As noted in the Exhibit footnote, the countries differed between the two surveys.

The conclusions are striking. Data indicate that there has been a multi-fold increase in the usage of all types of EDI, and of the other technical standard categories listed, across all enterprise size-bands. Of course the difference may be attributable, at least in part, to the change in the basic selection process for firms to be interviewed (the 2005 study was confined to those companies that used computers). Thus, the 2005 figures would tend to be elevated over the 2003 data. The variation in the countries surveyed for the same sector in the different surveys may also have an impact.

However, it is believed that the differences are in fact real and represent a significant increase in e-business take up within the textile sector.

Exhibit 2-11: Comparative data for types of standard used





Base (2005): all enterprises from the sectors, EU7 (DE, ES, FR, IT, UK, CZ, PL). N=561, 565, 565

Base (2003): all enterprises from the sectors, EU5 (DE, ES; FR, IT, UK). N=501, 501, 501

In % of enterprises by enterprise size-band, including Don't Knows for comparative purposes.

Source: *e-Business W@tch* (2003 and 2005)

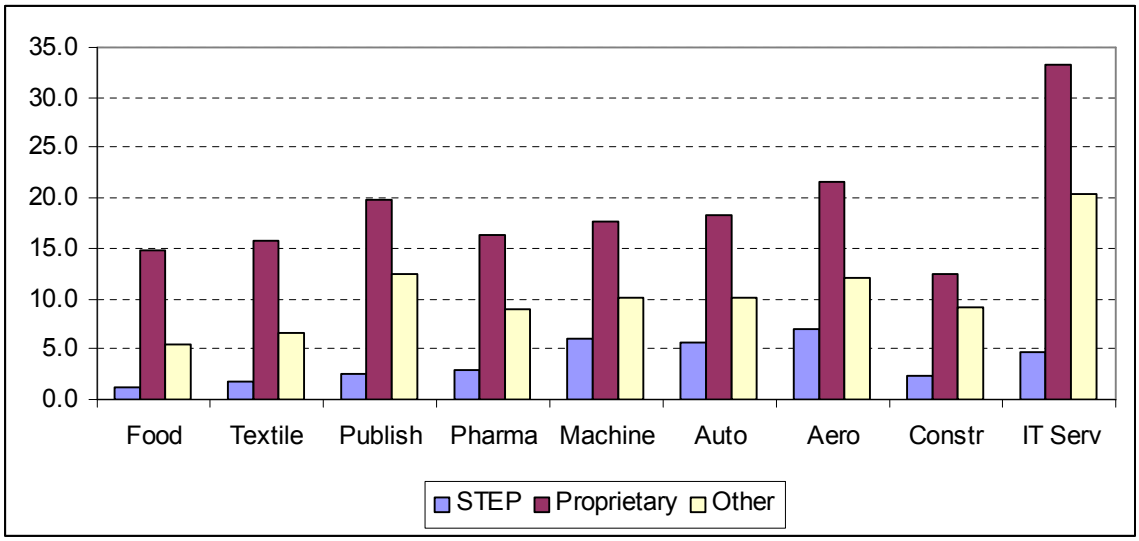
The main reason for this confidence is the great collaborative development that has been accomplished during the past few years in Europe by the companies involved in the CEN/ISSS Workshop TEX-SPIN (TEXtile Supply Chain Integrated Network) which produced CWA 14948[49] *Guidelines for XML/EDITEX messages in the textile/clothing sector*. The ongoing work of the follow-on workshop CEN/ISSS Tex-Weave demonstrates the continued interest. The TEX-SPIN Workshop was promoted by a European consortium led by Euratex, the European Apparel and Textile Organisation based in Brussels.

The relative usage per sector of standards in addition to EDI and XML is indicated in Exhibit 2-13. The significant information to notice is that for each sector there is a high percentage

[49] CEN/ISSS. *CWA 14948. Guidelines for XML/EDITEX messages in the textile/clothing sector.* (http://www.cenorm.be/cenorm/businessdomains/businessdomains/isss/cwa/textilecwa.asp, last accessed August 23, 2005).

use of proprietary and other standards. Taking *Other* to mean bilateral standards mutually agreed between partners and *Proprietary* to mean standards defined for instance by the major partner, it is evident that there is a huge opportunity for application of a more open framework. Such a move will increase flexibility of partner agreements and ultimately save on costs for each of the partners.

Exhibit 2-12: Type(s) of other standards in use, by sector



	Food	Textile	Publish	Pharma	Machine	Auto	Aero	Constr	IT Serv	Avg
EDI-based	22.2 (531)	13.9 (527)	8.4 (511)	16.7 (491)	7.1 (524)	18.8 (517)	9.2 (153)	5.4 (520)	10.1 (516)	12.7 (4290)
XML-based	8.5 (527)	9.4 (524)	17.2 (516)	11.1 (486)	8.6 (524)	6.7 (511)	8.3 (156)	6.1 (522)	35.2 (528)	12.7 (4294)
STEP	1.1 (529)	1.7 (519)	2.5 (517)	2.9 (490)	6.0 (529)	5.7 (512)	7.1 (156)	2.3 (521)	4.7 (516)	3.5 (4289)
Proprietary	14.8 (541)	15.7 (528)	19.9 (522)	16.3 (498)	17.6 (539)	18.2 (527)	21.6 (153)	12.4 (532)	33.3 (522)	18.6 (4362)
Other	5.4 (540)	6.6 (528)	12.5 (520)	9.0 (489)	10.1 (533)	10.0 (519)	12.0 (158)	9.1 (528)	20.5 (517)	10.4 (4332)

Base: All firms, excluding Tourism sector and Don't Knows.
Graphic: Percentage of firms by sector using STEP, Proprietary or Other technical standards for exchange of electronic data.
Table cells : Percentage of firms within enterprise size-band, or column/row totals, and N data in round brackets.

Source: *e-Business W@tch* (e-Business Survey 2005)

2.6 Perceived standards development/implementation gaps

An important standards policy and strategy related finding, from the e-Business Survey 2005, is an indication of the level of dissatisfaction shown in Exhibits 2-13 and 2-14 concerning some vitally important standards areas:

- Systemic business functionality:
  - data protection and privacy
  - information and information systems security
  - identity management and authentication
  - digital rights management
- Business transaction functionality
  - product/component catalogues and classification
  - transaction processing / business messaging

The concerns, reported by enterprise size-band within each sector, may be caused by inadequate standards, or due to a lack of widespread implementation of existing standards. The precise cause is not the issue right now. It is sufficient to know that significant levels of concern have been voiced across all sectors and across all enterprise size-bands. The variation within sectors across different enterprise size-bands indicates that not all firms see the issues in the same light. Likewise, the variation between sectors on specific standards issues indicates that there are differences of perception across sectors on even the most systemic of fundamental standards needs such as security.

Data in Exhibit 2-13 indicate, in particular, that there are strong reservations about security and data protection/privacy standards/implementation. These perceived gaps must be addressed in the same timeframe that new XML standards for trading are being introduced. If not, or if there is not at least a plan, then the potential benefits from investment in XML will be stunted. However the picture may not be as bleak as it first seems. Security of the messages and data protection around the transactions and other personal information can be overlaid onto ebXML applications, for instance, before these capabilities are introduced.

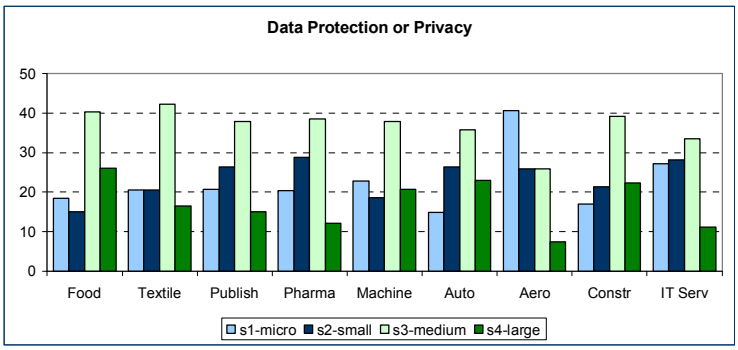
The levels of dissatisfaction for Digital Rights Management and Identity Management are also relatively high across all sectors. These are noted and merit a detailed analysis of the causes for the differences in each sector studied. It is not clear for instance whether the DRM concerns in the aerospace industry relate to in-flight entertainment or to intellectual property rights in relation to design elements of the aircraft components. It is recommended that experts in each sector consider this data and determine to the best of their abilities the root causes for the reported values.

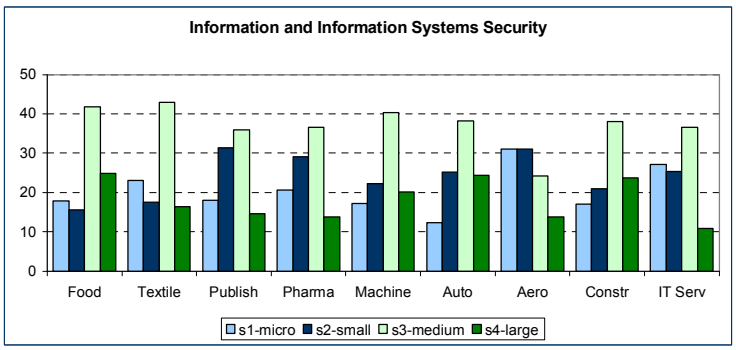
Once that is done it would be instructive and likely also very productive to pool the views of each of the sector experts and produce a consolidated cross-sector view of each of the standards areas examined.

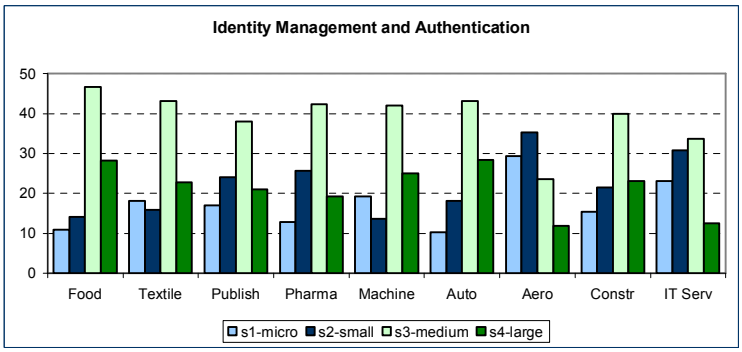
The contrast between these figures per sector to the results from a related question in the e-Business Survey 2003 (November) is striking. When asked, in 2003, whether they see obstacles to electronic business stemming from a lack of technical standards a majority (about 3 in 4 companies) said they did not see any obstacles, leaving less than 20% of firms perceiving problems and 7% undecided. There were hardly any differences by sector. Comparing size-bands, the awareness for obstacles was slightly higher among medium sized and large enterprises than among small firms.

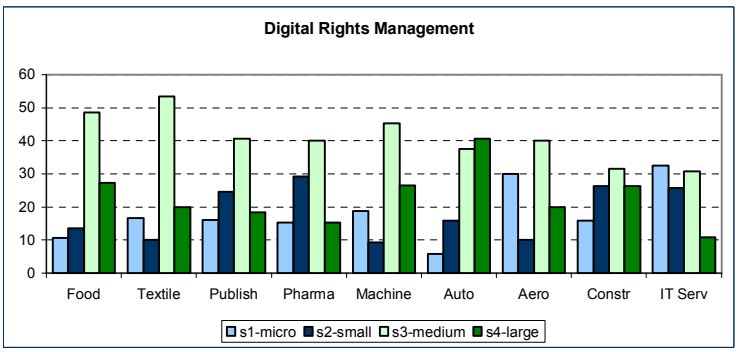
Exhibit 2-13: Significant standardisation development or wider implementation is required: systemic business functionality

Note: The charts below are valid for all sectors except Aerospace. Due to the lower sample sizes, special caution needs to be exercised in any deductions regarding this analysis by enterprise size-band in the Aerospace sector.









Base: Companies who take standards into account when developing new products or processes.

To be read … % of firms in the … enterprise size-band within the … sector who report that they take standards into account when developing new products or process consider that standards for …(specify name of standards area) need to be improved significantly or implemented widely in order to be able to realise the full success of e-business in that sector.

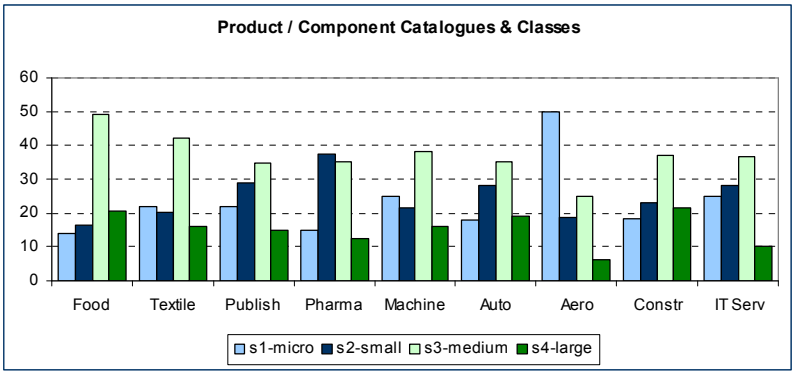
Responses are expressed in % of firms per enterprise size-band within sector, excluding Don't Knows.

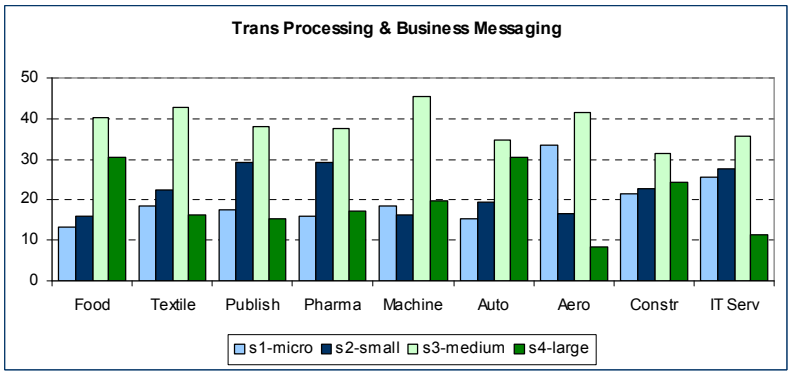
Source: *e-Business W@tch* (e-Business Survey 2005).

Data in Exhibit 2-14 indicate significant levels of concern ranging up to 50% among the sampled companies, in particular the medium size-band enterprises.

Exhibit 2-14: Significant standardisation development or wider implementation is required: business transaction functionality

Note: The charts below are valid for all sectors except Aerospace. Due to the lower sample sizes, special caution needs to be exercised in any deductions regarding this analysis by enterprise size-band in the Aerospace sector.





Base: Companies who take standards into account when developing new products or processes.

In % of firms. To be read …% of firms in the … sector who report that they take standards into account when developing new products or process consider that standards for …(specify name of standards area) need to be improved significantly or implemented widely in order to be able to realise the full success of e-business in that sector.

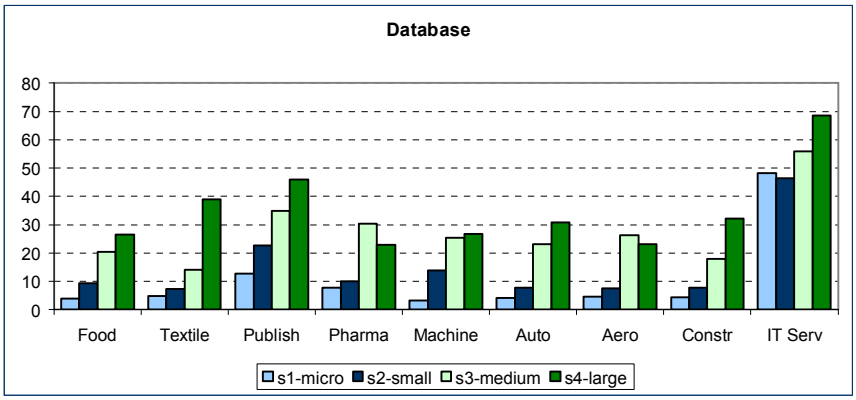
Responses are expressed in % of firms per enterprise size-band within sector, excluding Don't Knows.

Source: *e-Business W@tch* (e-Business Survey 2005)

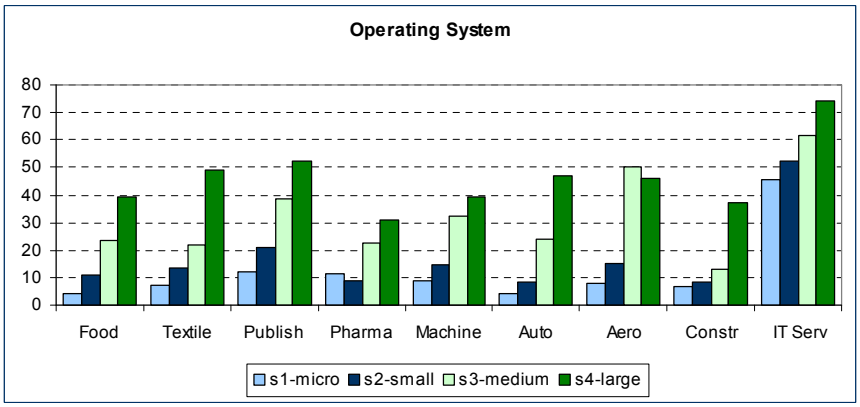
2.7 Open Source Systems

Responses to the three questions on the current level of adoption of open source technologies, in the e-Business Survey (2005), indicate a strong uptake of Open Source Systems. This is perhaps a good indicator for readiness to adopt, for instance, the free ebXML code available via www.freebXML.org.

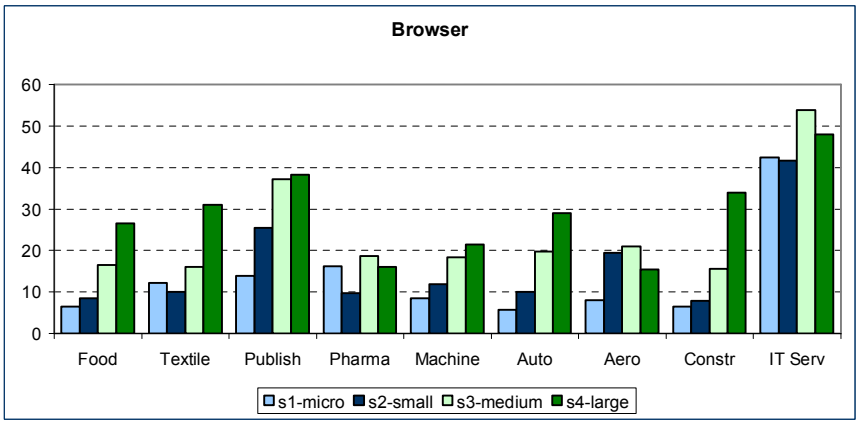
Exhibit 2-15: use of Open Source (in % of firms per enterprise size-band)



N (Sector) =548, 540, 531,505, 551, 543, 159, 551, 554



N (Sector) = 552, 549, 563, 514, 555, 546, 161, 555, 559



N (Sector) = 555, 542, 536, 515, 552, 544, 161, 547, 556

Base: All Companies, excluding Tourism sector.
Sample response (N) per sector varies per standards issue and is shown at the foot of each chart.
Responses are expressed in % of firms per enterprise size-band within sector excluding Don't Knows.

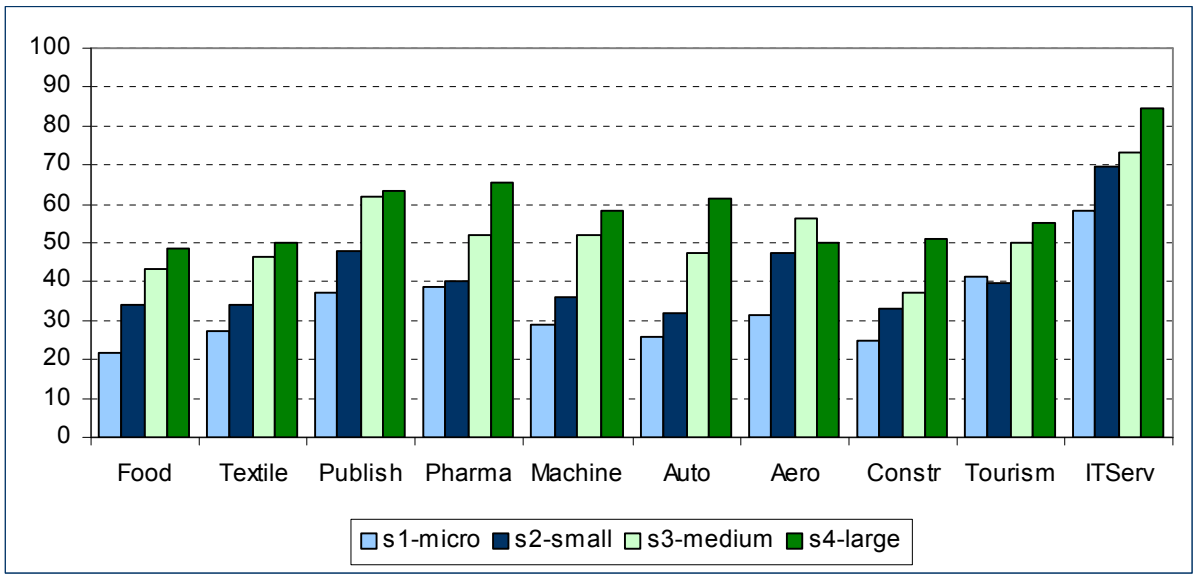
Source: *e-Business W@tch* (e-Business Survey 2005)

Micro and small enterprises are broadly similar in their implementations rates of open source operating systems, databases and web browsers. This is not to say that they use such open tools exclusively. However, it does indicate a relatively strong foothold for this technology. Medium enterprises trail large enterprises, but only by a relatively narrow margin of around 10 percentage points for each of the three technologies.

2.8 Future via Web Services

The vision of web services is that application software will be developed or assembled from components which are designed as re-usable services. This vision is in line with the search for a different business model for software (pay-per-use, utility computing, application hosting) that large software vendors are leading.

Exhibit 2-16: Future Importance of Web Services to Enterprises by size-band and by sector



	Food	Textile	Publish	Pharma	Machine	Auto	Aero	Constr	Tourism	ITServ	Total
s1-micro	21.8 (165)	27.4 (164)	37.3 (169)	38.6 (153)	28.9 (166)	25.7 (152)	31.3 (80)	25.0 (168)	41.3 (172)	58.2 (182)	34.0 (1571)
s2-small	33.8 (130)	34.1 (123)	47.8 (138)	40.0 (145)	36.2 (127)	32.0 (128)	47.5 (40)	33.1 (136)	39.7 (131)	69.6 (138)	41.2 (1236)
s3-medium	43.4 (152)	46.3 (147)	62.1 (161)	51.9 (129)	51.9 (160)	47.3 (148)	56.3 (16)	37.2 (156)	50.0 (158)	73.2 (168)	51.8 (1395)
s4-large	48.4 (62)	50.0 (52)	63.5 (52)	65.3 (49)	58.5 (53)	61.3 (62)	50.0 (12)	50.9 (55)	55.4 (56)	84.3 (51)	59.1 (504)
(N) = Sample size per enterprise size-band, per sector, excluding Don't Knows											(4706)

Base: All companies, excluding Don't Knows. N=4706

To be read … % of firms in the … enterprise size-band within the … sector stated that they consider integration of IT components by means of Web Services will be important for their company.

Source: *e-Business W@tch* (e-Business Survey 2005)

Over three years ago in February 2002, at the 2nd Annual Diffuse Conference entitled "Will web-services revolutionize e-commerce" a key objective was to provoke discussion on what web-services would bring to interoperability in the widest context and how web services will deliver on promises to transform businesses. At the same time web services were being promoted and marketed by commercial companies as the "next leap" in software. At the conference warning bells were sounded.

The presentation on ECIMF (E-Commerce Integration Meta-Framework), developed by a sub-group of the CEN/ISSS WS on e-commerce, was particularly cautious. Their conclusion was that use of web services would help to achieve interoperability, but mostly in the lower, technical syntax levels. For true Plug & Play use, the other interoperability aspects such as differences in business process specifications, differences in semantics and differences in business contexts (economic aspects) were considered to be in-adequately addressed.

Today no one will deny that this technology is in its "disillusion phase". After being hyped by major vendors – a cycle not uncommon for new technologies – the next expected phase is a more realistic one of modest but continuous growth.

The evidence from the *e-Business W@tch* data indicates the beginning of what appears to be a concerted intention by SMEs to move to web services. Exhibit 2-19 reflects the upbeat, but time indeterminate, responses received to the question on how important Web Services will be to their e-business in the future. What is important though is that the intentions to move to web services will likely be easier when EDI/XML solutions have already been widely implemented. Thus it is believed that evidence of a concerted effort now to implement EDI/XML, and specifically ebXML will in time ably assist in meeting the future goal of web services.

2.9 Proposal on a functional view of enterprise size-bands

In his presentation to the Modelling Workshop organised by eBIF, Huemer[50] proposed a theoretical information model for the types of systems that it is believed are likely to be used by companies in each of the enterprise size-bands. Exhibit 2-17 outlines the main ideas behind the proposal: only large and medium companies would have in-house application developers, and thus the only company types who would be significantly interested in EDI. Small companies, it was postulated, would prefer to buy COTS (Commercial Off-the-Shelf Software) for their B2B needs and micro companies would be content to use browser-based systems. It was considered that this classification is feasible and the data was therefore mined to see if the tentative conclusions were valid in practice.

Exhibit 2-17: Proposed B2B Functional Classification of Enterprise Size-bands

Size-Band	B2B functionality commonly used by Enterprises within the size-band
Large Enterprises	• run business applications • develop software or customise software, i.e. control their interfaces • more or less able to participate in B2B
Medium and some Small Enterprises	• run business applications • buy (or rent, or free) off-the-shelf software • need Off-the-Shelf Software with B2B Functionality
Micro and some Small Enterprises	• do NOT run business applications • act similar to consumers, and are satisfied with "browser-based" e-commerce • micro- and some small enterprises need Commercial Off-The-Shelf Software (COTS) that are a combination of ERP systems and B2B software for communication

In keeping with this scenario, three specific conditions are required to be simultaneously satisfied:

- ERP vendors must implement common B2B scenarios in their products;
- business processes must be unambiguously defined, i.e. it is not sufficient to merely have ambiguous business documents, even those that may work satisfactorily in current manual processes;
- Business processes must be defined in their business context.

Analysis of the proposition

The following Exhibits 2-18, 2-19 and 2-20 present the compiled information on types of systems used by type of enterprise. Based on the data in the tables, it is clear for instance from Exhibits 2-18, 2-19 that while micro-enterprises have the lowest level of use of in-house software, the difference between the enterprise size-bands overall is not that significant in that or in the other IT solutions used for procurement/sourcing or in marketing/sales. Thus at the current level of available data there is not sufficient evidence to support the proposition that there is a clean cut between the choices for software approaches and products between the different enterprise size-bands. Once there are readily available COTS products with inbuilt standardised (for instance ebXML capabilities) it is likely that these will be in high demand by all enterprise size-bands and assuming the marketing price is well set will be particularly attractive for the micro and small enterprises.

[50] Huemer, Christian (2005) and Brigit Hofreiter. *Introduction to UN/CEFACT modelling methodology.* Presentation at eBIF Modelling Seminar, Brussels, 1 July 2005. (ftp.cenorn.be/public/ebif, last accessed August 23, 2005)

The main argument however on the relative adoption of specific IT solutions is confirmed by Exhibit 2-8 Use of EDI and types of EDI used per enterprise-size band and in Exhibit 2-20 These clearly show that in general micro and small enterprises trail medium and large enterprises in their adoption of EDI and specific IT solutions for marketing and sales operations. There is clearly a large potential market and opportunity here that needs to be addressed in order to achieve the increased industry competitiveness demanded in order to meet the Lisbon Agenda.

Exhibit 2-18: IT Solutions used for sourcing or procurement

	Packaged s/w		In-House s/w		Asps Solutions		Suppliers' Solutions		e-marketplaces, trading networks	
	%firms	N	%firms	N	%firms	N	%firms	N	%firms	N
s1-micro	**69.9**	146	**51.7**	147	**33.1**	145	**36.6**	142	**26.9**	145
s2-small	**65.4**	156	**64.6**	158	**33.8**	151	**39.2**	153	**25.0**	156
s3-medium	**75.9**	303	**70.1**	304	**34.3**	297	**28.2**	298	**22.5**	298
s4-large	**70.3**	155	**71.8**	156	**34.9**	152	**39.2**	148	**29.5**	149
Average	**71.4**	760	**65.8**	765	**34.1**	745	**34.3**	741	**25.3**	748

Base data: companies who support sourcing or procurement processes by specific IT solutions. The number of companies in each enterprise size-band is shown under columns marked N. To be read as "of those firms supporting their sourcing or procurement processes by specific IT solutions …% of the firms in enterprise size-band … use IT solutions of type …

COTS:	Commercial off-the-shelf software; a standard software package, implemented in the company
IH S/W:	In-house developed software; customised company-specific IT solutions
ASP:	Software services provided by ASPs, i.e. Application Service Providers
SSS :	Functionalities offered via sales solutions of suppliers
e-Mark :	Functionalities offered on e-marketplaces or trading networks

Source: *e-Business W@tch* (e-Business Survey 2005)

Exhibit 2-19: IT Solutions used for marketing or sales processes

	Packaged s/w		In-House s/w		ASPs		Suppliers' Solutions		e-markets	
	%firms	N	%firms	N	%firms	N	%firms	N	%firms	N
s1-micro	**68.3**	142	**53.9**	141	**27.3**	132	**16.7**	132	**24.6**	138
s2-small	**73.6**	182	**61.8**	186	**35.7**	182	**17.7**	175	**21.1**	180
s3-medium	**67.9**	318	**69.9**	322	**28.7**	317	**19.0**	311	**18.2**	314
s4-large	**66.4**	140	**71.6**	141	**27.7**	137	**30.1**	133	**21.7**	138
FirmAverage	**69.1**	782	**65.4**	790	**29.9**	768	**20.2**	751	**20.6**	770

Base data: companies who support marketing or sales processes by specific IT solutions. The number of companies in each enterprise size-band is shown under columns marked N. To be read as "of those firms supporting their marketing or sales processes by specific IT solutions …% of the firms in enterprise size-band … use IT solutions of type …

COTS:	Commercial off-the-shelf software; a standard software package, implemented in the company
IH S/W:	In-house developed software; customised company-specific IT solutions
ASP:	Software services provided by ASPs, i.e. Application Service Providers
SSS :	Functionalities offered via sales solutions of suppliers
e-Mark :	Functionalities offered on e-marketplaces or trading networks

Source: *e-Business W@tch* (e-Business Survey 2005)

Exhibit 2-20: Enterprises, by enterprise size-band, supporting marketing or sales processes by specific IT Solutions

Companies currently supporting marketing or sales processes by specific IT Solutions

	Food	Textile	Publish	Pharma	Machine	Auto	Aero	Constr	Tourism	IT Serv	AvgTotal
s1-micro	5.8	3.7	6.8	7.9	4.7	5.1	9.4	3.7	10.1	23.8	8.1
s2-small	7.0	9.8	17.9	17.8	8.4	8.2	5.0	3.5	18.1	37.9	14.0
s3-medium	17.0	12.4	29.1	26.2	20.6	19.9	25.0	11.0	23.5	40.6	22.2
s4-large	22.6	20.4	51.1	29.2	20.0	22.4	7.7	21.4	30.4	52.3	28.3
FirmAverage	11.3	9.6	20.3	17.5	11.9	12.3	10.1	7.6	18.2	34.9	15.7

Base data: companies who support marketing or sales processes by specific IT solutions. To be read as "of those firms supporting their marketing or sales processes by specific IT solutions …% of the firms in enterprise size-band … use IT solutions of type …

Source: *e-Business W@tch* (e-Business Survey 2005)

Summary conclusions for Chapter 2

Throughout Chapter 2, the enterprise size-band views show that ***take-up of various standards by micro and small companies generally trails the medium and large companies*** *in terms of the percentage number of firms in their respective size-bands that have implemented or replied in the affirmative to the various issues.*

The main observations drawn from the chapter are that an analysis of interoperability and standards by enterprise size class within sector is possible and has been achieved. In order to extract and infer useful business guidance based on the analysis, a ***sector roadmap of interoperability framework*** *standards should be compiled by a representative multi-disciplinary team of business experts. The individual sectoral roadmaps can then be mapped into a comparative cross-sectoral roadmap of the standards in use / to be used;*

While there is no exact figure on the appropriate target level that SMEs should establish, for instance, for EDI/XML adoption it could be suggested that a ***target*** *equal to or higher than the best of class companies in that enterprise size-band would be appropriate.*

3 National Interoperability Initiatives

The need for a sectoral as opposed to a firm level approach to interoperability is clearly enunciated in the 1998 paper by Laopodis and others[51]. It states:

> *to modernize industry necessitates a prudent approach …to proceed promote collaborative-approaches per sector and cross-sector in areas where critical mass of interested stakeholders can be formed, and introduce interoperability through standardized open solutions built on consensus and which can therefore co-exist in a competitive environment.*

The national interoperability initiatives described in the following two sections have adopted this prescription. Each of the descriptions provides a clear example of good practice and valuable insights into how effective PPP (public private partnership) can be in these areas. Both describe national e-business interoperability initiatives. The first is drawn from recent developments in Luxembourg, the second from equally recent and ongoing initiatives in Australia.

3.1 Case study on Construction (CRP Henri Tudor, Luxembourg)

Construction projects are increasingly being managed in a virtual collaborative environment. More so than ever before, there is an increasing business need, during the entire life cycle of a construction project and its subsequent usage, for architects, engineers, construction and other AEC (Architecture, Engineering, Construction) partners to share and mutually update information on products and services. According to the multi-part CEN/ISSS European eConstruction Framework[52] agreed in December 2003

> *the eConstruction future is essentially towards model based and object oriented[53] project/company/market information management and sharing via open standards (IAI-IFC, ISO-12006-3, bcXML, CEN/ISSS eConstruction) over the web (Semantic Web, Web Services)*

Current information on the level of ICT adoption and e-business activity in 2005 is contained in the companion volumes in this series of *e-Business W@tch* reports. See in particular, Electronic Business in the Construction Sector (2005 Special Report No. 08-I and No. II) for specific conclusions, outlook and implications for the industry and policy.

CRTI-B is helping to achieve the high level of business interoperability needed between large and small companies within the building sector in Luxembourg. Their specific approach is described in the following case study. Although the objectives and content issues are directed specifically at the AEC environment the networking and communications strategies adopted are in many cases sector-independent. Many of the same critical factors arise in considering the establishment of a network of SMEs and the mechanisms for creation and consensus on an interoperability framework in other sectors. Accounting for some specifics characteristic of the construction industry, the lessons presented have been generalised in order to be directly useful to any national interoperability project addressing similar approaches in other sectors.

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[51] Laopodis, V., Conte, A., and Eleftheriadou, I. (1998). *A methodology for introducing interoperability in industrial sectoral applications of electronic commerce*

[52] CEN/ISSS. *CWA 14946: European eConstruction Framework (EeF) - Context and Scope for "eConstruction".* (March 2004)

[53] Covering data and functionality aspects in an integrated way.

CASE STUDY: CRTI-B (CRP HENRI TUDOR, LUXEMBOURG)

Abstract

The study outlines the processes by which CRTI-B, a Department of the Public Research Centre Henri Tudor, established and managed a formal national e-strategy via a representative network of construction sector stakeholders. It outlines how this voluntary network developed, adopted and integrated an agreed common national interoperability framework for e-construction, Build-IT, into everyday successful usage. The lessons for national and regional interoperability initiatives are identified and summarised together with generic guidelines on how to implement similar platforms which can contribute to specific added-value business practices. The generic conclusions drawn from this experience are being applied to other sectors within Luxembourg.

Case Characteristics	
Full name of the company	Centre de Recherche Public Henri Tudor
Location of the company	Luxembourg
Year of foundation	1987
Company size (no. of employees)	large (250+)
Turnover in last financial year	€ 19.5M
Primary customers	SMEs
URL	http://www.tudor.lu/
E-Business Focus	
Quality and Business performance	✱✱✱
Public support for e-Business	✱✱✱
Co-operation for interoperability	✱✱✱
Interoperability Standards	✱✱
✱ = some relevance / in implementation stage; ✱✱ = important / used in day-to-day business; ✱✱✱ = very important / critical business function	

Background

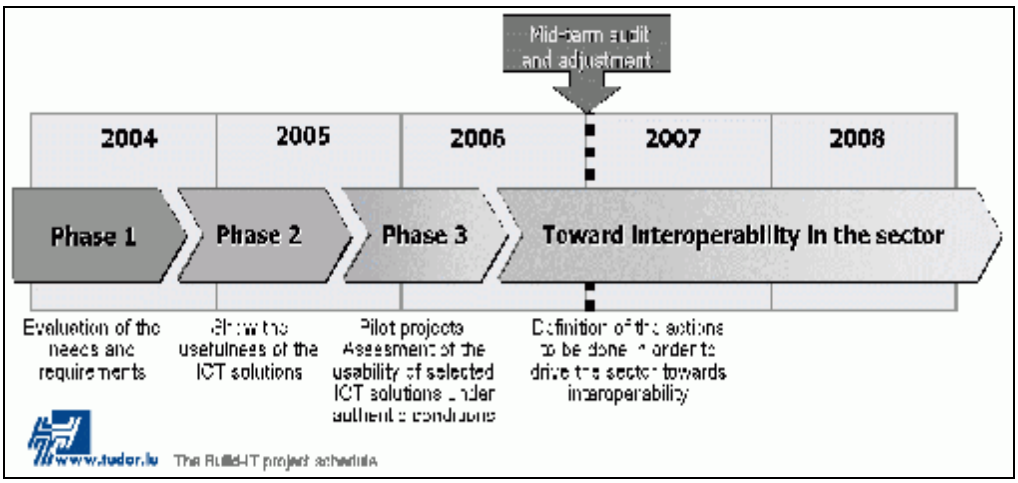
The Centre de Recherche Public Henri Tudor is the national research, development and innovation centre responsible for ensuring increased experimentation, use and adoption of the most promising ICT applications by private companies (mostly SMEs) and public sectors in Luxembourg. The members (regulation authorities, national federations of designers, industry, craftsmen, etc.) of the Luxembourg CRTI-B (Centre de Ressources des Technologies de l'Information pour le Bâtiment) are dedicated to enhancing national construction and building industry competitiveness.

The construction industry

The building trade is, on the one hand, a mature industry characterised by high professional skills in architecture, design, construction, aesthetics and the relevant legal aspects required for land contracts and development approvals. Very heterogeneous project teams have learned over time how to work to tight deadlines and interlinked inter-dependent schedules in order to deliver projects to the specifications required, on time and within budget. On the other hand, the growing market pressures for more housing and institutional building programs, together with higher expectations from customers and increasingly stringent necessary environmental constraints, has ensured that it is no longer sufficient to adopt a "business as usual" approach.

Nonetheless, despite a large usage of specific software (CAD, planning, monitoring), there is a very low usage of cross-trade electronic exchanges (e-procurement or collaboration platforms) within the construction industry – and not only in Luxembourg. This picture is consistent with the results from the *e-Business W@tch* 2005 survey which indicates that the construction industry has the lowest expressed critical business need for interoperability within its own sector (6.5% of construction firms using computers) and for interoperability with firms outside the sector (5.2% of construction firms using computers). Pro-rata these figures also indicate that the maturity of e-business in the construction industry may take longer to achieve than in other sectors. In this respect the schedule for interoperability in the construction sector adopted by CRTI-B for its Build-IT initiative, as shown in Exhibit 3-1 below, is realistic.

Exhibit 3-1: Build-IT Project Schedule



However, the primary reason for the schedule edging out to 2008 is that significant change takes time to be socialised, i.e. accepted and widely implemented. Notwithstanding specific requirements that exist and may emerge for modifications in applicable regulation (e.g. e-procurement, authentication) or in technology norms, the adoption of interoperable e-business in construction is significantly gated by sociological factors.

The strategic objectives

The primary goal of Build-IT is to enhance the competitiveness and the quality of the production process in the building trade by the usage of ICT. This goal is served by targeted strategic initiatives as outlined in the following two sections. These initiatives involved multi-competence teams organised in thematic workgroups.

e-Business activities

Several early initiatives established a high level of openness and cooperation. For example, the first activities related to the production of national paper-based norms for mutual contractual activities between stakeholders required little need for CRP Henri Tudor intervention and only low levels of interaction among the stakeholders. By the end of 2002, the CRP and all of the stakeholders had together defined and agreed an ICT innovation strategy, which was an impressive achievement within that narrow time frame. This section outlines each of the major steps through which this was accomplished and the challenges that had to be addressed and overcome along the way:

- The approach started by understanding the need to educate the designers, constructors and craftsmen to enable them to benefit from recognising and adopting the appropriate interoperability standard, and thereby, realise the benefits generated from ICT opportunities;
- The first socialisation of construction professionals to ICT usage and experimentation with an electronic interchange interoperability platform was accomplished in 2001 with the assistance of the architects' national representative body. This generic platform (Forum Altavista) for improved e-collaboration between professionals has since been customised and commercialised for the construction sector by a start-up (www.forum-network.com) located at the CRP start-up incubator (www.technoport.lu);
- An early decision was made to adopt a formal methodology (CASSIS: www.cassis.lu), which enabled all to participate equally in defining the e-construction IT strategy and particularly in the development of e-procurement in public building projects;
- An internet portal (www.crtib.lu) was created and dedicated explicitly to the sector which supplies professionals with information about standards (tendering and procurement) and which also supports asynchronous electronic collaboration within the working groups.

e-Construction Standards

In compliance with the e-strategy, the national Build-IT project was designed with a major objective: to increase the use of e-business in the sector and at same time to ensure international interoperability by adoption of a standardized digital plan (Industry Foundation Classes (IFC) standard and Building Information Model Philosophy). This initiative had the following intrinsic characteristics:

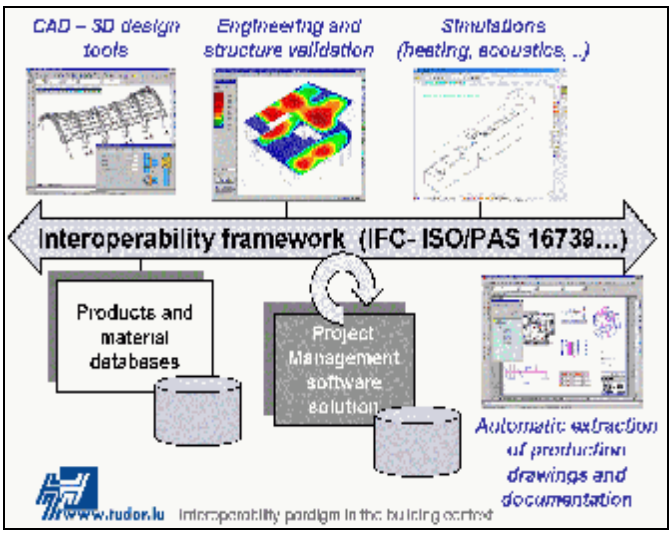
- The IFC created by the International Alliance for Interoperability (www.iai-international.org) were adopted unanimously by all stakeholders;
- A series of information events with specialists and software editors informed all concerned about the IFC standard;
- Some specific studies and R&D projects were also undertaken:
  - A longitudinal study was conducted to identify and quantify the real needs;
  - Co-ordination software was developed to meet the needs identified;
  - A special project was used to initiate early positive movement within the sector;
  - Pilot projects were conducted in the chosen application area to validate and demonstrate the benefits of ICT.

Results realised and lessons learned

In 2002, the Luxembourg building sector comprised some 400 enterprises employing 12,000 workers, and producing 7% of Luxemburg's GDP[54]. The successful management of the Build-IT processes has accelerated the sustained learning required for adoption of IFC classes by these Luxembourg enterprises. See Exhibit 3-2 IFC Interoperability Framework for a schematic overview of the linked capabilities which serve the specific needs of each stakeholder.

[54] http://www.eiro.eurofound.eu.int/2002/10/feature/lu0210102f.html, last accessed August 23, 2005.

Exhibit 3-2: IFC Interoperability Framework



Proof of success for e-construction

The mobilisation and meetings have specific action oriented objectives and demonstrable results. Influential stakeholders receive and share information and, in turn, implement knowledge and innovation processes which improve the quality and level of formalisation of the sectoral e-governance and business interoperability strategies. Since the establishment of the first working groups in 1991, active participation is consistent and of high quality. The range and scope of the initiatives within the building sector has also increased:

- over 60 different stakeholders are active across 7 on-going working groups and met no less than 23 times during 2004;
- 77 stakeholders received advanced information and training on IFC standards in the first six months of 2005. This gives the respective stakeholders the knowledge, confidence and power to experiment and learn by doing;
- Not all ICT innovation initiatives need direct facilitated intervention. At any given time, CRTI-B initiatives are directly supporting e-business activities in about 10 public or private organisations.

Lessons learned

BuildIT is designed to meet, amongst others, the requirements of public building projects and related administrative processes. As such it is explicitly based on established sectoral standards and specifications. Nonetheless, at a generic level the overall approach is applicable to practically any sector. All comprehensive projects of that nature must be designed to emphasise and take fully into account the sociological aspects of the interactions, and the change management structures which are needed to support the individuals and their respective expert roles vis-à-vis the network organisation and their own company goals.

- The change process begins with a **mobilisation of competencies** in which partners in a given sector take an active part in establishing learning groups and working projects. For this to be effective, a formal nationally defined e-strategy agreed by all the sectoral stakeholder representatives is the first priority. As observed by Jean-Pol Michel, Directeur CITI/CRP *"an agreed formal e-strategy is a major asset at the political and social levels. The public transparency of the strategy allows each actor to position their own goals within the 'consortium'*

ones. Without this transparent trust baseline, a technical framework alone would be a poor asset";

- Establishing and reinforcing **trust and confidence** between the involved stakeholders, and a sense of partnership in a common cause, is a pre-requisite. In-person discussion must be promoted by bringing, at least initially, all stakeholders (where possible) around the same table. The respective roles must be clear and the skills and needs they each bring to the table must be mutually understood. Within a given sector, at minimum it is essential to have as core participants a neutral research centre offering skill sets as follows:
  - coordination, standard survey, ICT expertise, connections with other research institutes in Europe, as well as all of the relevant professional organisations;
- **Change and knowledge processes** for interoperability are as important as the end-result. Change is a continuous process. Early experimentation and implementations at all stages are required to establish momentum and technical electronic interchange platforms for early adopters. These early adopters need to be well supported as they are potential best sponsors for change. At every level, but particularly at the assessment and architectural level, these early pilot successes provide good challenges and establish a strong fellowship and esprit-de-corps. They also demonstrate the feasibility of addressing more strategic and longer term technical and business challenges.
- Sustaining long term activities, based on a **clear strategy** agreed between the stakeholders active in the sector, is critical in order to be able to adjust and lead the evolution of the sector. This should be managed in waves of change e.g. a first strategy was defined at the creation of the CRTI-B in 1990, and a second e-strategy was defined in 2002 in order to renew the 'e-ambition' of the CRTI-B network.
- The working processes and national norms for contractual activities must be open to continuous improvement. Ideally this delicate balance of maturation and renewal will be ensured through formal working groups. This adaptability is an important semantic-level asset of the framework, as otherwise the norms in practice might ultimately constrain the interpretation of business activities and business-related objects. It is also a good asset from the cultural point of view. It will be easier to promote an interoperability framework where **cooperation** is the common way of work and where terms and definitions are formally shared between actors. A good **maturity at the semantic level** will benefit both the technical level (derivation of technical requirements, adoption of technical standards for ICT common tools) and the business level (cooperative change of business practices)
- Any interoperability framework must be **dynamic**. Networked knowledge and innovation management processes must also be systematically deployed in order to improve the "e-knowledge and e-innovation of the sectoral stakeholders". This can be achieved by means of a business and technology watch function, coupled with shared awareness events such as meetings, demonstrations, training, pilot projects, and celebrations of success.

Additional Generic Guidelines

Technical, semantic and business process aspects are important but a common business focus coupled with strong political leadership and social network management take precedence. Speaking on the goal of a standardised digital building plan for e-construction, Jean-Pol Michel noted that:

> *"From our experience, technical issues do not mobilise the good actors, neither does the question of interoperability. Only added-value business opportunities ensure strong mobilisation. So even if interoperability is our goal, the strategy has to focus on ICT applications that demonstrate clear advantage. For example, in the tourism sector, we are addressing an attractive and non-critical ICT application (geo-localised information system) with expectations for a clear and direct return on the investments for all. Consequently, each stakeholder is mobilized on this client oriented added-value service. Resolution of the interoperability, semantic and technical issues will come after."*

To emphasise the importance of this point Jean-Pol Michel continued:

> *"The ICT adoption and the related interoperability issue are mainly a change issue on the business. We have to address this change management issue rather than merely focus on the technical or semantic issues. For example, in order to deploy the national electronic marketplace for the training offer in Luxembourg, we do not only propose an interchange electronic standard but we have first studied the changes required in the business processes in order to publish the new electronic course database and have also proposed dedicated tools with which to effectively address this business process change".*

Given the construction industry structure in Luxembourg, it is clear that SMEs, as a significant group of the primary stakeholders, are critical to the change management processes. However, it is generally accepted that neither they nor their federations can maintain sufficient internal staff or pay for external consultants to access the necessary competences required for cross-sector collaboration on e-standards and inter-operability. In this context, the neutral role of a public body (such as CRTI-B performed in e-Construction sector) is essential for informed consensus and assured global interoperability. At the simplest level, this role must be structured to ensure that important issues are adequately discussed under a neutral chairman and with all required information (where possible) immediately to hand so that the implications are understood prior to decision by the partners.

In a technology-rich and changing environment the public body therefore requires significant current multidisciplinary competences in the areas of change management, business process modelling, technology developments and semantics in order to manage and optimise the knowledge process. Only when this is the case can the public body support the large variety of activities required to address the social, political and cultural issues that can otherwise and inevitably block the path to sustained successful change management and technology adoption.

Conclusion

The CRP Henri Tudor Innovation Platform (IPF) is applied in the building and other sectors, such as healthcare, training, and ICT services. It has, thus, resulted in a national Luxembourg counterpart to the European Technology Platform (ETP) which is

applicable to e-business developments and realisation of associated interoperability in –practically- any business sector.

For similar success elsewhere, such networked organisations should be based on:

- an agreed sector-specific **national objective**;
- a well managed **action plan**; and,
- an expert network mobilising **multi-disciplinary competencies** with representatives from each of the major stakeholders (e.g. users, suppliers, regulators, researchers, trainers).

Essential support infrastructure will include an appropriate portfolio of R&D, training, conferences, workgroups, pilot experiments, and formal interoperability certification, coupled with active measurement and tracking of specific impact indicators related to the national goals.

References and acknowledgements

This case study was compiled by Henry J. F. Ryan, Lios Geal Consultants, on behalf of the *e-Business W@tch*.

References:

- Interviews with Jean-Pol Michel, Directeur du Centre d'Innovation pour les Technologies de l'Information (CITI), Centre de Recherche Public Henri Tudor, and email inputs from Damien Hanser, CRP Henri Tudor (CITI), in July 2005.
- Desk research and various documents on Build-IT authored by Jean-Pol Michel, Michel Brachmond, Damien Hanser, Anne Rousseau and others.

Key messages from Section 3.1

*The CRP HenriTudor **BuildIT** initiative and sectoral support mechanism has successfully increased SME awareness and compatible e-business implementation, at a particular sectoral level.*

*The same approach is **readily applicable** to other sectors. Similar sector-led initiatives in other member states in the same or different sectors, ideally led by respected neutral organisations equivalent to CRP Henri Tudor, are recommended as a positive way to accelerate the pre-competitive business and technology agreements required for effective national and regional implementation of existing and emerging sectoral e-business standards and guidelines.*

3.2 The Story of BizDex (Standards Australia)

The BizDex Mission is to be *a trusted and independent, not-for-profit, consortia of government and recognized standards bodies, committed to B2B standards simplification, partnering with private enterprise to deliver low cost, scaleable, B2B interoperability to all Australian businesses*[55].

Bizdex is a public-private partnership initiative which has been successfully applied to e-business in the wheat production sector. The BizDex repository of integration schema and BizLink connector may be used by any community to reduce integration setup costs – particularly for small businesses. The concepts are equally applicable to establishing business links within and between different sectors and service areas including Energy, Health, Banking, Automotive, Retail, Steel, Human Resources, Utilities, Agriculture.

Australia's sectoral and market-led development of B2B e-business has been actively led and supported by a national PPP (public private partnership) program established at the initiative of the former National Office of the Information Economy (NOIE). As facilitator of the technical and business collaboration required to increase e-business uptake, NOIE convened an Interoperability Forum in April 2002. This brought together key business stakeholders to assess the development of e-business and to identify ways to enhance existing government and industry initiatives aimed at increasing the level of e-business interoperability. Over 70 organisations from the standards, vendor, service provider, industry and government end-user communities attended. Following the forum, the NOIE partnered with Standards Australia to create BizDex - a framework to enable SMEs and large enterprises to readily, and at low cost, engage with trading partners through B2B.

The background to this innovative approach is described in a 2001 report[56]

> *The main driver for e-commerce to reach its full potential will be companies collaborating to develop whole-of-industry solutions and deliver shared benefits. To achieve this, companies will need to share their understanding of business information and workflow processes, and agree on how they can best automate their interchanges for efficiency. This will then free business resources to concentrate more on competitive issues such as product quality and price.*

The 2001 report further noted that the overwhelming emphasis in most national e-commerce strategies at that time was on assisting firms. Australia differed in that the support was addressed to the sectors.

Through the Standards Australia governance process an implementation strategy was quickly established. BizDex was successfully completed in November 2003, with a set of key design documents describing how interoperability could be facilitated by a national framework. The deliverables and many other excellent comprehensive reports are freely available from www.bizdex.com.au.

The interoperability framework is an open technical and commercial infrastructure that is operated by non-aligned trusted bodies, namely, government and standards organisations. The framework is ebXML compliant and comprises:

- a governance structure for collaborative development of standards;
- a repository of standards, messages and components;

[55] BizDex: a one page overview. http://www.bizdex.com.au/files/BizDex-One%20Page%20Overview.pdf, last accessed 23 August 2005

[56] Australian Government. Department of Communications, Information Technology and the Arts (2001). *B2B e-Commerce: capturing value online.* (http://www.dcita.gov.au/ie/publications/2001/10/b2b_e-commerce, last accessed August 23, 2005)

- a registry of businesses and their B2B profiles;
- a repository of re-usable schema that permit organizations to comply with, and bind to, BizLib processes.
- an open integration platform for small businesses that have no pre-existing middleware;
- an open commercial framework to provide incentives to deployment.

The components significantly reduce the cost of B2B integration. As announced by Standards Australia (October 2003):

> *A cornerstone of BizDex is its proposed ownership structure. In a nutshell Bizdex is a piece of national infrastructure similar to the roads network. This means that Bizdex requires a collaborative approach to both investment and management; a balance of public funding and private investment, coupled with a balance between regulation and free enterprise. Such an approach promotes a high level of interoperability and trust, thereby helping Australian organizations to avoid an operating environment plagued by standards proliferation, technical lock-in and high switching costs. It also provides a commercial incentive for private enterprise to rapidly populate BizDex content, thereby enabling all Australian organizations to share in the benefits offered by e-business*.[57]

In December 2003, the BizDex results of the technical proof-of concept work were presented to over 100 organisations in open industry consultation forums in Sydney and Melbourne. This included a demonstration connecting the SAP financial management system used by many large firms, to the Quickbooks accounting package used by many small businesses. The objective of these consultation forums was to demonstrate the outcomes and gather feedback from industry representatives. Opinions were taken on the potential for BizDex to assist the take up of e-business in Australia, as well as an assessment of the likelihood of organisations making use of BizDex should a production service be deployed. At that time the Working group proposed that BizDex be established as a not-for-profit entity that supported infrastructure based around a collection of open standards-based components including:

- a library of public e-business standards;
- a registry of businesses and their technical interface requirements; and
- integration tools such as a connector from small business software applications to corporate software applications.

A possible business model, involving a call for Australian industry funding, was developed. The call for industry funding was made in the first half of 2004. This did not attract sufficient support to enable immediate and full scale deployment. Nonetheless, progress continued to be made. In late 2003, Standards Australia led a Consortium partnered with Red Wahoo, the Australian Wheat Board (AWB), AWB Grainflow, Freight Australia (now Pacific National) and Sun Microsystems to trial business process e-enablement of the wheat supply chain via an ITOL grant. Standards Australia were thus able to pilot the BizDex framework in the wheat industry with Red Wahoo as solution architects. The results of this work along with several case studies, technical papers and reports from a February 2005 Workshop on the future of Bizdex are published.[58] Standards Australia, as the owners of the BizDex name, continue to formulate the future formation of the BizDex service.

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[57] Standards Australia. *BizDex: a one page overview.* http://www.bizdex.com.au/files/BizDex-One%20Page%20Overview.pdf, last accessed 23 August 2005

[58] see www.bizdex.com.au

Since the completion of the initial funded BizDex project, Red Wahoo undertook to self-fund the detailed design and implementation of the BizDex design specifications. In tandem, its Monteverdi suite of products (see http://www.redwahoo.com/white_papers.html) was created. Demonstrating that there are significant commonalities between private and public use of e-business and interoperability requirements, in October 2004, Red Wahoo were engaged by AGIMO (an Australian Federal Government department within the Federal Department of Finance) to define detailed use cases for specification of GovDex – a service designed to facilitate and enable low cost interoperability of G2G and G2B transactions modelled on BizDex. They have since been retained to work with several government agencies to pilot the identified use case.

Scenarios for the future of Bizdex

An open workshop to determine the way forward for BizDex was held on February 8, 2005 at the Standards Australia offices, Sydney. The workshop was attended by approximately 30 representatives from a variety of end users, government bodies, standards bodies and industry associations. Each participant was provided with information on the BizDex Framework, recent case studies, and options available to those undertaking or wanting to undertake e-business. The discussion paper[59] issued in advance of the forum outlines four possible scenarios together with an assessment of the potential activities, likely cost/revenue model, advantages, disadvantages and role for vendors for carrying BizDex forward.

In summary, the four options identified in the subsequent Workshop Report[60] are presented in Exhibit 3-3.

The meeting included presentations on several case studies:

- Optimising the Wheat Supply Chain
- Steel Online
- LIXI – lending industry XML initiative (i.e. mortgage lending industry)
- Perspective of a company (Boral)

The first and last of these cases had been successfully conducted using BizDex.

While there was support for all options at the meeting, Option 4 was preferred by a narrow margin. This approach is deemed high-risk and challenging to model short and medium term demand and revenue. There was also support for a phased approach incorporating a staged adoption of each option in turn.

[59] Standards Australia. *Discussion paper: BizDex and e-business standards development: working together to create a way forward January 2005*. (http://www.bizdex.com.au/download.html, last accessed August 23, 2005)

[60] Standards Australia. *End-user e-business & interoperability workshop, February 8, 2005. Workshop report.* (http://www.bizdex.com.au/files/Workshopreportv2.pdf, last accessed August 23, 2005)

Exhibit 3-3: BizDex Future Option Scenarios

Option	Aims, roles and key functionality for the option
1	**Share Experience** Aim: To provide a focal point for organisations or industry groups that are looking to establish standards, in the process of developing standards, or have deployed standards. Potential activities: • convene meetings of end-users developing standards to share experiences; • publish information and case studies on standards development.
2	**Define Methods and Processes** Aim: To provide end-users with advice on methods and processes that could be used to develop standards in green-field scenarios or to re-develop existing standards. Potential activities: • convene meetings of end-users developing standards to share experiences; • conduct consultation process to obtain endorsement from both end-users and vendors for a defined "Australian standard" for e-business standards development; • publish document detailing agreed methodology; • act as a referral service for end-users to contact vendors who use the approved method.
3	**Develop, manage and maintain standards** Aim: To assist end-users with advice on methods and processes to develop standards, manage the standards throughout their lifecycle and provide advice on deployment options. Potential activities: • provide leading input to international standards forums to seek acceptance or inclusion into international standards; • share an understanding of the Australian and Asia-Pacific business context; • understand the business drivers for change within a client industry; • identify opportunities for electronic commerce cooperation and improvement; • aid client partners to form consortium projects to advance these opportunities; • aid uptake of technology and application usage; • recommend architectural patterns and infrastructure to support e-business efficiency; • provide a repository facility to manage the local context usage of the reference standards; • provide certification services for subsequent standards usage; • provide compliance checklists for deployment frameworks.
4	**Develop, Maintain, Manage and Deploy Standards.** Aim: To assist end-users to develop standards and manage them throughout their lifecycle, as well as to host a registry of business information and integration solutions. Potential activities: As for option 3 with the following additions: • a registry of businesses and their technical interface requirements; • a marketplace for vendors to sell integration tools that make use of the standards held in the repository to connect common business applications.

Source. Standards Australia. End user e-business & Interoperability Workshop report. February 8, 2005. (www.bizdex.com/au, last accessed August 23, 2005)

Summary of the BizDex national collaboration for SMEs

The Australian economy includes multiple industry-specific communities. Bizdex is a public-private partnership initiative which has been successfully applied to e-business in the wheat production sector. The BizDex repository of integration schema and BizLink connector may be used by any community to reduce integration setup costs – particularly for small businesses. The concepts are equally applicable to establishing business links within and between different sectors and service areas including Energy, Health, Banking, Automotive, Retail, Steel, Human Resources, Utilities, Agriculture.

Bizdex is not about picking standards for industry. Instead, through its collaborative approach to e-business it provides the technical infrastructure, methodology and governance which industry can then use to manage change and variation between standards in common usage. Managing standards is not the core interest of most businesses. Managing standards is beyond the means of most SMEs, and can act as an inhibitor to large scale deployment and take-up of e-business initiatives in and across supply chains. Bizdex helps SMEs and industry generally to widely deploy their chosen B2B solutions, by reducing the cost of compliance with the standards used in their trading communities.

Key messages from Section 3.2

*The **BizDex** work is an example of **a successful PPP** (public private partnership) model where the standards body takes on a much greater role and responsibility for the costs, standards and integration tools developed. In effect it becomes part of a wider business partnership and assumes risks in taking this approach.*

This experience should be studied at first hand and the possible applicability of similar initiatives being introduced in Europe investigated. This could be introduced, for example, as a special topic within a workshop conducted by the e-Business Interoperability Forum (eBIF)*, or by DG Enterprise and Industry, and the attitudes of the different stakeholders elicited in a neutral climate.*

Clearly a change of this magnitude would not be undertaken lightly. The important issue at first would be to fully understand the BizDex model and how it might or might not suit the European SME circumstances and needs such as, for example, the multi-cultural and multi-lingual environment.

It is recommended that a more extensive description of the BizDex experiences covering both achievements and challenges is compiled, and made available within Europe, and that any meeting in Europe to discuss the approach await until after the BizDex future plans are known.

4 Policy Considerations and Recommendations for Action

The eEurope follow-up initiative "i2010" outlines three policy priorities:

- to create an open and competitive single market of information;
- to increase EU investment in ICT research by 80%[61];
- to promote an inclusive information society.

B2B interoperability via standards is particularly set to help deliver on the first objective. The key to this is knowing how best to bring SMEs into the digital B2B fold without causing unnecessary expense or loss of management time to small and micro companies in particular.

Exhibit 4-1: Recommendations for Policy Action

Policy Objective	Suggestion for policy	Potential Initiator(s)
Sector level interoperability	Increase awareness and support mechanisms, at sectoral level, with emphasis on SMEs: • encourage sector led initiatives, ideally led by respected neutral organisations, similar to that conducted by CRP Henri Tudor as a way to accelerate the pre-competitive business and technology agreements required for effective national and regional implementation of existing and emerging sectoral e-business standards and guide-lines;	• ICT Innovation Centres • Sector Industry Associations • National Standards Bodies • Member state business development agencies • proposed new High Level ebXML Implementation Group
	• encourage and assist CEN/ISSS eBIF and EBES to jointly compile and distribute information on successful implementations of ebXML and Web Services by SMEs;	• ICT Innovation Centres • EU and national RTD projects
	• facilitate SME access (preferably free) to all strategic eBIF information documents.	• DG Enterprise and Industry • CEN/ISSS eBIF and EBES members
Cross-sector interoperability	Review the enterprise size-band data presented by sector and topic in the interoperability report in a cross-sectoral workshop and establish a process to: • assist typical SME enterprise size-band representatives establish and share appropriate targets and standards road-maps for interoperable e-trade with their business partners; • Establish formal BPI (Business Process Integration) mechanisms (e.g. piloting, training and model sharing) to encourage and assist SMEs in integrating business processes into their B2B implementations; • Look for cross-sector commonalities. Where relevant actively promote European common cross-sector interoperability	• SME Associations • Sector Industry Associations • DG Enterprise & Industry • CEN/ISSS eBIF and EBES members

[61] NB. This proposal, if approved, would apply to the Community funding.

	standards and convergence; • Improve European inputs to the global e-business standards convergence ISO/IEC/ITU/CEFACT Business Standards Convergence framework, and in the global context, also collaborate with NIST eBSC Forum convergence activities	
Standards Policy	Investigate the potential for developing a Bizdex like approach to some forthcoming European or national standardisation and e-business implementation projects.	• National Standards Organisations • ICT vendors • DG Enterprise and industry

4.1 Sector level interoperability

As stated by David White,[62] Director, European Commission, Enterprise & Industry Directorate General, in September 2005,

> *The realisation of i2010 goals will very much depend on "platforms, services and applications being able to talk to one another and to build an economic activity on the information received" This is what we understand as "Interoperability". It is complex, not limited to the infrastructure level but encompasses semantic interoperability, organisational interoperability and even regulatory interoperability.*

Competitiveness of SMEs

The report *SMEs in Europe 2003*[63] reveals that there were 19.3 million enterprises, in the European Economic Area and Switzerland, providing employment for 140 million people. More than 99% of these enterprises were SMEs; 92% with less than 10 employees; and, about half of all enterprises (those providing employment and income to the self-employed and family workers only) having no employees at all[64]. More than two thirds of all jobs were in SMEs, with almost one third of all jobs provided by large enterprises. Medium term developments (1998-2003) show that, despite fluctuations over time, employment increased in SMEs (and in particular in micro and small enterprises), whereas in large enterprises employment decreased.

As stated in the same report, this is remarkable as real turnover and value added growth have been smaller in SMEs than in large enterprises. So, large enterprises increased their production more and sold more products and services than SMEs. In effect large enterprises have become more efficient, more quickly than SMEs. In practice this may have been influenced by a combination of downsizing and retrenchment rather than solely through business efficiencies. Thus detailed study of the data in the survey analysis requires sector experts who can distinguish the causative factors. In the case of the cross-sector results

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62 White, David. *Interoperability and standards* (http://portal.etsi.org/docbox/workshop/sos_interoperability/SOS2/SOS2_14%20David_White_Interoperability_and_Standards.doc, last accessed 29 Sep 2003)

63 *SMEs in Europe 2003* (Observatory of European SMEs 2003, No. 7) (http://europa.eu.int/comm/enterprise/enterprise_policy/analysis/doc/smes_observatory_2003_report7_en.pdf, last accessed 29 Sep 2003)

64 *Highlights from the 2003 Observatory* (Observatory of European SMEs 2003, Number 8) (http://europa.eu.int/comm/enterprise/enterprise_policy/analysis/doc/smes_observatory_2003_report8_en.pdf, last accessed August 23, 2005)

presented here this means that input is required from business industry experts from the relevant sectors.

Increase SME awareness of the business and support move to B2B

Evidence from the Luxembourgish and Australian initiatives outlined in previous chapter shows that specific targeted actions at sectoral level to facilitate e-trading partnerships by increasing awareness and support for faster SME take up and implementation of flexible standard based approaches to B2B is recommended, required and can be effective. Broad policy initiatives are suggested based on the following observations drawn from the survey results and other information published on SME efficiencies relative to large firms:

- the awareness and adoption data from the enterprise size-band analysis per sector from *e-Business W@tch* indicates an almost linear relationship between B2B related activities and enterprise size;
- micro, small and medium enterprises trail one another and seriously lag behind large companies in the adoption rates for B2B related technologies; and,
- the lower efficiency of SMEs relative to large firms noted in the report "SMEs in Europe 2003".

Involve the stakeholders

When implementing interoperable systems, standards alone are insufficient. Steps must be taken to accelerate the efficiency and hence competitiveness of SMEs by increasing awareness and support for SMEs in relation to adopting EDI/XML based solutions (ebXML and Web services).

As shown by the CRTI-B Case Study it is essential to involve the various stakeholders in a structure which, although relying on existing standards, focuses on the primary interoperability needs, and proceeds on a time controlled cycle to develop and implement functioning systems. If this is done properly then standards can trigger innovation directly by codifying accumulated technological experience and by forming a baseline from which new technologies emerge. Standards can also act as a catalyst for innovation indirectly because they increase global competitiveness, which in turn spurs innovation.

General Observations

The growth observed in use of EDI and other standards between the e-Business 2003 and 2005 studies is heartening. However, there is a difference between adopting specific standards and **making those standards part of everyday business** for all occasions. The following activities could be considered to enhance the actual use of e-standards in business transactions:

- Subject to interest and support from industry and national agencies, the Commission could establish, in conjunction with the European Standards Organisations and relevant other bodies such as Chambers of Commerce, and User/SME Associations and organisations, a new **high level ebXML implementation group** to advise on ebXML introduction, implementation and application in all sectors across Europe. The charter of this group would be to develop a systematic support plan to accelerate the sporadic implementations and identify/overcome barriers to progress. It is envisaged that the High Level Group will select at least one sector, with significant information exchange and trading links to other sectors, and use that as the nucleus for priming the roll-outs.
- The proceeding and presentations delivered at all **eBIF meetings could be freely accessible** to all. The rationale for this suggestion is that eBIF is by its charter not a

standards making body. It operates as a forum and information repository for those companies, especially SMEs that are interested in establishing interoperable business connections with partners in Europe. In addition a category of free corresponding member could be added to the current membership lists which will entitle those who sign up to free electronic copies of all documentation. Such corresponding members could also be entitled to participate in and encouraged to contribute papers, case studies and information about interoperability implementations, developments and conferences.

- Where relevant, subsets of **information tailored to particular SME group interests** or general information related to standards convergence or cross-sector studies should be compiled and individually targeted to specific companies and sector associations in accordance with dissemination profiles.

4.2 Cross-sector interoperability

Europe should follow more closely, and contribute where relevant to policy and business requirements, to the e-business technology framework and standards convergence underway in the ISO/IEC/ITU/CEFACT MoU Management Framework Group. In addition, within the longer term global considerations, partnership collaboration is also recommended with the standards' matrix and convergence themes of the NIST eBSC Forum.

CEN/ISSS already has commitment to provide input to such globally focused activities, as evidenced for instance by the eBES and eBIF goals. However, stakeholder participation and external awareness/profile of relevant activities in these two groups are relatively low. For example, interest from national standards bodies is very limited – indeed EDI standardisation and delegations to the UN/CEFACT process has usually been the responsibility of national organisations other than the national standards bodies. In addition, in terms of their investments and active standards participation European arms of multi-national ICT vendor companies, and many European research projects, generally favour direct influencing of international standards and global consortia. Consequently European standards framework activities, so essential for effective interoperability which depends heavily on the system architectures adopted, are generally seriously under-resourced. It is critical that Europe overcome these barriers and contribute to facilitating the e-business technology framework and standards convergence necessary for global e-business outreach.

Business Process Standards

A common feature of all of the newer approaches to interoperability is the need for a systematic approach to understanding and modelling the business processes. Thus, at this time business managers should where possible be focusing on the requirements and standard methodologies that will support business process description and modelling.

4.3 Standards policy

Ideally, strategic investment decisions enable long term stability and growth potential. At the same time it is vital to have an inbuilt flexibility. In fact according to Mintzberg[65] strategies need not be deliberate; they can also emerge:

> *strategies can form, as well as being formulated. A realised strategy can emerge in response to an evolving situation, or it can be brought about deliberately, through a process of formulation followed by implementation. But when these planned intentions do not produce the required actions, organisations are left with unrealized strategies.*

This is the approach that appears to have been adopted in formulating the i2010 Action Plan. The broad outlines have been proposed and agreed. The way to achieve the plan, tailor some of the edges and keep a strong focus on benefits for SMEs is now open to debate. The essence of debate – if it is not to degenerate into a futile discussion on semantics – is that there must be evidence on which to make specific choices. This evidence may be a hunch, a rough back of the envelope calculation, or it may be something stronger and more scientific.

The evidence from *e-Business W@tch* presented in this report and elsewhere should be used to inform the planning for SMEs in responding to a changing world of technology and electronic business relationships.

Realizing, in particular with reference to successful Public Private Partnership work, that there are options available within EDI/XML solutions (ebXML, Web Services) to this end consideration should be given within the national standards bodies, European standards organisations and the European Commission to specific public private partnerships similar to the BizDex initiative in Australia.

In deciding what is to be accomplished technologically, the policy criteria must be "*the good of man, of society and of business*". In planning for the use of technology, both decision makers and policy planners sometimes seem to operate on other grounds. Often appearing to decide based on either or both of two other principles: a) "*what is technically possible to do, ought to be done*" – whereby feasibility is elevated into a normative concept; and b) "*maximal efficiency and productivity*" - even if this entails minimal individuality, creativeness, and the elimination of differences.

Certainly it is possible to wait and see what new standards emerge in the areas of web services, ontologies, grids and the rest of the semantic web. It is possible to wait for better and more complicated standards, which will for instance eventually enable automated agent-based trading between applications. However in determining the standards' winner in network markets, expectations are crucial and can easily be self-fulfilling: *the product or technology expected to prevail does prevail*[66].

Visibly choosing or **supporting a business interoperability framework now can make a world of difference in the adoption rate**. The issue is not what is the best standard; it is not always the best standard that wins out. The ideal outcome is that the winning technology used to assist inter-enterprise business trading, increases flexibility and competitiveness and can be easily adopted and applied by all industries, regardless of size and location.

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Annex I: The e-Business Survey 2005 – Methodology Report

The *e-Business W@tch* collects data on the use of ICT and e-business in European enterprises by means of representative surveys. The e-Business Survey 2005, which was the third survey after those of 2002 and 2003, had a scope of 5,218 telephone interviews with decision-makers in enterprises from seven EU countries (Czech Republic, France, Germany, Italy, Poland, Spain and the UK).[67] Interviews were carried out in January and February 2005, using computer-aided telephone interview (CATI) technology.

Questionnaire

The general design of the questionnaire builds on the ones used in the previous surveys of 2002 and 2003 in order to ensure a basic continuity of the research approach. However, new modules on security and interoperability have been added, while other modules have been reduced (mostly the ones on perceived impacts of e-business, where little new evidence was to be expected compared to the findings of 2003).

New questions were also introduced in the e-commerce related modules, reflecting the developments in electronic business and changing perspectives in research, in particular the emphasis on electronic business processes. An important focus of the 2005 survey was on the use of ICT systems to support e-procurement and online sales processes. These questions complement the previously used questions on online purchasing and selling activity.

The questionnaires of all three surveys (2002, 2003, 2005) can be downloaded from the *e-Business W@tch* website at www.ebusiness-watch.org/about/methodology.htm.

Population

In contrast to the surveys of 2002 and 2003, the 2005 survey considered only **companies that used computers**. Thus, the highest level of the population was the set of all computer-using enterprises which were active within the national territory of one of the 7 countries covered, and which had their primary business activity in one of the 10 sectors specified on the basis of NACE Rev. 1.1 categories.

Evidence from previous surveys shows that this does not make a noticeable difference for medium-sized and large firms, as the share of firms that use computers can be expected to be 99% or more in all sectors and countries covered. Differences are relevant, however, for micro and small enterprises, in particular in the food and beverages industry, the textile industry, construction and tourism. In these four sectors, 10-30% of micro enterprises and 4-15% of small firms (depending on the country and sector) do not use a computer.[68] Therefore it makes a difference if a figure represents a percentage of "all companies" (as in 2003) or a percentage of "companies using computers" (as in 2005). Differences are much less pronounced, though, when figures have been weighted by employment.

The 10 sectors that have been selected for the 2005 survey are extremely heterogeneous in terms of their size. Construction is by far the largest with about 2.3 million enterprises in the EU-25. At the other end of the range are the aerospace and pharmaceutical industries with only about 2,200 and 3,900 firms respectively in the EU-25. This is a factor of about 100 between the largest and smallest sector. This imbalance has clearly implications for the achievement of survey quota and the impact of weighting on sector data and on aggregate results.

[67] These seven countries are frequently referred to as the "EU-7" in this report. They account for roughly 75% of the EU-25 population and GDP.

[68] Non-computer users include typically small craft firms (textile, construction), bars, restaurants or pensions (in tourism), and small food producing companies.

Table 1: Population coverage of the e-Business Survey (2005)

No.	NACE Rev. 1.1		Sector name (as used by *e-Business W@tch*)
	Section	Division / Group	
01	DA	15	Manufacture of food products and beverages
02	DB	17, 18	Manufacture of textiles (17), wearing apparel; dressing & dyeing of fur (18)
03	DE	22	Publishing, printing and reproduction of recorded media
04	DG	24.4, 24.5	Manufacture of pharmaceuticals (24.4), soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations (24.5)
05	DK	29.1 – 29.5	Manufacture of machinery and equipment (not included: Manufacture of weapons and ammunition, domestic appliances)
06	DM	34	Manufacture of motor vehicles, trailers and semi-trailers
07	DM	35.3	Manufacture of aircraft and spacecraft
08	F	45	Construction
09	H, I, O	55, 62.1, 63.3, 92.3+5	Tourism, including hotels and restaurants (55), parts of air transport (62), travel agencies and tour operators (63.3), and parts of recreational, cultural and sporting activities (92)
10	K	72	Computer and related activities

Sampling frame and method

No cut-off was made in terms of minimum size of firms. The sample drawn was a random sample of companies from the respective sector population in each of the seven countries, with the objective of fulfilling minimum strata with respect to company size class per country-sector cell. Strata were to include a 10% share of large companies (250+ employees), 30% of medium sized enterprises (50-249 employees), 25% of small enterprises (10-49 employees) and up to 35% of micro enterprises with less than 10 employees. Samples were drawn locally by fieldwork organisations based on widely recognized business directories and databases (see Table 2).

Table 2: Directories from which samples were drawn (2005)

Country		Directory / database
CZ	Czech Republic	Albertina Business Database (database of economic subjects with >1m entries)
DE	Germany	Heins und Partner Business Pool
ES	Spain	Dun & Bradstreet
FR	France	SIREN file from INSEE (the French National Statistics Institute)
IT	Italy	Dun & Bradstreet
PL	Poland	Kompass Polska
UK	United Kingdom	Dun & Bradstreet

The survey was carried out as an enterprise survey: data collection and reporting focus on the enterprise, defined as a business organisation (legal unit) with one or more establishments. In some of the sectors, target quota in the larger enterprise size-bands could not be accomplished in each of the countries. In these cases, interviews were shifted to the next largest size-band (from large to medium-sized, from medium-sized to small).

Fieldwork

Fieldwork was coordinated by the German branch of Ipsos GmbH (www.ipsos.de) and conducted in cooperation with its local partner organisations (see Table 3) on behalf of *e-Business W@tch*. Pilot interviews prior to the regular fieldwork were conducted with 12 companies in Germany in December 2004, in order to test the questionnaire (structure, comprehensibility of questions). The survey had a scope of 5,218 interviews, evenly spread across the seven countries covered. About 565 interviews per sector were conducted (see Table 4), except for the aeronautics and the pharmaceutical industry. Due to the small population of firms in these sectors, it was not possible to achieve the target quota. In the aerospace industry, only 163 company interviews could be realised in the seven countries covered. In this sector, practically the entire population of companies was contacted.

Table 3: Market research companies having conducted the fieldwork in the e-Business Survey 2005

Country		Fieldwork organisation
CZ	Czech Republic	Ipsos Czech Republic, Skolska 32/694, 110 00 Praha 1
DE	Germany	Ipsos GmbH, Papenkamp 2-6, 23879 Mölln
ES	Spain	Ipsos ECO Consulting, Avda. de Burgos, 12.-8[a], 28036 Madrid
FR	France	Ipsos Insight Marketing, 99, rue de l'Abbé Groult, 75739 Paris Cedex 15
IT	Italy	Demoskopea S.p.A., Via Salaria 290/ Via Rubicone 41, 00199 Rome
PL	Poland	Ipsos, ul. Pulawska 39, 02-508 Warsaw
UK	United Kingdom	Continental Research, 132-140 Goswell Road, EC1V 7DY London

Table 4: Number of interviews conducted by sector and country (2005)

Sector	CZ	DE	ES	FR	IT	PL	UK	TOTAL
Food and beverages	85	80	82	80	86	83	75	**571**
Textiles and clothing	85	76	81	80	81	83	75	**561**
Publishing and printing	84	80	82	80	79	83	75	**563**
Pharmaceutical industry	54	83	81	76	81	82	75	**532**
Machinery and equipment	85	80	81	77	84	83	75	**565**
Automotive industry	85	80	81	80	81	83	75	**565**
Aerospace industry	20	38	15	39	23	3	25	**163**
Construction	84	81	83	80	80	83	75	**566**
Tourism	84	80	82	80	82	83	76	**567**
Computer related services	84	80	82	78	82	84	75	**565**
TOTAL	**750**	**758**	**750**	**750**	**759**	**750**	**701**	**5218**

Table 5: Interview contact protocol: completion rates and non-response reasons (2005)

		CZ	DE	ES	FR	IT	PL	UK	Total
1	**Sample (gross)**	**2632**	**7247**	**8796**	**10123**	**5082**	**7825**	**13104**	**54809**
1.1	Telephone number does not exist	126	880	680	373	340	959	870	4228
1.2	Not a company (e.g. private household)	42	130	220	200	44	214	115	965
1.3	Fax machine / modem	40	56	10	0	359	248	116	829
1.4	Quota completed > address not used	191	361	3357	1623	351	1161	3856	10900
1.5	No target person in company	57	344	186	98	72	109	691	1557
1.6	Language problems	2	16	14	14	1	0	0	47
1.7	No answer on no. of employees	10	8	3	1	0	0	8	30
1.8	Company does not use computers	11	80	194	332	41	30	567	1255
	Sum 1.1 – 1.8	479	1875	4664	2641	1208	2721	6223	19811
2	**Sample (net)**	**2153**	**5372**	**4132**	**7482**	**3874**	**5104**	**6881**	**34998**
2.1	Nobody picks up phone	212	366	335	892	1080	1333	6	4224
2.2	Line busy, engaged	60	52	6	68	60	438	0	684
2.3	Answering machine	42	133	20	1208	79	137	463	2082
2.4	Contact person refuses (refusal at reception, switchboard)	472	931	2010	2024	755	1613	1695	9500
2.5	Target person refuses	388	2125	184	693	142	122	2591	6245
2.6	No appointment during fieldwork period	42	13	395	202	0	261	298	1211
2.7	Open appointment	77	935	363	1584	968	371	1008	5306
2.8	Target person is ill / not available	10	3	47	0	2	0	0	62
2.9	Interview abandoned	91	56	22	57	28	79	119	452
2.10	Interview error, cannot be used	9	0	0	4	1	0	0	14
	Sum 2.1 – 2.10	1403	4614	3382	6732	3115	4354	6180	29780
3	**Successful interviews**	**750**	**758**	**750**	**750**	**759**	**750**	**701**	**5218**
	Completion rate (= [3] / [2])	**34.8%**	**14.1%**	**18.2%**	**10.0%**	**19.6%**	**14.7%**	**10.2%**	**14.9%**
	Average interview time (min : sec)	**17:07**	**19:06**	**17:29**	**17:15**	**20:51**	**21:15**	**19:53**	**19:00**

Non response: In a voluntary telephone survey, in order to achieve the targeted interview totals, it is always necessary to contact more companies than just the number equal to the target. In addition to refusals, or eligible respondents being unavailable, any sample contains a proportion of "wrong" businesses (e.g., from another sector), and wrong and/or unobtainable telephone numbers. Table 5 shows the completion rate by country (completed interviews as percentage of contacts made) and reasons for non-completion of interviews. Higher refusal rates in some countries, sectors or size bands (especially among large businesses) inevitably raises questions about a possible refusal bias. That is, the possibility that respondents differ in their characteristics from those that refuse to participate. However, this effect cannot be avoided in any voluntary survey (be it telephone- or paper-based).

Feedback on the fieldwork

No major problems were reported from the fieldwork with respect to interviewing (comprehensibility of the questionnaire, logical structure). The overall feedback from the survey organisations was that fieldwork ran smoothly and that the questionnaire was well understood by most respondents. The main challenge was the fulfilment of the quotas, which was difficult or impossible in some of the sectors, in particular among the larger size-bands. Specific remarks from fieldwork organisations, however, point at some differences in the local situation (see Table 6).

Table 6: Comments by national fieldwork companies on their experience (2005)

Country		Comments
CZ	Czech Republic	• It was more difficult to complete interviews with very small companies. They were less willing to participate in an interview. • Respondents often felt that questions about a firm's profit or turnover are not adequate. The interviewers mentioned that these questions were several times a cause of abandoning the interview.
DE	Germany	• In total fieldwork ran smoothly and the questionnaire was easy to understand and interesting for most of respondents. • Answering the question about turnover as well as the investment on ICT was often problematic for the respondents and yielded a high proportion of non-replies. • Respondents of small companies often had difficulty in answering questions related to specific technical terms and application. In cases where they used only one or few computers, some questions (e.g. regarding networks) were not relevant for them. • Positive resonance comes from the respondents when they know that the survey is being done on behalf of the European Commission. The reference to the website at the end of the interview was welcome and helpful.
ES	Spain	• Interviews in very small companies were more difficult to complete due to the lack of knowledge about ICT. On the other hand, the participation of respondents in big companies was difficult to achieve. • Generally the questionnaire was easy to understand. • About a quarter of the firms contacted have subcontracted most of their ICT tasks, which made it difficult for the respondents to answer specific technical questions. • Questions regarding the turnover and investments were difficult to answer for the respondents and yielded a high proportion of don't know responses. This is also often experienced in other B2B surveys.
FR	France	• Small companies often do not have much ICT equipment. Respondents therefore sometimes had difficulty in answering some of the questions, since the questionnaire was not adapted to these companies. Small companies often answered "don't know" to more detailed questions. • Respondents from larger companies had difficulty answering questions concerning turnover, benefits and other financial issues. These questions would be better put to somebody from the financial department. • As more and more companies outsource their IT department, it is difficult to identify a responsible person within the company to answer the questions.

IT	Italy	• The questionnaire was considered long, but quite easy to answer. • However, a few sections (mainly D and E) were considered more complicated than others. In particular technical terms that referred to security and to online services were difficult to understand. • Interviews were carried out without any problems in medium-sized enterprises where it is easier to identify and contact an IT manager. Those respondents had the best grasp of what was being talked about in the interview. • The financial questions were difficult to answer for most of the respondents, especially the question on ICT investments.
PL	Poland	• Respondents from small companies often had difficulties in answering questions related to specific technical applications. • Companies are quite reluctant to provide financial information, so respondents often answer DK to the financial questions. • In many companies, IT people are not allowed to say anything about internal matters of the company. • Many companies outsource their IT department and its activities.
UK	United Kingdom	• As with previous surveys carried out in the context of the *e-Business W@tch* programme, fieldwork ran relatively smoothly. • However, the anticipated strike-rate was severely affected by the substantial length of the interview (20 minutes). • Gathering turnover and investment details again yielded a high proportion of don't know responses. • As a final point, it is becoming increasingly difficult to secure interviews with IT/DP professionals, and we suspect that this situation will only worsen in the future.

Weighting schemes

Due to stratified sampling, the sample size in each size-band is not proportional to the population numbers. If proportional allocation had been used, the sample sizes in the 250+ size-band would have been extremely small, not allowing any reasonable presentation of results. Thus, weighting is required so that results adequately reflect the structure and distribution of enterprises in the population of the respective sector or geographic area. *e-Business W@tch* applies two different weighting schemes: weighting by employment and by the number of enterprises.[69]

- Weighting by employment: Values that are reported as employment-weighted figures should be read as "enterprises comprising x% of employees" (in the respective sector or country). The reason for using employment weighting is that there are many more micro-enterprises than any other firms. If the weights did not take into account the economic importance of businesses of different sizes in some way, the results would be dominated by the percentages observed in the micro size-band.
- Weighting by the number of enterprises: Values that are reported as "x% of enterprises" show the share of firms irrespective of their size, i.e. a micro-company with a few employees and a large company with thousands of employees both count equally.

The use of filter questions in interviews

In the interviews, not all questions were asked to all companies. The use of filter questions is a common method in standardised questionnaire surveys to make the interview more efficient. For example, questions on the type of Internet access used were only asked to those companies that had replied to have Internet access. Thus, the question whether a company has Internet access or not serves as a filter for follow-up questions.

[69] In the tables of this report, data are normally presented in both ways, except for data by size-bands. These are shown in % of firms within a size-band, where employment-weighting is implicit.

The results for filtered questions can be computed on the base of only those enterprises that were actually asked the question (e.g. "in % of enterprises with Internet access"), but can also be computed on the base of "all companies". In this report, both methods are used, depending on the indicator. The base (as specified in footnotes of tables and charts) is therefore not necessarily identical to the set of companies that were actually asked the underlying question.

Statistical accuracy of the survey: confidence intervals

Statistics vary in their accuracy, depending on the kind of data and sources. A "confidence interval" is a measure that helps to assess the accuracy that can be expected from data. The confidence interval is the estimated range of values on a certain level of significance. Confidence intervals for estimates of a population fraction (percentages) depend on the sample size, the probability of error, and the survey result (value of the percentage) itself. Further to this, variance of the weighting factors has negative effects on confidence intervals.

Table 7 gives some indication about the level of accuracy that can be expected for industry totals (EU7 totals based on all respondents) depending on the weighting scheme applied. For totals of all-sectors, an accuracy of +/- 2 percentage points can be expected for most values that are expressed as "% of firms", and of +/- 3 percentage points for values that are weighted by employment. The confidence interval for industry totals (EU-7) is about +/- 5 percentage points (in both weighting schemes). Employment-weighted results for the pharmaceutical, the automotive and the aeronautics industry have higher confidence intervals, because these sectors are more sensitive to weights due to their structure (i.e. the dominance of large firms in a comparatively small population). In the aeronautics industry, employment-weighted figures should not be used.

The calculation of confidence intervals is based on the assumption of (quasi-) infinite population universes. In practice, however, in some industries and in some countries the complete population of businesses consists of only several hundred or even a few dozen of enterprises. In some cases, literally each and every enterprise within a country-industry and size-band cell was contacted and asked to participate in the survey. This means that it is practically impossible to achieve a higher confidence interval through representative enterprise surveys in which participation is not obligatory. This should be borne in mind when comparing the confidence intervals of *e-Business W@tch* surveys to those commonly found in general population surveys.

Table 7: Confidence intervals for all-sector and sector totals (EU-7)

		Confidence interval		
	Survey result	Weighted by employment	Weighted as "% of firms"	Unweighted
All sectors (aggregate), EU-7	**10%**	**8.1% - 12.2%**	**8.7% - 11.5%**	**9.3% - 10.7%**
Food and beverages	10%	7.2% - 13.8%	6.9% - 14.3%	8.1% - 12.3%
Textile industries	10%	7.4% - 13.3%	6.9% - 14.3%	8.1% - 12.3%
Publishing and printing	10%	7.2% - 13.7%	7.2% - 13.8%	8.1% - 12.3%
Manufacture of pharmaceuticals	10%	5.3% - 18.0%	7.5% - 13.1%	8.1% - 12.4%
Manufacture of machinery and equipment	10%	6.5% - 15.1%	7.1% - 13.9%	8.1% - 12.3%
Automotive industry	10%	4.6% - 20.2%	7.7% - 12.8%	8.1% - 12.3%
Aerospace industry	10%	1.7% - 41.3%	5.7% - 16.9%	6.8% - 14.6%
Construction	10%	7.7% - 12.8%	7.0% - 14.1%	8.1% - 12.3%
Tourism	10%	7.2% - 13.8%	6.9% - 14.3%	8.1% - 12.3%
IT services	10%	7.3% - 13.6%	6.5% - 15.2%	8.1% - 12.3%
All sectors (aggregate), EU-7	**30%**	**27.0% - 33.2%**	**27.9% - 32.2%**	**29.0% - 31.1%**
Food and beverages	30%	25.2% - 35.2%	24.7% - 35.9%	26.9% - 33.3%
Textile industries	30%	25.7% - 34.6%	24.7% - 35.8%	26.9% - 33.3%
Publishing and printing	30%	25.3% - 35.1%	25.3% - 35.2%	26.9% - 33.3%
Manufacture of pharmaceuticals	30%	21.5% - 40.2%	25.9% - 34.4%	26.8% - 33.4%
Manufacture of machinery and equipment	30%	23.9% - 36.9%	25.1% - 35.4%	26.9% - 33.3%
Automotive industry	30%	19.9% - 42.6%	26.3% - 34.0%	26.9% - 33.3%
Aerospace industry	30%	10.5% - 61.0%	22.3% - 39.0%	24.4% - 36.2%
Construction	30%	26.3% - 34.0%	24.9% - 35.7%	26.9% - 33.3%
Tourism	30%	25.2% - 35.2%	24.7% - 35.9%	26.9% - 33.3%
IT services	30%	25.5% - 35.0%	23.9% - 36.9%	26.9% - 33.3%
All sectors (aggregate), EU-7	**50%**	**46.6% - 53.4%**	**47.7% - 52.3%**	**48.9% - 51.1%**
Food and beverages	50%	44.6% - 55.4%	43.9% - 56.1%	46.6% - 53.4%
Textile industries	50%	45.2% - 54.8%	44.0% - 56.0%	46.5% - 53.5%
Publishing and printing	50%	44.7% - 55.3%	44.6% - 55.4%	46.5% - 53.5%
Manufacture of pharmaceuticals	50%	39.8% - 60.2%	45.4% - 54.6%	46.4% - 53.6%
Manufacture of machinery and equipment	50%	42.9% - 57.1%	44.4% - 55.6%	46.5% - 53.5%
Automotive industry	50%	37.7% - 62.3%	45.8% - 54.2%	46.5% - 53.5%
Aerospace industry	50%	23.2% - 76.8%	40.9% - 59.1%	43.6% - 56.4%
Construction	50%	45.8% - 54.2%	44.1% - 55.9%	46.5% - 53.5%
Tourism	50%	44.5% - 55.5%	43.9% - 56.1%	46.5% - 53.5%
IT services	50%	44.8% - 55.2%	42.9% - 57.1%	46.5% - 53.5%
All sectors (aggregate), EU-7	**70%**	**66.8% - 73.0%**	**67.8% - 72.1%**	**68.9% - 71.0%**
Food and beverages	70%	64.8% - 74.8%	64.1% - 75.3%	66.7% - 73.1%
Textile industries	70%	65.4% - 74.3%	64.2% - 75.3%	66.7% - 73.1%
Publishing and printing	70%	64.9% - 74.7%	64.8% - 74.7%	66.7% - 73.1%
Manufacture of pharmaceuticals	70%	59.8% - 78.5%	65.6% - 74.1%	66.6% - 73.2%
Manufacture of machinery and equipment	70%	63.1% - 76.1%	64.6% - 74.9%	66.7% - 73.1%
Automotive industry	70%	57.4% - 80.1%	66.0% - 73.7%	66.7% - 73.1%
Aerospace industry	70%	39.0% - 89.5%	61.0% - 77.7%	63.8% - 75.6%
Construction	70%	66.0% - 73.7%	64.3% - 75.1%	66.7% - 73.1%
Tourism	70%	64.8% - 74.8%	64.1% - 75.3%	66.7% - 73.1%
IT services	70%	65.0% - 74.5%	63.1% - 76.1%	66.7% - 73.1%
All sectors (aggregate), EU-7	**90%**	**87.8% - 91.9%**	**88.5% - 91.3%**	**89.3% - 90.7%**
Food and beverages	90%	86.2% - 92.8%	85.7% - 93.1%	87.7% - 91.9%
Textile industries	90%	86.7% - 92.6%	85.7% - 93.1%	87.7% - 91.9%
Publishing and printing	90%	86.3% - 92.8%	86.2% - 92.8%	87.7% - 91.9%
Manufacture of pharmaceuticals	90%	82.0% - 94.7%	86.9% - 92.5%	87.6% - 91.9%
Manufacture of machinery and equipment	90%	84.9% - 93.5%	86.1% - 92.9%	87.7% - 91.9%
Automotive industry	90%	79.8% - 95.4%	87.2% - 92.3%	87.7% - 91.9%
Aerospace industry	90%	58.7% - 98.3%	83.1% - 94.3%	85.4% - 93.2%
Construction	90%	87.2% - 92.3%	85.9% - 93.0%	87.7% - 91.9%
Tourism	90%	86.2% - 92.8%	85.7% - 93.1%	87.7% - 91.9%
IT services	90%	86.4% - 92.7%	84.8% - 93.5%	87.7% - 91.9%

confidence intervals at α=.90

Annex II: The e-Business Scoreboard 2005

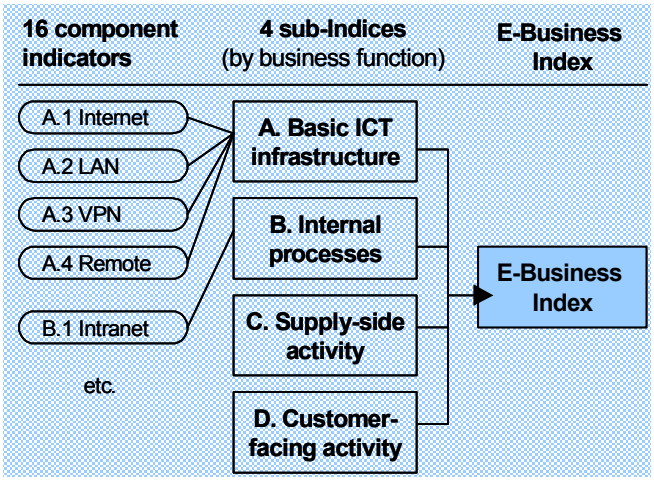
Introduction

The e-Business Scoreboard approach was developed by the *e-Business W@tch* in 2004. It is an instrument to compare and visualize the intensity of e-business activity across different sectors, countries or size-bands, in different areas of business activity. Conceptually, the Scoreboard owes to the Balanced Scorecard (BSC) approach, which suggests that an organisation should be viewed from four perspectives, and that metrics (and targets) are to be defined for each perspective. Similarly, the e-Business Scoreboard looks at ICT use by enterprises from four (inter-related) perspectives. Component indicators represent the metrics for these perspectives.

The Scoreboard is composed of component indicators which are taken from the e-Business Survey 2005 by the *e-Business W@tch*. These indicators can be aggregated on two levels:

- 16 component indicators are, in a first step, aggregated into four sub-indices that represent major application areas of e-business. The diamond charts on the following pages show these four dimensions of e-business activity.
- The four sub-indices can then be aggregated into the (overall) e-Business Index.

Structure of the e-Business Scoreboard



The E-Business Scoreboard takes into account the percentages (diffusion rates) from all sectors and show how a specific sector differs from the all-sector-average. An index value is based on mean values and standard deviations.[70] Thus, index values express the multiple of the standard deviation (1 or (-1)) for a specific sector and the selected indicator. 0 equals the mean value for all sectors.

Indexes simplify multi-dimensional concepts. To correctly assess the validity and shortcomings of the Scoreboard and its e-Business Index, the following notes are important to be taken into account:

- **Weighting**: Results are influenced by the selection of the underlying weighting scheme. In the computation presented in this chapter, employment-weighted figures were used. This emphasizes e-business activity in large firms and has an impact on the Index for sectors with dominant large players (for instance the automotive and pharmaceutical industry).
- **Component indicators**: The selection of component indicators may have a bias towards manufacturing activities, as some indicators in dimension B ("internal process") are more relevant for manufacturing than for service sectors (e.g. ERP). The full list of component indicators and their definition is given in Annex II.
- **Relative comparison**: The e-Business Index and the Scoreboards do not represent absolute measures of e-business activity. The Scoreboard results depend on the respective set of sectors (or countries etc.) that are compared to each other, as figures are derived from computing standard deviations from the average of the respective set.

[70] Constituting values are z-values, i.e. z = (x - mean(x))/stddev(x). This procedure results in a distribution with mean(z)=0 and stddev(z)=1.

Component indicators of the Scoreboard 2005

A. ICT infrastructure and basic connectivity		
A.1	Enterprises connecting computers with a **LAN**	= the percentage of employees from a sector working in enterprises that have connected computers with a Local Area Network (LAN).
A.2	**Internet** connectivity	= the percentage of employees working in enterprises that are connected to the internet, with a supplementary indicator for the type of internet connection in terms of bandwidth. The percentage of employees working in enterprises that are connected with a bandwidth of less than 2 Mbit/s is computed with a factor of 0.5, enterprises connected with at least 2 Mbit/s bandwidth with a factor of 1.0. The maximum value of 100 would be returned if all employees from a sector work in enterprises connected to the internet with more than 2 Mbit/s bandwidth.
A.3	**Remote access** to the company network	= the percentage of employees from a sector working in enterprises where it is possible to access data from the company's computer system from a remote location.
A.4	Enterprises with a **VPN**	= the percentage of employees from a sector working in enterprises that use a Virtual Private Network (VPN)
B. Internal business process automation		
B.1	Use of an **intranet**	= the percentage of employees working in enterprises that use an intranet.
B.2	Use of online technology to **track** working hours and/or production time	= the percentage of employees working in enterprises that use online technologies (other than e-mail) to track working hours and/or production times
B.3	Use of **EDM** systems	= the percentage of employees working in enterprises that use an Enterprise Document Management system
B.4	Use of **ERP** systems	= the percentage of employees working in enterprises that have implemented an ERP (enterprise resource planning) system
C. Procurement and supply chain integration		
C.1	Enterprises **purchasing** at least 5% of their supplies online	= the percentage of employees working in enterprises saying that they purchase at least 5% of their supplies online via the internet or other computer-mediated networks (for example via EDI based connections to their suppliers)
C.2	Use of **specific IT** solutions for e-procurement	= the percentage of employees working in enterprises that use specific IT solutions to support the selection of their suppliers and/or procurement processes
C.3	Use of **SCM** systems	= the percentage of employees working in enterprises that use an SCM (supply chain management) system
C.4	Online management of **capacity and inventory**	= the percentage of employees working in enterprises that that use technologies to manage capacity and inventory online
D. Marketing and sales processes		
D.1	Enterprises maintaining a web-site with a **CMS**	= the percentage of employees working in enterprises that have a website and use a content management system to maintain and update the website
D.2	Use of **CRM** software systems	= the percentage of employees working in enterprises that use a CRM (customer relationship management) software to organise data about their customers electronically
D.3	Enterprises **selling** at least 5% of their goods & services online	= the percentage of employees working in enterprises saying that online sales via the internet or other online networks (for example via an extranet) constitute at least 5% of their total sales volume
D.4	Use of **specific IT** solutions for marketing and sales processes	= the percentage of employees working in enterprises that uses specific IT solutions to support marketing and sales processes

Results: sectors in comparison

The e-Business Scoreboards visualize that the nature and impact of electronic business differs widely between sectors, particularly between manufacturing and service sectors. There are several underlying reasons; for example, the nature of e-business activities depends on whether the focus is on B2B or B2C.

Manufacturing

- Among the 7 manufacturing sectors surveyed, electronic business activity has reached the highest level of intensity in the **automotive**, **pharmaceutical** and **aeronautics** industries. The rapid development in these sectors is mostly driven by the large international companies. Supply-chain integration and the streamlining of procurement processes are common objectives in these industries for which e-business solutions are attractive. In the **machinery and equipment** industry, electronic business activity has not yet reached the same level of intensity. At first sight, this confirms the findings of the Survey 2003. However, developments in this sector have been quite dynamic since then. For example, e-business is increasingly recognized as a useful means of providing customer service.
- The **publishing and printing** industry has a different e-business profile, as major segments of this sector operate in B2C markets. ICT has a considerable impact on production and internal work processes. Furthermore, customer-facing activities (online publishing, marketing, advertising) are critical. On the other hand, processes with a high e-business potential such as inventory and supply-chain-management are less critical in this sector.
- The **food and beverages** sector, and the **textile and clothing** industry, are late adopters of ICT compared to the other manufacturing sectors studied. However, in the food and beverages industry, there are signs of increasing e-business activity, mainly in response to structural changes and new requirements. Important issues that promote e-business are food safety and the digital integration of the value chain. RFID (Radio Frequency Identification) based technologies could play an important role in these areas.

Construction

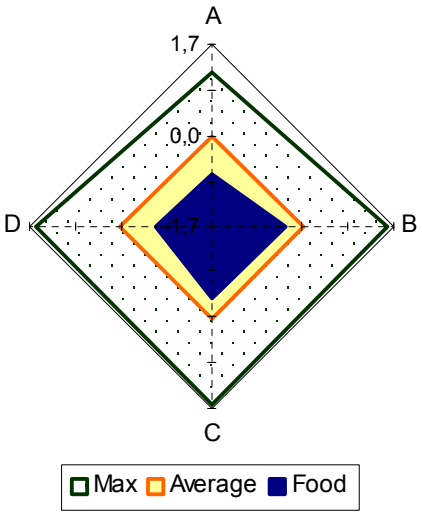
- ICT adoption and e-business activity in construction companies appears to be very limited compared to most manufacturing sectors. The structure of the industry, which includes many small craft companies, cannot fully explain this gap. An industry with a multitude of standards, technical specifications, labels, and certification marks is not an optimal forum for drawing benefits from electronic business. However, e-business tools have the potential to benefit complex construction projects where there is a need to coordinate a large number of sub-contractors.

Service sectors

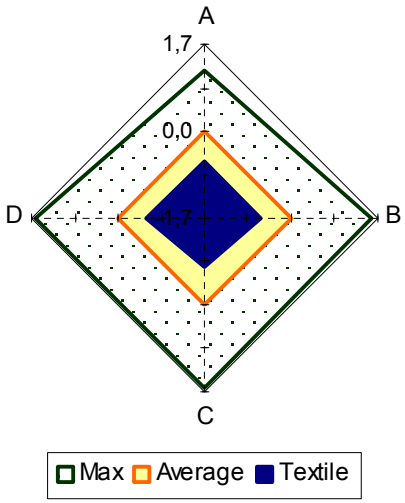
- The **computer related services** sector is a special case with regard to e-business. Although companies in this sector have Information Technology and e-business as their end product, ICT also plays a significant role in the way that this product is produced, promoted and provided. This specific way of using ICT distinguishes the IT services industry from the other sectors analysed by the *e-Business W@tch*. Here, in this sector the use of ICT and the production of related services are difficult to separate from each other.
- The IT services sector shares a common feature with **tourism**: in both industries, online channels have become key tools for marketing, communication and interaction with customers. In tourism, online booking and reservation services have been widely accepted among consumers and business travellers, and "e-tourism" has truly taken off. However, the great importance of ICT in this sector is not properly reflected in the e-Business Index. The main reason is that e-business normally does not have the same significance in supply-side activities and internal work processes (for example in hotels), as in manufacturing sectors.

e-Business Scoreboards for 10 sectors (2005)

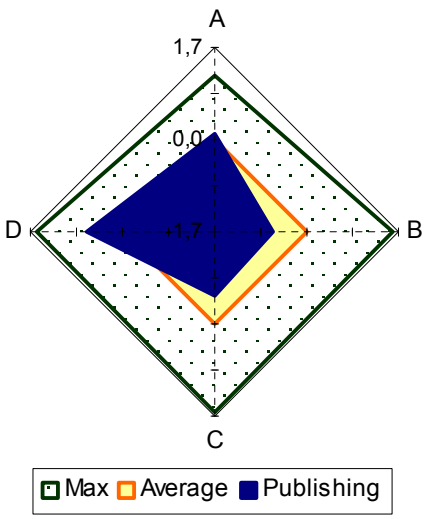
Food and beverages



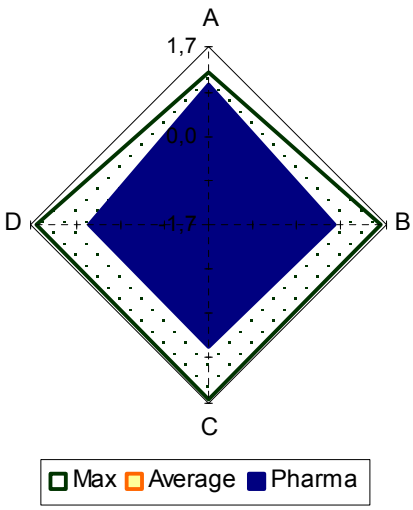
Textile and clothing industry



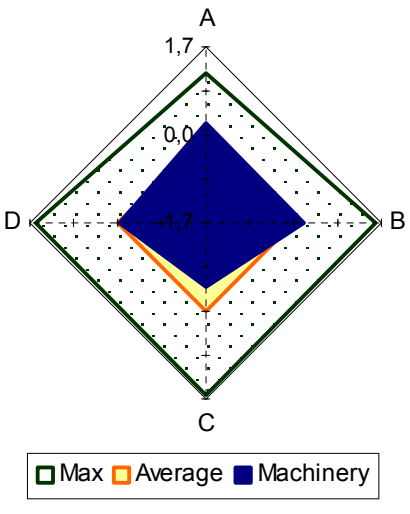
Publishing and printing



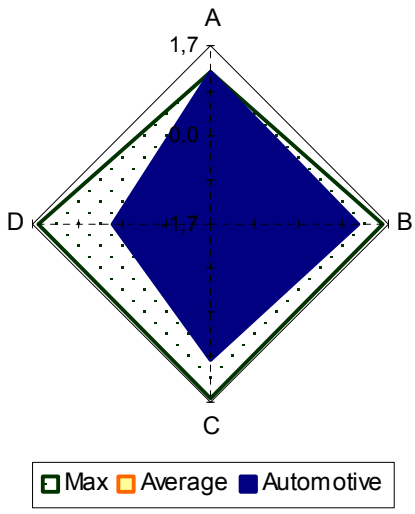
Pharmaceutical industry

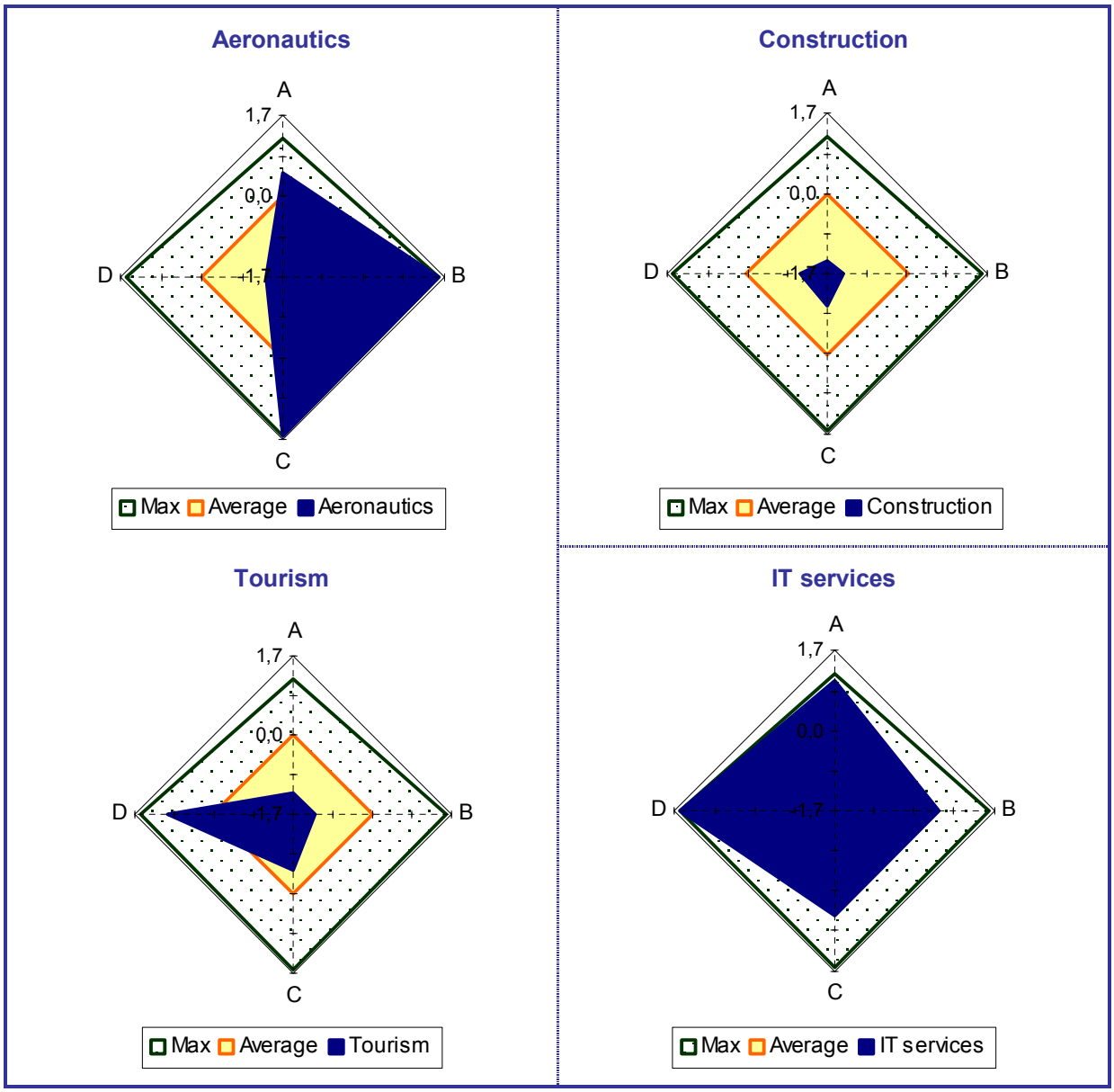


Machinery and equipment



Automotive industry



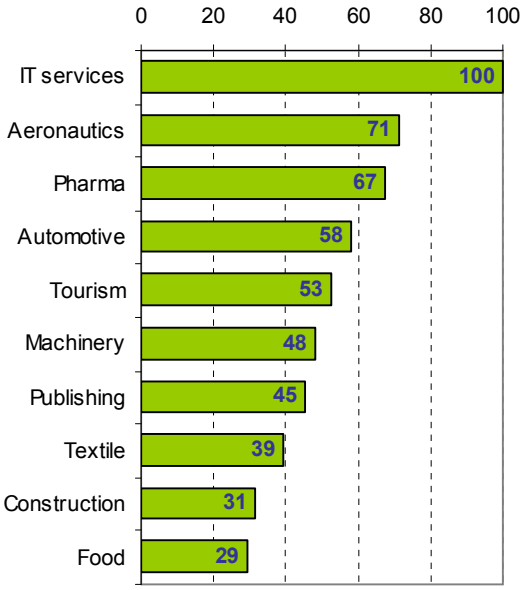


Source: *e-Business W@tch* (e-Business Survey 2005)

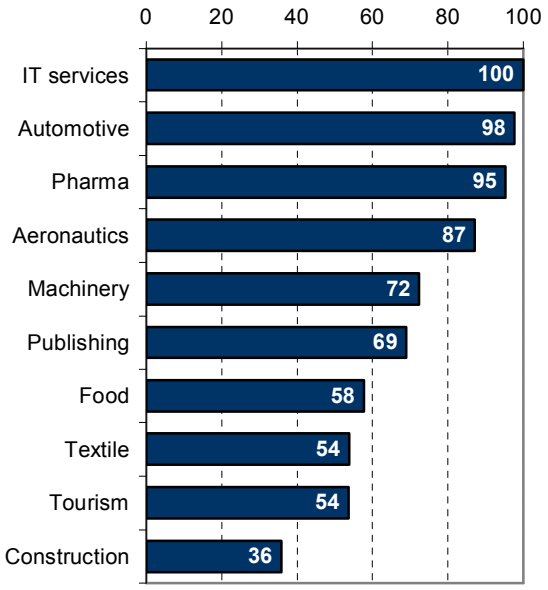
e-Business Index for 10 sectors (2005)

(Compound Index of 16 component indicators)

Benchmark based on **firm-weighted data** [1)]
(indexed values: highest score = 100)



Benchmark based on **employment-weighted data** [2)]
(indexed values: highest score = 100)



1) **Firm-weighted** data express e-business adoption as "*% of firms in a sector with a certain activity*", irrespective of the size of the companies (i.e. small companies and large ones count equally). Results are mainly determined by the situation in small firms, as there are many more small companies than large ones in the population of enterprises.

2) **Employment-weighted** data express e-business adoption as *"activity in firms comprising …% of employment in a sector*", thus emphasising the situation in larger companies.