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Networked Organisations – Research into Standards and Standardisation

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Executive Summary

The deliverable provides an integrated view on the demand and supply side, respectively, of standards for e-business and e-government. It sets out by arguing that any distinction between 'ICT infrastructure' and 'e-business/e-government applications' is more or less artificial, as the boundaries between them are changing over time, moving 'upwards' that is, increasingly applications are becoming part of the 'infrastructure'. Moreover, e-business would not function without an underlying infrastructure.

A taxonomy of e-business standards provides a foundation for understanding the business models of organisations involved in standardisation. The *function* of the standard is determined by the identified need, but within the processes and organisations developing the standard there are choices relating to e.g., *compliance, compatibility* and *intellectual property*. A company's strategy for *intellectual property* will have a major influence on its choice of arena in which the standards are to be developed. Standards where participants can see strategic commercial benefits or high costs of maintenance will lead instigators towards licensing. On the other hand, standards which will gain from wide acceptance and low maintenance costs will lead them to bodies such as W3C and OASIS. The business models of actors will influence their *compatibility* decisions. Business models, the standard's function and the choice of SDO will also influence the process for assessing compliance.

Very little efforts a dedicated towards government standards. In particular, there is currently no coherent approach visible towards standardisation for e-government. While in some respect the characteristics of e-government standards resemble those of service standards, there are marked differences as well.

Analysing the demand for e-government and e-business standards we find that the rather complex, multi-level organisational structure of governmental organisations and the resulting need for interoperability of internal processes are the most important driving forces for the development of common standards. The resulting pressure is further re-enforced by several initiatives at the European level either via the publication of framework directives or relevant CEN workshop agreements. Also, the cost efficiency argument is also a driving force to implement standard-based e-procurement systems, which increase the market power of governmental organisations in relation to the suppliers of goods and services.

So far, most such initiatives have focussed on internal interoperability, and is making good progress. Yet, the use of standards specifically to improve the communication between governmental organisations and citizens – the major aspect that sets e-government apart from e-business – is emerging only slowly. The restricted demand for this kind of standards and the reluctance to implement them can be explained by the monopoly of governmental organisations to provide certain services. This special constellation also explains the rather limited number of standardisation activities being launched this context. Yet, specific standardisation efforts driven or even funded by governmental organisations are required in order to satisfy e-governments special requirements.

E-business standards are already very important, especially in the ICT related manufacturing and service sectors. Here, highest importance is assigned to standards

enabling the structured exchange of data.. Reluctance to implement XML based standards is going to decrease as applications of these standards are more and more promising. Finally, there is a strong need for service companies active in e-commerce to develop and implement standards to improve the crucial relationships to their customers. This is a major challenge for future standardisation activities.

A close relation may be identified between standardisation and business models. This relation also links the supply side for standards with the demand side. Both the standardisation arena and the business modelling arena can be modelled as triangles, where three groupings of stakeholders, which may or may not be identical in both arenas. It turns out that business models are a useful device to characterise the complexity of the standardisation environment – which for most stakeholders is closely connected to the procurement and deployment of ICT in commercial or public service contexts.

These deliberations on the relation between standardisation, business modelling, and the stakeholders involved in the processes lead to the development of a business modelling framework. Applying this framework to the case of 'broadband service platforms (fixed and mobile)', and determining the value proposition for broadband service platforms shows that the originally static roles of 'Originator', 'Intermediary', and 'User' are becoming increasingly dynamic, with each stakeholder group potentially acting in each role. These dynamics are further elaborated upon.

Not unlike the business model approach a taxonomy of standards setting bodies necessarily links the supply and demand sides – such a taxonomy of what establishes the supply side for standards is of little value if the needs of the demand side are not taken into account. The fact that dynamic aspects of the standards setting environment need to be taken into account when analysing SSBs is another similarity to the business model approach. Rather than classifying the demand side according to the traditional 'vendor' – 'user' dichotomy a more dynamic approach is used, based on the roles a representative of the demand side assumes in the standards setting process, i.e., 'Leader', 'Adopter', or 'Observer'. This role may be determined, for instance, by the company's respective business model, or the underlying strategy. Obviously, the role also determines the requirements an SSB has to meet in order to be selected for a standards setting initiative.

Accordingly, in order to enable a matching of the requirements onto the characteristics of an SSB, the common distinction between 'formal SDO' – 'informal industry consortium' is abandoned. Rather, a set of attributes of the form <type | value> is used to describe an SSB. The attributes fall into the four categories 'General', 'Membership', 'Standards setting process', and 'Output'. Depending on the role the individual companies assume, the preferred attribute values will differ. These dynamic and flexible descriptions not only represent a simple means for determining the most suitable SSB for a given standardisation initiative. They also a provide first tool to estimate the success of the ensuing standard.

Two aspects which are of particular interest in the context of the ongoing discussion about the European standardisation systems are also addressed. These include the definition of what exactly establishes an 'open standard' and a discussion of the pros and cons of the new deliverables recently introduced by several SDO. With respect to the former several existing definitions are analysed, and their respective strengths and – particularly – weaknesses are identified. In particular, the definition given in

the IDABC European Interoperability Framework document is criticised and, in fact, considered unsuitable, for several reasons[1]. The required characteristics of an open standard are particularly relevant as public procurement in the ICT/e-business/e-government domain is increasingly requiring the use of 'open standards'. They may also be of relevance to policy making, as standards are referenced in Directives.

Likewise, the ESOs' deliverables have considerable relevance to policy making. Here again, the distinction between SDOs, whose standards are policy relevant, and consortia, whose standards are not, needs to be overcome. The processes of several larger consortia (notably W3C and OASIS, but others as well) increasingly resemble those of the ESOs. In particular, the processes leading to the ESOs' New Deliverables (most notably, CEN Workshop Agreements, CWAs) require a lower level of consensus than many consortium standards.

Against this background of SDOs vs consortia the impact a standard's origin has on its success in the market is analysed. A questionnaire was sent to a number of recipients from universities, industry, SSBs, contract research organisations, user associations, consultants, and regulators. Overall, it becomes very obvious that neither the selection of a standard for implementation, nor the preference for a specific SSB is influenced by its respective origin, t least not in the sense of 'SDO vs consortium'. What does have an impact, though,. are several of the originating SSB's characteristics. Here, considerable importance is assigned to the processes adopted by an SSB., where IPR aspects seem to play the most important role. More generally, an SSB's characteristics need to be compatible with a company's strategy and its business model. Accordingly, preferences typically depend on the characteristics of the individual case; there's hardly any general 'SSB of choice'. Obviously, SDOs may enjoy a competitive advantage in cases where regulatory requirements still call for 'formal' standards.

[1] Including the fact that none of the ESOs or other SDOs would produce 'open standards' under this definition.

1 Motivation and Background

1.1 Introduction

Analyses of ICT standardisation commonly focus on either demand or supply-side phenomena. Based more on disciplinary interests, most frequently economics, than the current concerns of industry, studies tend to focus on either the initiation and elaboration of standards, or on conditions for their adoption and, much less often, their implementation. This report starts from the observation that this segmented focus significantly hampers the broader understanding of how standards interact with the networked organisations. The report therefore combines a study of supply and demand-side factors that affect the relevance and the quality of standards – and, thus, influence their impact – for networked organisations.

The market for electronic business solutions is vast and heterogeneous. E-business solutions have the potential both to affect the organisation of many existing markets but also have the scope to open up significant vistas for new economic activities. In this setting it is therefore clear that characteristics rooted in the changing 'user environments' can generate demand for standards, can shape their relevance, and can therefore condition their potential impacts[2]. It is equally clear that the way these standards are developed will affect their relevance and their ultimate impacts for existing markets as well as for emerging markets, perhaps unforeseen by the original sponsors of the individual standard.

In this context, the report addresses the dynamic between factors that condition demand and factors that condition the supply for standards. The ultimate aim is to provide the basis on which to better understand how e-business standards might be better articulated to the changing needs of networked organisations. The report is concerned with the interaction of standards with their environments[3]. At the heart of these dynamic processes are the Standards Setting Bodies (SSBs) which created as a manifestation of a collective recognition of a need for standards but then become the locus of the processes delivering the standards to meet that need. In the light of this interaction our focus is especially directed to the changing landscape of SSBs. including their ability to adapt to and influence these market environments.

1.2 Motivation

During the last 20 years, the business world has undergone significant changes. For some organisations, doing business globally has become critical to their survival, and others discover new opportunities by focusing their business in a local setting. In this process of change, ICT[4] plays a significant role both enabling and triggering the re-organisation of business activities. ICT became ubiquitous, invading all aspects of business domain.

[2] The No-Rest Deliverable D10 will provide 'Guidelines for tools for an integrated a-priori impact assessment of standards for networked organisations'.

[3] And therefore also links to D07 and D08, 'Report on the dynamics of standards and their implementations' and 'A framework for a heuristic model of the dynamic evolution of standards', respectively.

[4] Information and Communication Technologies.

The Internet has considerably accelerated the diffusion of inter-organisational networks, and has intensified the collaboration between organisations. Regardless of company size and type of business, today virtually all organisation's ICT systems are interconnected. In such an increasingly networked world, ICT and e-business standards aim to ensure interoperability between both different IT systems within and between organisations. As ICT-enabled collaboration has becomes a decisive tool in the struggle for competitive advantage, interoperability within and between organisations has become strategic necessity in all industries. To communicate and collaborate, interoperability is absolutely essential. However, seamless communication and integration of data and information is not possible in the absence of common standards – standards and the standardisation process have gained strategic significance.

Throughout the past twenty years there have been considerable changes in the world of standards setting. Until the mid 80s, standardisation was virtually exclusively dominated by the formal Standards Developing Organisations (SDOs) such as ISO and CEN. However, in the late 1980s the slow and highly bureaucratic processes that then characterised formal SDOs was seen as inadequate to deal with the challenges that resulted from the increasingly shorter life cycles of ICT products. As a result, the number private standards consortia saw a massive increase during the 1990s, when in less than a decade more than 140 ICT standards consortia were created.

The emergence of such a huge number of standard setting bodies (SSBs), often with overlapping coverage, caused a fragmentation of the market for standards development. This fragmentation raised the problem of how to co-ordinate the organisations involved in the process. The economic literature has modelled extensively the co-ordination strategies of the players, which represent alternative forms of standards setting (i.e. market versus committee based standardisation). However, as a result of the supply fragmentation, this also needs to consider the organisations' choice between competing standards setting bodies.

Also, the ICT sector is subdivided into different industry categories, each of which has specific needs and requirements. Consequently, sector-specific standards are being developed and used, thus further contributing to the fragmentation of the market.

The process of standardisation is an integral part of the world of networked organisations, and for the evolution of the Information Society in Europe. Addressing standardisation issues requires a multi-disciplinary research approach to fully understand the economic, social and technical aspects of the process.

1.3 An Integrated View of e-Business and the Underlying ICT Infrastructure

Traditionally, a distinction has been made between 'applications' on the one hand, and 'infrastructure' on the other. Specifically, a variation on this theme has been used in the e-business domain – 'e-business' and 'ICT'. However, we would argue that this distinction is becoming increasingly blurred, and indeed artificial. Accordingly, this section briefly outlines the project's motivation for not making this distinction, and why it was decided to do an integrated analysis.

1.3.1 E-Business applications

Reflecting the wider deployment of Web technologies since the mid-90s, the older term e-commerce[5] was frequently re-defined along the lines of "*commerce enabled by Internet technologies*" (Seddon, 1997). It refers to the use of Web technologies both within and outside the organisational borders (Riggins and Rhee, 1998), rather than the simple matter of buying and selling electronically. However, the distinction between e-commerce and e-business is extremely blurred; frequently, the terms are used interchangeably. Davydov (2000), for example, defines e-business as "*an all-encompassing concept of enabling the exchange of information and automation of commercial transactions over the Internet*"[6].

Today, e-business is seen as a significant part of the strategy of most companies in their pursuit of cost reduction, efficiency and better performance (Amor, 2000.; Morath, 2000; van der Mandele, 2000; van Hooft and Stegwee, 2001; Venkatraman, 2000). Specifically, it is supposed to "*enable business process efficiencies in all aspects of enterprise activities*". That is, e-business is one means of implementing business processes and thus, ultimately, business strategies.

Yet, e-business services are not provided by stand-alone artefacts. Rather, they are embedded in, and part of, a larger system, which also comprises the underlying ICT infrastructure. This is also reflected in the definition of e-business provided by Business W@tch[7]: "*E-business is ... about using technology to redefine your business. To succeed, you'll need an infrastructure flexible enough to absorb new technologies, maximize efficiency across your organization, and support business model changes*".

1.3.2 ICT infrastructure

Over the past decades, the definition of the term infrastructure has been adapted to the technological developments. In an analogy to, for example, the road network, POTS[8] represented the communication infrastructure, to be complemented by packet-switched networks such as the various national X.25 networks[9] in the seventies.

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[5] E-commerce may broadly be defined as '*Conducting business communications and transactions over networks and through computers'.*
e-Business W@tch gives the following definition of e-commerce*: "E-commerce refers to transactions between companies, private households and non-profit organisations (including government) via non proprietary networks that are established through an open standard setting process, and all activities needed to provide the necessary infrastructure to pursue these transactions."*

[6] Occasionally, confusion may still be still be observed regarding the relation between e-commerce and e-business. For example, Weilnhammer (2000) uses e-business to represent the B2B side of e-commerce, whereas Yen et al (2002) uses electronic business to refer to the B2C side of electronic commerce. Other studies use e-business as an all- encompassing term, also including the use of digital technologies to restructure business processes (DTI, 2003).

[7] DG Enterprise and Industry has established e-Business W@tch as a market observatory which monitors and analyses the deployment of ICT in different sectors of the European economy.

[8] Plain Old Telephone System.

[9] An associated definition would be: "*A network of interconnected computers and communications systems. Essential elements include wiring, fiber optics, radio, video and/or cellular broadcast signals*."
http://iet.ucdavis.edu/glossary/

As late as 1992, the RACE project PALACE produced a survey of the requirements of the RACE Application Pilots on a communication infrastructure. In this survey, 'infrastructure' still only covered on the bottom three layers of the OSI/RM[10].

Eventually, the idea of 'infrastructure' broadened. Hong & Landay (2001), along with many others[11], included 'Middleware' into their idea of an infrastructure. That is, 'infrastructure' comprised the full seven-layer OSI stack; a considerable extension from the original view. More specific, elements of a middleware – and thus of an infrastructure – include (Eertink & Demchenko, 2000):

- directories and public key infrastructure,
- fixed-mobile integration and QoS management,
- authorisation, access control, accounting & billing,
- content descriptions and multimedia communication,
- data management and data distribution in computational GRIDs,
- active networks.

Along similar lines, agent-based systems are now considered part of an infrastructure (see e.g., (Bellissard et al., 1999)).

More recently, approaches may be observed that also include services like SOAP[12], WSDL[13], and UDDI[14] in the infrastructure (see e.g., (Papazoglou, 2003), (Paolucci & Sycara, 2003). Web services are supposed to facilitate asynchronous communication between business processes by replacing proprietary interfaces and data formats with a standard web-messaging infrastructure.

1.3.3 Strategy, Applications, and ICT – Some Earlier Research

To quote Business W@tch once more: "*The use of ICT in business processes leads to e-business*[15]". In fact, in our view this sums up quite nicely the extremely close links that exist between the ICT infrastructure and e-business applications.

Going one step further, Venkatraman (1991) identified inter-relation between business strategy and corporate IT infrastructure. The categories he identified include

- 'independent' no relation between IT infrastructure and business strategy,
- 'reactive' strategy shapes infrastructure,
- 'interdependent' mutual shaping.

Recent research has extensively addressed the latter two categories, and the importance of adequate links between corporate ICT and e-business. For instance, Broadbent (1999) observe that "*... implementing process innovation requires an extensive*

[10] RACE Project PALACE 'Requirements of the RACE Application Pilot Projects on Network Infrastructure', Project Deliverable 3, 1992.

[11] Such as, e.g., Klingenstein, K. J. (1999).

[12] 'Simple Object Access Protocol'.

[13] 'Web Services Definition Language'.

[14] 'Universal Description, Discovery and Integration'.

[15] http://www.ebusiness-watch.org/index.php?option=content&task=view&id=55&Itemid=67.

set of infrastructure capabilities ...". Even earlier research on IT/business strategy alignment has shown positive linkages among competitive strategy, information technology, and performance (Peteraf, 1993). Along similar lines, Wieringa (2004) locates a corporate 'communication architecture' at both the 'software applications' and the 'business processes' layers.

Industry as well has realised the importance of an alignment, and interlinkage, of ICT infrastructure and business strategy. Britt (2002) notes that "*A corporation's technology strategy should no longer be subordinate – developed after the business strategy is complete. The corporate technology strategy is woven throughout the business strategy*".

1.3.4 ICT Infrastructure Impact on E-business – Some Examples

Figure 1 shows the different levels of process integration across the stack of standards-based, e-business-related services.

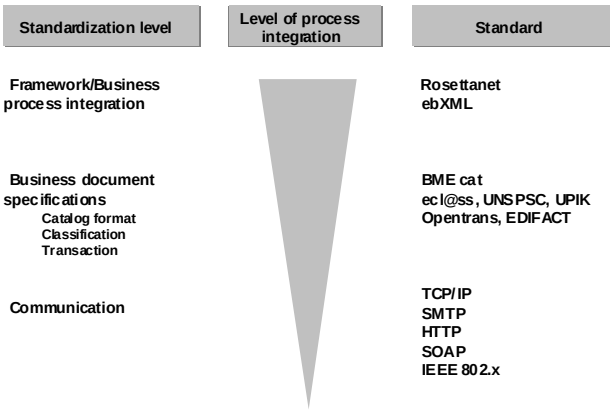

Figure 1: Taxonomy of e-business standards[16]

There are several prominent cases where those elements of the overall system that are frequently referred to as ICT infrastructure exert a significant influence on e-business and business processes.

This holds especially for issues of scalability of e-business applications, which are closely linked to the underlying infrastructure. Issues like latency, scheduling or scalability may have considerable impact to the e-business application performance (Oudshoorn, 2003). The same applies for clearly ICT-related technologies like Grid-computing, which have enabling effects, with potentially enormous implications, on e-business (Silva & Senger, 2004).

Generally, technical standards play a crucial role in shaping not only the future form of the technology (Williams et al, 1993) but also nature and functioning of the organisation and the relationships between organisations (Tapscot, 1995).

[16] Adapted from (Gerst, 2003).

Consequently, the infrastructure standards affect the way in which organisations interact and do business electronically.

For example, whereas the standards for the new RFID products would be 'communication' standards (in Figure 1), they are essential in enabling organisations such as, e.g., WalMart and US DoD (Department of Defense) to integrate their global supply chain. In fact, this integration was triggered by the increased availability and maturity of RFID tags and readers. Here, elements of the ICT infrastructure, and the standards upon which they are based, have been instrumental for the design and implementation of scalable e-business systems (Su et al, 2001).

Likewise, common network standards were critical to the success of the Cisco's 'global networked business model' (Kraemer and Dedrick, 2002.). This model was constructed based on the integration of all business relationships and the supporting communication within a 'networked fabric'. The global networked business model opened the corporate information infrastructure to all key constituencies, leveraging the network for competitive advantage (Castells, 2000). Infrastructure technology standards supported the creation of network that linked Cisco with its trading partners and was at the core of the Cisco e-business strategy.

Networks standards such as for wireless LANs (for example, the extension of the WirelessMAN Broadband Wireless Metropolitan Area Network Standard to support residential applications) affect the way in which business is conducted, hence shaping the evolution of e-business. The same holds for the role other standards for mobile communication enabled m-business.

This has also been recognised by major SDOs in the 'Memorandum of Understanding Concerning Standardization in the Field of Electronic Business' (IEC, 2000). In this context, a number of recommendations developed by ITU-T have been identified as being of relevance to e-business. In addition to higher-level recommendations addressing directory services and security aspects, these include, for example, end-system architecture and interfaces, as well as multimedia and mobile systems[17].

1.3.5 In Conclusion

1.3.5.1 Integration of standards for e-business and ICT

The discussion above suggests that not only standards relevant to business processes and applications (i.e., the top-levels depicted in Figure 1) have a direct impact on e-business. Rather, the same holds for the supporting technical standards at the lower levels of integration, the ICT infrastructure. Interoperability, which is key to e-business, can be – and in fact has to be – addressed at different layers. The standards of these three lower layers also determine the shape of e-business. Consequently, one has to take into account all layers of standards – including those from the 'classical' ICT sector.

Moreover, the notion of what exactly establishes an 'ICT infrastructure' changes; increasingly including higher layer protocols and services. In fact, this makes sense –

[17] See also http://www.itu.int/ITU-T/e-business/m3gii/index.html.

ICT and e-business both serve to enable business making. Drawing a line between these two at some point in the protocol and service stack – with e-business services located above the line and ICT infrastructure below – would necessarily be arbitrary and thus not make much sense.

Once more, a quote from e-Business W@tch nicely puts it in a nutshell: "*The adoption and use of Information and Communication Technologies (ICT) by companies, often referred to as e-business, is widely seen as an important factor to improve the competitiveness of the European economy*".

1.4 Organisation of the Report

The introductory remarks above serve to put the interrelationship between standards and the environments of their elaboration and use into perspective. Furthermore, we proposed that the separation of the supply and demand sides of standardisation is artificial and that these elements must be integrated into a single overarching perspective. This is due not least to the fact that in many cases the stakeholders who create the demand for standards are also actively involved in their supply. However, we also give an overview of the activities in, and the future demand on, e-business and e-government standardisation. The remainder of the report is organised so as to explore key elements of this problem in such a way as to provide a broader analytical framework for the interpretation of empirical findings and the development of scenarios to guide standardisation policy and strategy.

The task begins with a brief review of how the various types of standards that are used in an e-business and e-government context. Against this backdrop, the report goes on to consider the defining aspects of standards in the dynamic e-business environment. It starts by exploring at a high level of abstraction just how the basic features and functions of standards link them in general terms to the dynamics of user environments as expressed in terms of business models. Here the demand for standards is understood to emerge from a dynamic interaction between three basic stakeholder constituencies: producers, intermediaries, and users. The section takes account of relational, contextual, and motivational variables of these stakeholder groups to generate a set of hypotheses on the interrelationship between these dimensions of e-business organisations and the use of standards. The general framework is illustrated with reference to the example of how business models have evolved relative to the emergence of broadband service platforms.

The report then turns its attention to evolution in the supply side dimension of standards by examining how the types and functions of Standards Setting Bodies (SSBs) has been changing over the past 10-15 years. This standardisation landscape is discussed in terms of a market for standards, where market dynamics are evolving. General organisational traits of different types of bodies as well as a breakdown of functions in the standardisation process are elaborated. This section than considers the way a set of Standards Setting Bodies are organised and function. The question of credibility is especially raised as a factor that might influence the success in this market, as conceived in this way. Finally, implications for the other deliverables are drawn and conclusions made.

2 E-Business Standards and Business Models

2.1 Taxonomy of e-Business Standards

2.1.1 Taxonomy of Standards

As with all inter-organisational information technology, e-business and e-government depend upon standards. The two parties in any transaction are aligned within a complex web of standardisation. To take a banal example, governments increasingly encourage citizens to make their tax declarations on-line. The citizen goes to their PC connects to a government portal by broadband Internet connection, authenticates themselves and completes their tax return on-line. This simple transaction depends upon all the layers of Internet standardisation, including security, the government's standardisation of the citizen's identity and the standardisation and codification of the tax system, right down to the meaning of the term 'income'. Instead of speaking of a standard for electronic submission of tax returns, it is more accurate to see the electronic submission of tax forms as being at the centre of a web of standardisation. However, when thinking of the processes of supply and demand that led to this mesh of standardisation, it is apparent that not all of the standards used in this simple example are the same. The transaction depends upon standards which are generic, for example HTTP, but also on others specific to this context, for example the citizen's identity, their postcode and bank sort codes. Some standards used may be proprietary, whereas others are free for use. A second issue is that the transaction depends upon their being a physical transfer of data between the citizen's browser and the government's server, so standards are being used here, but the transaction does not require a specific standard: the tax return can be completed using ADSL broadband connections, GPRS mobile connections or WiFi connections. Increasingly, due to the building of applications on Internet standards, physical and transport layer standardisation is unproblematic in e-business except where the application uses novel physical interfaces, for example RFID. Even with RFID the focus of standardisation activities has moved away from the development of air interface standards, which are largely generic, into a multiplicity of standardisation activities to develop the standards for the data to be read to and from tags in specific use contexts.

In this report we want to link e-business and e-government standards to the supply and demand processes through which they emerge. In this section we shall develop a taxonomy allowing us to identify the contingencies shaping e-business standards. Even the most cursory survey of the burgeoning literature on standardisation shows that writers realise that all standards are not the same. One common distinction is between *de facto* standards, which have emerged through the market, and *de jure* standards, which have been ratified by some legitimate body. The classification of standards as *de jure* and *de facto* is a classification of the processes that developed the standards rather than a classification of the standards themselves.

More usefully David (1987) proposed a three level taxonomy of the function of standards: *reference standards*, *similarity standards* and *compatibility standards.*

- Reference Standards: standards for units and definition;

- Similarity Standards: standards for minimum acceptable attributes;
- Compatibility Standards: standards for interfaces allowing interoperation.

In the study of IT standardisation the vast majority of effort has been expended on the analysis of the emergence of compatibility standards. It is unclear why this etiquette layer is not simply a manifestation of more sophisticated compatibility standards.

In David's model the complex specification of choreographed interactions between trading partners is simply a complex compatibility standard, but in negotiating these standards there is a standardisation of the underlying business process and the standardisation of the meaning of the data being exchanged. Baskin, Krechmer and Sherif (1998), in a discussion of telephone protocols, added a fourth etiquette layer defining the 'the range and open-ended variability of protocols'. The importance and distinctiveness of the standardisation of business processes and the agreement on the meaning of complex data in e-business standardisation leads us to propose adding two further categories to David's generic model: semantic standards, in place of similarity standards, and process standards.

We shall see that a functional classification of standards is very important in understanding diversity within the market for standards, but there are other attributes of standards which influence the dynamics of the standards development and use, specifically the processes assessing compliance with the standard, compatibility with earlier versions and the intellectual property regime embedded within the standards. We shall now consider each of these in relation to the market for e-business standards:

- Function
- Compliance assessment
- Compatibility
- Intellectual Property

2.1.2 Function: Reference/Semantic/Similarity/Compatibility/Process

2.1.2.1 Reference

The earliest standards were Reference Standards, defining a quantity. Implicit in a standard is a belief that an entity can be assessed relative to the standard and that the assessment will be objective. Following this definition the earliest standards were time standards: for example a year or day, with hours defined relative to these fundamental measures. Unlike time, most attributes do not have fundamental units, for example length and weight. In these cases local definitions emerged but without a reference standard there would be no consistency. An early case of standardisation was the definition in the thirteenth century by the state of King Edward I t ordered a permanent measuring stick made of iron to serve as a master yardstick. From this reference yard the other definitions of distance (mile, foot and inch) and area (acre) could be defined. The definition of the standard yard can be viewed as a public policy response to the market failure of bilateral trading to define distance or as a response to the state's need to impose control. We also see here the emergence of a process to define and maintain a standard: the yardstick had to be produced and a process created by which it could be reproduced.

All e-business standards build upon reference standards and they are taken so much for granted that it is tempting to see their use in e-commerce as unproblematic. However business transactions are based on understandings of basic reference units and the history of business is littered with transactions where, for example, an 18 foot model is produced only 18 inches high. These misunderstandings become more significant in e-business because the human intervention that would identify unlikely values has been removed.

2.1.2.2 Semantic

The second group of standards are Semantic Standards: the standardisation of the meaning of information and representations of information. For example in logistics system crossing organisational boundaries there has to be a standardisation of the attribute information which is tied to each parcel, but this may include definitions of legal values and the meaning of the information. Unlike reference standards this meaning will be context dependent and we would expect it be agreed within trading communities. The importance of semantic standards has grown with the rise of inter-organisational IT systems, for example the definition of data dictionaries for EDI messages. We would hypothesise that the context specific nature of Semantic Standards will lead to the emergence of different processes for their creation, with a greater involvement from users.

2.1.2.3 Compatibility

The third group of standards are Compatibility Standards, ensuring inter-working between system components. The earliest examples of compatibility standards are in the manufacture of armaments, where the manufacture of projectiles was separate from the manufacture of the fieldpieces. It is the study of compatibility standards, in particular conflicts between competing compatibility standards that has dominated the social science analysis of standardisation. In the majority of e-business applications the compatibility issues are minimised through the use of generic Internet standards, including XML and Web Services.

2.1.2.4 Process

The fourth group of standards are Process Standards, the standardisation of how things should be done. Increasingly, as e-commerce standards embody models of business processes they become Process standards, extending beyond dyadic transactions into a choreographing of the interaction between the systems of two partners. Exemplary of this evolution from pure compatibility towards the convergence of business processes are the RosettaNet Partner Interface Processes (PIPs) developed for supply-chain integration in the electronics sector. As with semantic standards, as standards become more closely embedded in the context of their use we would expect the role of users to become more significant in standards development.

2.1.2.5 A Hierarchy of Standards

These four categories of standards form a logical hierarchy, with Process standards embedded in technology building on Compatibility Standards, Compatibility Standards building on Semantic Standards, and Semantic standards building on

Reference Standards. In e-business the definition of Reference Standards are relatively unproblematic, with standards development focusing on the use of existing Reference standards to create Semantic, Compatibility and Process Standards. The general dependence upon generic web technologies makes compatibility relatively unproblematic. One place where this is seen starkly is in the XML committees of W3C: XML is acknowledged as being the most influential standard in e-business, but so long as the process does not do anything drastic with the standard the major commercial interests are happy to allow the process to be run by the document specialists who were instrumental in initiating the standard.

2.1.2.6 Compliance

Our second dimension is the process by which compliance with the standard is assessed. The process of compliance assessment may be explicit in the standard or informally defined by users. Assessment of compliance may be a significant issue in the dynamics of standards because even a simple standard may result in a complex institutional structure, with attendant costs, to monitor compliance. Although not directly related to e-business these issues are seen most starkly in the creation of an entire industry to assess and certify against ISO 9000. The three means by which compliance can be assessed are:

2.1.2.7 Functional testing

The functions of the entity are assessed against the standard and if all the functions meet the specification the entity can be defined as being compliant. However, standards are written documents and are therefore potentially incomplete, allowing scope for idiosyncratic interpretation. To restrict this ambiguity standards may include, or be extended by, an explicit means of assessing compliance with the standard.

2.1.2.8 Comparison to Reference

Compliance can be assessed through compatibility with a reference implementation. This may mean that the entity is believed to be compliant when some specified functionality is not present or conversely it may be that some functionality is exploited which is not in the written standard. The advantage of comparison to a reference is that compliance testing is simplified: if it ‘works’ it can be assumed to be compliant. This opens up an area in standards dynamics where interpretations of standards may begin to diverge. This has been seen in Bluetooth implementations where device manufacturers evaluate the devices for compatibility with their own devices, but the claimed compatibility with all Bluetooth devices is lost. The emergence of diversity is also seen in implementations of XML, web site design and Java where implementations are assessed to work with particular parsers, browsers and VMs.

2.1.2.9 Audit

Compliance to Process standards cannot definitively be assessed through compatibility with reference implementations or functional testing. An example of this relevant to the e-business arena is ISO 17799, the ISO standard for data security. Assessment is undertaken by assessment that the system specification meets the

standard and an audit to check that there is evidence that the specification is being followed. With the familiarity with management system audits provided by ISO9000 and ISO14000, it is expected that certification to standards based around audits will become a more common method of assuring compliance with standards in the e-business area, especially where the system 'working' would not provide evidence of compliance, for example in RFID tag reading systems, the exchange of personal health data and the regulation of competition law violations in e-business systems.

2.1.3 Backward Compatibility

The third dimension of the e-business standards taxonomy is compatibility. There are two aspects to compatibility, both closely related to the business models of developers and users. First, any new version of a standard may or may not be compatible with previous versions of itself, either building upon its established user base or requiring existing users to face the costs of switching to a new version. Second, a standard may be compatible with competing or alternative standards, enabling users to interwork, or may be incompatible forcing users to decide which camp they are members of.

Compatibility with existing standards is important in standards dynamics because it crucially affects the market for the standard. A standard with no compatibility with existing standards will be in direct competition with the installed user-base of these standards whereas a standard that is compatible with existing standards can build upon their established user bases. *Narrow backwards compatibility* is limited to compatibility with earlier versions of the same standard, avoiding suppliers cannibalising their own user base or having to fight their user-base, and *broad backwards compatibility* is compatibility with other existing standards. source!!!

The analysis of backwards compatibility in e-business standardisation is complicated because backwards compatibility can either be embedded in the standard or be achieved through the provision of converters, possibly by third parties. A lack of broad backwards compatibility is a factor in many standards wars, but broad backwards compatibility does not remove the possibility of standards wars: frequently competing standards will both be compatible with existing standards but not mutually compatible. In this case each standard can build upon the existing user-base but existing users are faced with a choice about which of the competing standards they adopt.

Whereas compatibility in standards is central to the social analysis of the emergence of discrete system standards, for example notoriously VHS versus Betamax and, more contemporarily, competing recordable DVD formats, the lack of an incentive to gain competitive advantage in e-business standards, the network externality benefits with network technologies form adopting the dominant standard and the pressure on developers to provide converters all reduce the significance of compatibility in e-business standards dynamics.

2.1.4 Intellectual Property

The fourth dimension of this e-business standards taxonomy is the treatment of intellectual property embedded within the standard. At one extreme we see standards based around proprietary intellectual property, for example Bluetooth,

where the licensing of the technology generates income for the core consortium participants, whereas at the other extreme we have standards free for use and modification, for example XML and HTML. Clearly the IPR regime within which standards are produced will be both an outcome of the business models of the standards developers and will influence the dynamics of standards in use, in terms of the market acceptance, adaptation and the circulation of the standard.

Historically public standards were seen as being public goods and could be contrasted with proprietary technologies where the owners of IPR sought a return on there investment through licensing, with the possibility that the proprietary technology would become recognised as a de facto standard. In recent years this distinction has become progressively less clear as the locus of standardisation has moved into consortia and the developers of open standards realise that in areas such as image processing it is difficult to develop standards which do not impinge on existing patents (Blind et al, 2002).

2.1.4.1 Royalty Free (RF) Use:

In royalty free use the standard can be used by anyone without payment of royalties, RF includes most ISO standards and, in the area of e-business, W3C standards. The proposal by ISO in 2003 to licence ISO 3166, the codes for countries and ISO639, the codes for languages, led to a wave of opposition. The business issue in royalty free standardisation is generating the resources to support the development and maintenance of the standards. Largely fully royalty free standardisation depends upon a combination of selling the texts of standards, government support and donations of resources by actors who can see a benefit in influencing the standard. The free use of open standards is discussed more in detail in section 3.1.

2.1.4.2 Standards Incorporate Licensable IP

Increasingly the development of standards places the developers with a choice between adopting a patented technology within their standard or reverse engineering an equivalent without infringing any patents. Unsurprisingly, with the pressure to develop standards expeditiously, standards increasingly incorporate licensed IPR. The firm whose IP is incorporated may expect to be able to license their IP within the standard. The development process is simplified but the use of the standard is made more complicated by the need to monitor use and collect license fees.

The licensing of IPR within standards is generally on the basis of *reasonable and non-discriminatory* (RAND) terms. 'Non-discriminatory' is an acceptance that the licenses will be available to all on broadly similar terms, but the definition of 'reasonable' in relation to standards licensing is currently unclear. A RAND policy is therefore a statement that the standards will not be used to distort the market through barring their use to some actors or using discriminatory pricing. RAND licensing is increasingly used by e-business standardisation bodies, including OASIS and IETF. One implication of non royalty-free RAND or other licensing is that it creates a need for a process to monitor sales and possibly use in order to collect the licensor's fees. There are also concerns at the increasing use of RAND licensing in standards as the term may prohibit the sale of systems built around the standard to third parties. Following this line, it has been argued that RAND standards are discriminatory

because they do discriminate against users who cannot afford the licenses and, more significantly for the dynamics of standards, the conditions restricting re-use prevent the use of RAND licensed standards in Open Source software.

2.1.4.3 Licensed Standards

The third level of IP policy in standardisation is for the developers of the standards to license the standards to generate revenue to recompense them for the costs of development or to pay for maintenance of the standards. The distinction from the previous category is that the standards development process itself is producing commercially exploitable IP and the business models of the participants can see the development of standards as an asset creating activity. The issues surrounding the additional complexity created by licensing and the impact of licensing on use will be even more significant than in the previous category because the developers of the standard must determine the price of the licenses and develop a process to collect licence fees and distribute them among the IP owners or allocate them to further standards development and maintenance. Licensors behave strategically, seeing standards as a potential revenue source. This creates a need for institutions to manage this process[18].

2.1.5 Conclusion

The taxonomy described here provides a foundation for understanding the business models of organisations involved in standardisation. The *function* of the standard is determined by the identified need, but within the processes and organisations developing the standard there are choices relating to e.g., *compliance*, *compatibility* and *intellectual property*. The strategy for *intellectual property* will be a major influence on the choice of arena in which the standards are developed, with standards where participants can see strategic commercial benefits or high costs of maintenance leading instigators towards licensing there standards and standards which will gain from wide acceptance and low maintenance costs leading them to bodies such as W3C and OASIS. The business models of actors, in particular their willingness to take on existing standards, will influence their *compatibility* decisions. Business models, the standard's function and the choice of SDO will influence the process for assessing compliance, for example whether they will certify and brand uses of the standard. The complexity of the business models of actors within the standardisation process is covered in the next section.

2.2 The Demand for E-Government Standards

Not unlike e-business, e-government covers an extremely wide range of topics, ranging from e.g., electronic voting via e-taxation and geo-spatial data to e-education and e-health care. Also, the users are similarly diverse as are the e-business users, including e.g., European, national, state / provincial and municipal authorities, and a host of specialised agencies. Many of these entities have already developed solutions for their individual tasks and problems, which are hardly ever compatible. In a sense,

[18] One could contrast the institutional complexity of MPEG standards, leading to the creation of MPEG LA to handle license revenues with the simplicity of XML, where there is no need for such a body at all because there is no protected licensable IPR in the standard.

this situation is similar to the one that could be observed in the e-business sector a couple of years ago. Priority aspects to be addressed include interconnectivity, data integration, access, and content management (Borras, 2004)[19]. These aspects are also crucial for e-businesses.

The different 'expressions' of e-government services are also similar to those in the e-business domain – functionality required for G2G[20] is roughly equivalent to B2B functionality, and G2C to B2C. G2B lies somewhere in between, but is closer related to B2C (see also Figure 2).

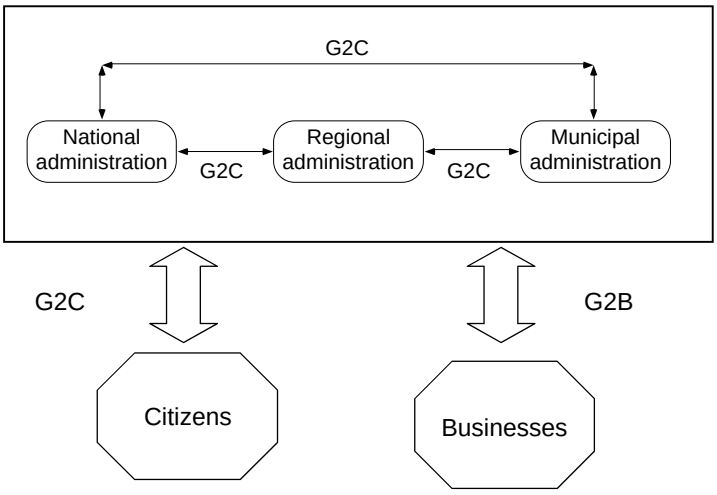

Figure 2: The different expressions of e-government

The main question regarding the interaction between e-business and e-government standardisation is the comparability between such activities on the different dimensions. The best way to do this is to start with the main distinction between both concepts on an abstract level. While e-business is on the whole aimed at commercial aspects of ICT, e-government is aimed towards participatory aspects of ICT. The existence of such a focus can also be observed in the importance of accessibility standards that are a prominent factor in e-government interoperability (IDABC 2004). The implementation of recommendations of the Web Accessibility Initiative of the W3C concerning is still very low with more than 90% of French, German or U.K. sites not passing minimal accessibility checks of Web Content Accessibility Guidelines (WCAG) 1.0 Priority 1 tests. (Marincu, McMullin 2004) Even though this phenomenon is not limited to government web sites the role and actions of governments concerning accessibility standardisation can produce positive spill-overs into e-business standardisation. The participation focus does not exclude the relevance of G2B activities like e-procurement services, but highlights the primary objective that is both embedded in the institutional settings of either governments or

[19] Consequently, OASIS, an SSB that is a major player in the e-business domain, is also actively working in e-government standardisation Within OASIS' Techncial Committee on e-government, projects are under way to cover Core Components, ebXML Registry, Harmonising Taxonomies, Naming and Design Rules, Semantic Interoperability, Records Management, Workflow, and Web Services.

[20] G2B = Government-to-Business, G2G Government-to-Government, G2C = Government-to-Citizens.

companies and in their agenda and also leads to a difference in perception of the social roles of the demand side, namely individuals as customers or individuals as citizens. Comparability in this context can thereby broadly be distinguished by aspects of the demand side or target group of standardised services and the agenda of the supply side, namely governments or companies. Apart from rational reasons for standards that apply to both the economic and political realm (e.g. reduction of cost for service provision for either profit maximisation in business or cost-cutting on government side to manage their revenues) distinctions can mostly be made on the demand side. While companies are aimed to provide services for certain target groups, governments mostly have to provide services for the whole set of citizens. This might be the most striking difference between the rationales underlying both areas of standardisation. Even though it might be argued that in a due process of e-business standardisation activities standards are produced that reflect the needs of a large number of users this factor is of higher importance for e-government standardisation as in that case the access and thereby participation of all citizens is a primary objective.

According to the Dutch Programme for Open Standards and Open Source Software in Government (OSSOS), benefits of open standards in e-government include (OSSOS, 2002):

- reduction of the dependence on external software suppliers and to increase the range of choice;
- a way to combat monopolies in the software market in order to prevent abuse of dominant market positions;
- enhancement of the quality of government information systems in terms of accessibility of information, transparency of action, security and future-proofness;
- reduction of the cost of software implementations;
- improvement of the exchange of data between government domains.

Some other aspects of e-government are also worth considering:

- security aspects are extremely high on the agenda, even higher than in e-business,
- there is considerable commitment to the use of standards (and open software; this holds despite the fact that many systems based on proprietary technology have already been implemented),
- some national governments have implemented national ‘standards’ which are not necessarily open, and which do not necessarily provide for interoperability with European / international standards[21].

Overall, the majority of standards-related e-government activities aim at the identification of suitable existing standards, and to the provision of guidelines regarding their implementation and use. Also, these activities very much focus on the three lower layers of the interaction architecture (see Figure 3 below). So far, very little has been achieved in terms of standardisation for the upper layer. Moreover, in

[21] The German government is a case in point; see e.g. (BundOnline, 2003)

Germany, for example, only some mandatory 'building blocks' have been identified which belong to the 'Application' layer (e.g., 'e-payment'; see (SAGA, 2003)).

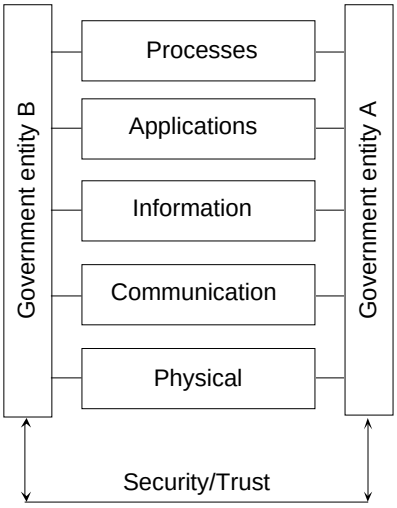

Figure 3: An e-government layered interaction architecture

While many (e-business) standards may be deployed in the e-government context, dedicated e-government standards, and standards setting activities, are only emerging. OASIS and ebXML have a Technical Committee and a 'Focus Area', respectively, exclusively dedicated to e-government issues, a CEN / ISSS[22] looks at the related topic of a 'citizen card', and another CEN Workshop is dedicated to defence procurement. The purpose of OASIS TC is to provide a forum for governments to voice their needs and requirements with respect to XML-based standards. These are then forwarded to appropriate other TCs. The XML.org Focus Area is supposed to serve as a central clearinghouse for information on XML and related standards for the public sector. CEN WSs are more or less created by chance; with no underlying, overarching strategy – there is currently no coherent approach towards standardisation for e-government. Yet, as the following discussion will show, such an approach would be badly needed.

2.2.1 Introduction

In order to give an overview and to analyse the demand for e-government standards in the EU, we apply the following approach. We take into account the data provided by the IDABC e-government Observatory (IDABC e-government Observatory 2005), because its report on e-government activities in the 25 Member States is a reference information source on e-government issues and developments across Europe. It provides us with a unique set of information and with valuable insight into e-government strategies, initiatives and projects in Europe. The e-government Observatory maintains a series of templates presenting the situation and progress of e-government in each Member State of the European Union providing for each one of

[22] CEN Information Society Standardisation System, the 'ICT arm' of CEN.

them information on major past e-government developments, strategies, legal initiatives, key organisations involved in the e-government and key components of the infrastructure established to support the provision of services for citizens and businesses. Based on this rich source of information, we have identified only those initiatives and programmes, which mention explicitly the need for the development or adjustment of e-government standards. Several activities require standards in the one or other way. However, the focus on those activities, which express an explicit need for standards, generates a much clearer and sharper picture of existing priorities.

Simple country-specific presentations of requirements for standards supporting e-government activities are likely to replicate common trends. Therefore, we have structured the trends in the demand for e-government standards according to a taxonomy of service standards. Governments on all levels provide different kind of services ranging from national defence, internal security to simple administrative services like the certification of a marriage. Consequently, governmental bodies are comparable to service companies. In addition, more and more public services are outsourced to private service companies, e.g. the removal of refuse or security services. However, it has to be noted that governmental institutions are often in a monopolistic position or in the obligation to provide certain services to all citizens, and not only to segments of the society. Furthermore, they are restricted by rather rigorous regulations, integrated in multiple organisation layers, but non-profit organisations, which are able to rely on tax revenue in case of deficit spending or losses.

Whereas we can rely on a long tradition of standardisation and large stock of standards in the manufacturing sector, standardisation related to services and service companies are just emerging. Furthermore, the simple transfer of typologies of standards approved for the manufacturing sector and physical products is not adequate. According to EN 45020, service standards are in general defined as standards that specify requirements to be fulfilled by a service to establish its fitness for purpose. Since this definition is very general, we rely on a services standards typology, which differentiate in more detail possible components of the service delivery process and the service result appropriate as objects for standardisation. Such classifications of standards, which are independent from specific service sectors, can be used to structure the demand for respective standards, but also to generate hypotheses about the demand and supply of standards.

The most recent and differentiated approach to set up a typology of service standards was developed by de Vries (1999; 2001). According to his general definition, standards concern entities or relations between entities. Therefore, for a systematic approach to standards in the service sector, it is first necessary to define entities. Typical of services is the interaction between supplier and customer as the main entities. On the supply side, the organisation or the service company and service employees can be regarded as entities. Transferred to e-government, the various governmental levels, but also the institutions within one level are entities. Furthermore, both the service process and the service results can be considered as further entities, although often service process and result occur simultaneously. Finally, a distinction between delivery and final result has to be made. Based on these theoretical considerations, the following classification can be derived (Table 1.

Standards for: Entities or relations between entities	**…may concern:**
Service organisation	Quality management, environmental management, occupational health and safety management. Solvency and other financial aspects. Crew, e.g., minimum number of staff and their educational level.
Service employee	Knowledge. Skills. Attitude. Ethical code (e.g., confidentiality).
Service delivery	Specification of activities. Trustworthiness. Privacy aspects. Safety aspects. Code of conduct.
Service result	Result specification. Trustworthiness.
Physical objects supporting service delivery	E.g., technical requirements for trains in public transport services.
Workroom	E.g., requirements for daylight access in offices.
Precautions	Emergency measures. Complaints handling. Guarantee.
Additional elements to the core service – delivery.	E. g. waiting facilities
Additional elements to the core service – results	
Communication between customer and service organisation (before, during and after providing the service)	Semantics (e.g., data elements to be used). Syntax (e.g., forms layout, syntax rules for electronic messages). Specification of Information and Communication Technology to be used. Protocols. Code of conduct. Approachability (e.g., hours of accessibility per telephone and average waiting time).
Communication within the service organisation or between this organisation and its suppliers	Semantics. Syntax. Specification of ICT to be used. Protocols. Code of conduct. Approachability.

Table 1: Services Standards Typology (Source: de Vries 2001)

We will structure the demand for standards in e-government according to the categories in the left column in Table 1.[23] Based on the general and the country specific findings on ongoing activities and future requirements, we will derive some preliminary conclusions also addressing the supply side of standards regarding e-government standards.

2.2.2 The Need for E-government Standards in Various Dimensions

In our overview of the demand for standards in the various dimensions of e-government we follow the categories of the taxonomy presented in Table 1. According to the information provided in IDABC (IDABC e-government Observatory 2005), no requirements for e-government standards for the quality, environmental or safety management of governmental institutions, which are, after all, some kind of service organisations, have been published yet. Also, no e-government standards can be found for the service employees, i.e. civil servants, neither for offices and workshops, or for the physical objects supporting the delivery of e-government services (except for the ICT infrastructure, which will be mentioned separately in the context of internal and external communication processes). The lack of demand under these two categories is also plausible, since the introduction of e-government activities will not normally change these very general types of standards necessary for running a service company or governmental institutions. However, some minimum standards for c civil servants ould be perceived, in order to be able to provide e-government based services effectively and efficiently. We also do not see standard requirements and needs related to the specifications and the trustworthiness of service results, or for precautions, e.g. emergency measures and complaints handling. Although safety issues are addressed, which will be presented later, it could be discussed whether or not governments should introduce standards for timely delivery of services not only in the context of e-government.

2.2.2.1 Service delivery

Under ‘Service delivery’, de Vries also includes privacy and safety aspects. Here, e-government activities generate additional requirements compared to traditional government activities. Consequently, Austria, but also Finland, France, Italy and Spain explicitly address the development of information security and data protection standards in their initiatives and strategies in order to guarantee the security of e-government products and services. The observation that not all Member States explicitly mention the need for security standards in the context of e-government can be explained by already existing international standards addressing information security, which can also be applied by governmental organisations.

2.2.2.2 Communication between citizens and governmental organisations

The trend towards e-government is accompanied by an increasing pressure on governmental organisations to become more client oriented. In the light of standardisation this proves an important aspect, due to the heterogeneity of the demand side in question. This heterogeneity can be partly horizontal, and socially

[23] Blind (Blind 2006) performed an empirical test of the taxonomy by relying on survey data, which led to a further reduction of standards´ categories. For the sake of simplicity, we use the more differentiated version.

neutral aspects but might also include vertical heterogeneity, e.g. social stratification of society. Examples for such vertical heterogeneity effects might be the access of individuals in lower income classes to high performance computer equipment needed to access certain e-government services. This aspect is only of limited importance for e-business standardisation oriented to target groups but is a crucial factor for the government agenda to bridge potential political and participatory digital divides. We observe several initiatives to develop and implement standards which structure the interface between governmental organisations and the citizens. The standardisation requirements range from harmonised web portals or gateways of governmental organisations, over standards for the exchange of documents, to e-signatures and electronic identity cards.

Since citizens are confronted not only with one governmental institution but with several 'shops', standards are required in order to guarantee a unique layout for forms and structure of e-government portals or gateways. This need is explicitly perceived in Austria, Poland ('Gateway to Poland'), recently Sweden, and other countries. Consequently, Ireland is going to develop guidelines and standards for all public sector web sites building on best practice in relation to design, search facilities and accessibility guidelines. The Netherlands announced recently to develop a meta-data standard for public sector web sites in order to make it easier for citizens to find and access the information they need across the more than 1,200 separate government web sites in the Netherlands. Within the German Deutschland-Online strategy, the access to e-government services will be enhanced by implementing the required interoperability of Internet portals. In the Czech Republic, it is also stressed that e-government services have to be provided of comparable quality throughout the country based on open international standards (e.g. W3C). In Sweden, the goal of achieving a 24-hour Public Administration can only be realised by a minimum of binding rules and standards necessary for a well functioning electronic communication within the public administration and with its customers.

In the United Kingdom 'The Government Gateway' was already launched in 2001. It is a central registration and authentication engine enabling secure authenticated e-government transactions to take place over the Internet. Citizens need to register with the Gateway in order to use online government services and subsequently transact securely with government departments. Built on open standards, the Gateway also enables the joined-up delivery of government services by allowing different systems in different departments to communicate with the Gateway and with each other. More explicitly, the exchange of documents requires standards. The Danish XML project announced in 2001 aimed to define standards for exchange of data between government and the public, data formats used by the individual authorities conform to a common, open, national standard. Belgium published recently a list of open standards to be used by public authorities aimed at facilitating the electronic exchange of information with citizens and businesses.

The efficient communication between the government and the citizens requires not only the effective exchange of documents. Since the private sector is a forerunner in use of digital signature we observe a close co-operation with the private sector. For example, a public-private e-signature alliance was formed in 2003 between the German Government and a number of private sector companies (banks, IT services

companies, etc.) to establish e-signature standards based on current use of e-signatures in government and in the economy.

Closely related to the issue of digital signature is the use of electronic ID cards and other forms of smart cards. Already in 1998, Sweden established an e-Identification infrastructure by approving standards regarding electronic ID. Following a framework agreement signed between the Swedish Agency for Public Management and digital certificates suppliers, software-based electronic IDs (in particular the BankID developed by the largest Swedish banks) can also be used for certain e-government services. For the future, the Swedish government has plans to introduce an 'official" electronic ID card containing biometric identifiers. In 2003, the Italian Government signed an agreement with nine smart card providers to adopt a new unique standard ensuring interoperability of cards distributed across the whole Italian territory. In Germany, the so called e-card strategy published in 2005 will define common standards for a number of e-government smart card initiatives in the areas of citizen identification, social security information and health insurance services to foster the development and take-up of transactional e-government services and maximise efficiency gains and cost savings. The Cyprus announced similar goals by pointing to the need for a European collaboration in order to put in place key pan-European services such as cross-border company registration, electronic public procurement, job search and e-voting. Ireland published a standard framework for Public Service Cards (PSC) in the year 2004. Public Service Cards are cards used to identify individuals using public services (i.e. medical card, social services card, etc.).

As already mentioned in the various initiatives outlined above, an electronic health insurance card is of major relevance for several countries. Besides the examples already mentioned, France will also develop new IAS (Identification, Authentication and Signature) standards for the health insurance card. Similar, the Czech Republic aims to introduce smart cards compatible with EU standards for health insurance by the year 2006.

In general all these e-government initiatives improve the work flow in government administration. In Austria, the completion of the government-wide electronic record system (ELAK) in 2005 marks a key milestone of the Austrian e-government programme, leading to significant improvement in service delivery at federal level. The electronic record is the original document, printouts are regarded only as copies. The digital handling of administrative procedures allows simultaneous processing, more efficient workflow, standardised working methods and cost savings in hardware procurement. The benefits for citizens and enterprises are faster administrative procedures and the widespread delivery of electronic documents.

We observe various initiatives of governments to standardise web portals, gateways, the exchange of documents, electronic signatures and identification cards, especially for e-health applications in order to optimise the interface between the e-government and the citizens. Although most e-government initiatives are restricted to the local or national territory, several initiatives highlight the need to recur on existing or to develop international or European standards.

2.2.2.3 Communication within the governmental organisation or between government and its suppliers

Standards structuring the interface between e-government services and products and citizens are also relevant for the internal communication in governmental organisations or between the various governmental organisations at the different levels. In our overview we start with initiatives to develop and implement communication and interoperability standards required for e-government, discuss then the establishment of databases of software for governmental organisation and finally e-procurement standards.

For most of the countries, it is essential to establish standards for interfaces between governmental departments, institutions and various governmental levels that permit efficient and transparent communication. For example, the United Kingdom published already in the year 2000 the first version of the e-government Interoperability Framework (e-GIF), setting out the government's technical policies and standards for achieving interoperability and information systems integration across the public sector. In particular, it adopts XML (Extensible Markup Language) as the primary standard for data integration and presentation on all public sector systems. Defining the essential pre-requisite for joined-up and web enabled government, the e-GIF is a cornerstone in the overall e-government strategy in the United Kingdom. The Danish XML project defines standards for the description of all relevant data in the public sector, so as to support easy and cheap access to and reuse of public data, and to enable data exchange and information systems interoperability across the public sector. Finland started to develop methods for the integration of e-government systems and services by means of meta-data standardisation based on XML standards. In Sweden, the Government Interoperability Board was established in 2004 with the mandate to issue common standards and guidelines for electronic information exchange within government. The e-Government Interoperability Framework lists technical policies and specifications to guide IT decision-makers in their choices of IT systems to harmonise the use of technologies through out the Danish administration. As already briefly described in section 2.2., Germany's e-government interoperability framework SAGA (Standards and Architecture for e-Government Applications) sets out the technical standards for the implementation of the e-government initiative BundOnline2005, the e-government initiative with a view to determine the need for interoperability policies, technical standards and organisational requirements for online federal services. The Deutschland-Online strategy provides the framework for co-operation between all administration layers to interconnect Internet portals: The federal government, state governments and municipalities will create joint standards as well as data and process models for e-government.

Besides these forerunners in Europe, especially the new Member States, e.g. Slovenia, try to comply with EU recommendations and orientations with regard to the European Interoperability Framework (IDABC 2004) for e-government services.

The management of documents electronically including finding consensus on how to organise digital or electronic signatures is a central challenge for the development of respective standards. The implementation of the EU directive on electronic signatures and gives requires also respective standards. Several Member States started to develop and implement respective standards. In Germany, general e-

signature standards are developed based on current use of e-signatures in government and in the economy.

A central element within the interoperability initiatives is an agreement on common standards. Consequently, we observe in several countries attempts to reach commitments among governmental organisations to implement the same software and standards. For example, in Belgium, a list of open standards to be used by public authorities at all levels was recently published in order to support a better integration of federal back-offices, promoting the interoperability of their information systems. A central repository of information about data interchange standards, the so-called InfostructureBase was installed by the Danish government in 2003 not only addressing the public, but also the private sector. In the Netherlands, the 'e-Communes' project was launched in 2003 in order to encourage the exchange of best practices as well as the development of common local e-government standards and projects.

Besides the agreement on common standards, which promotes and guarantees interoperability between different organisations, cost effectiveness is another rationale to use the same, preferable open standards. Since we observe both multi-level governance in all Member States and a huge number of governmental organisations at the local level, cost savings can be realised, if standards are either developed at the higher or highest level, which can then transferred to the lower governmental levels. For example, the MEDIA@Komm-Transfer project aims at identifying and developing transferable and standardised e-government solutions, including the standard for e-government data exchange OSCI (Online Services Computer Interface), for German local and regional authorities. . In addition, the German Government Site Builder is a new Content Management System (CMS) meant to become a government-wide standard.

Austria established in 2004 a web-based plat-form providing Austrian municipalities with access to affordable and standardised e-government tools. The Spanish Government and the Federation of Municipalities and Provinces (FEMP) launched the 'PISTA-Administración Local' initiative, aimed at enabling small and medium-size municipalities to deliver services online. The project consists in the development of a standardised software application designed to enable the simple deployment of basic online information and services, which small local authorities will be able to use for free.

In the Netherlands, the open source software exchange platform, enables public sector bodies to access, share and exchange open source software programs (see sect. 2.2 for more details). It forms part of the programme for Open Standards and Open Source Software in Government (Verhoosel, Akkersdijk 2004), designed to stimulate the adoption and use of open source software in the Dutch public sector. In 2003, France established an open source content management system (AGORA) providing a quick and easy tool for managing Internet, intranet or extranet sites at reduced cost. Its aim is to help rationalise content management and foster interoperability of web content and functionalities across government, while reducing web sites costs and building times, enabling web publication by non-technical staff, enabling content syndication across web sites and organisations, and simplifying web sites implementation through standardisation. Relying on open source software in establishing e-government services is especially a strategy for the New Member

States to catch up quickly and cheaply with the more advanced countries in the EU. For example, in Slovakia the government is committed to: __build public administration information systems using open software standards as cost-effective solutions.

In the section above, we have collected initiatives of governments in the EU to improve the interface with its clients and customers, the citizens. However, we observe also activities to make the relationship with its suppliers more efficient by establishing e-procurement and in order to implement the new EU public procurement directives (2004/17/EC and 2004/18/EC). Following the activities at the European level, several Member states have fostered e-procurement in order to increase the efficiency of the procurement process, but also to save the costs and to increase the quality of the procured goods and services. These activities follow the efforts in the private sector.

Besides the implementation of European guidelines and standards (CEN 2005), which is of high priority in the new Member States[24], like in the Czech Republic or Estonia, also to ensure interoperability of e-procurement systems across borders, we observe several progressive initiatives at the national level. In Denmark, the Universal Business Language (UBL) as a standard for public sector e-procurement was implemented in 2004. The UK Government adopted also in 2004 a new common, open-standard IT language – named UKGOV XML – to deliver interoperable e-procurement solutions to public institutions and their suppliers. In addition, a National e-Procurement Project was launched as part of the local e-government strategy to deliver standard e procurement tools for councils. In 2005, Portugal launched the national e-procurement portal ('Portal de Compras'). Developed in the framework of the National e-Procurement Programme, the portal – which complies with the guidelines of W3C's Web Accessibility Initiative – aims to become the new standard for public procurement.

If we summarise the requirements of standards addressing internal communication within governmental organisations and with their suppliers, then we have to observe the general need to ensure interoperability of e-government systems, which is reinforced both by the heterogeneity of governmental organisations at one level and by the multilevel structure. Besides the use of standard IT language, common data formats for the exchange of documents the use of common e-signature systems support the realisation of interoperable solutions. The various governmental levels with its numerous organisations down to single municipalities or local communities allow also the exploitation of economies of scale effect by the use of common standards, especially standard software. Besides using the same proprietary software in order to save licensing fees, the use of open source software also for the implementation of e-government solutions allows saving significant costs (see also section 3.1). The cost argument is also a driving force for the introduction of standardised e-procurement solutions, which increase the market power of governmental organisations in order to procure goods and services at lower costs or at higher quality.

[24] In Slovakia, the Office for Public Procurement has elaborated standard forms of public procurement notices, which will be sent by contracting authorities to the Office for Public Procurement electronically.

2.2.2.4 Summary

The application of the taxonomy of service standards developed by de Vries (2001) to structure and analyse the general requirements identified and already undertaken activities to establish e-government services in the EU based on the IDABC report on e-government (IDABC eGovernment Observatory 2005) revealed the following patterns regarding the demand for standards which is only partly satisfied. The rather complex and multi-level organisational structure of governmental organisations is the most important driving force for developing common standards in order to establish and ensure the internal interoperability of processes. This internal co-ordination process is still running and not all requirements for standards are already fulfilled despite significant progress and success especially in those countries being forerunner, like the United Kingdom and the Scandinavian countries. Due to several initiatives at the European level either via the publication of framework directives or first CEN workshop agreements, there is additional pressure, but also support to promote the development of respective standards supporting the establishment and promotion of e-government. Besides the requirement to ensure interoperable processes, It has further to be mentioned that the exploitation of economies of scale require the use of common proprietary software standards in order to save licensing fees and promotes also the use of open source software for the implementation of e-government solutions. The cost efficiency argument is also a driving force to implement standard-based e-procurement systems, which increase the market power of governmental organisations in relation to the suppliers of goods and services.

The use of standards in e-government solutions in order to improve the efficiency of the the communication between governmental organisations and their clients, the citizens, also stands to benefit from standards which are being implemented or going to be implemented in order to ensure internal interoperability, like standards for the exchange of documents or digital signatures. However, the need for further standards which increase the customer relation or better citizen relation is only to be to emerge. The restricted demand for this kind of standards, like structuring accessibility, or the reluctance to implement respective standards can be explained by the monopoly of governmental organisations to provide certain services. This special constellation explains also the rather few standardisation activities being launched in order to improve safety or privacy aspects in the context of the provision of e-government services, although here solutions developed for the private sector can also be implemented.

2.3 The Use of Standards in E-Business

In order to give an overview of the current use and the possible future demand for standards in e-business, we have analysed the European E-Business Report (2004), which monitors the adoption, development and impact of electronic business practices in different sectors of the European economy. The report applies a rather broad approach, since ‘electronic business’ has increased from a very specific to a very broad topic in the last decade and follows the OECD, which defines e-business as ‘automated business processes (both intra-and inter-firm) over computer mediated networks’ (Roberts 2004). This definition makes clear that e-business is more than e-

commerce, which focuses on commercial transactions between companies and their customers, and includes processes both within a company and between companies.

The European E-Business Report 2004 is the first edition which devotes a significant focus on the role of standards in running e-business. The methodology to assess the diffusion of ICT and e-business is based to a large extent on a representative survey among decision-makers of European enterprises. The survey covers 10 aggregated sectors, which represent the major share of economic activity in the European Union. Table 2 summarises the relevance of ICT and e-business in these 10 sectors, which is a condensed presentation based on quantitative statistics, desk research and case studies. In addition to the relevance of internet connectivity, the role of ICT in sourcing and marketing or in marketing and sales the survey also highlights the use of e-business standards.

Here, we first observe that the use of e-business standards is particularly closely connected to the internet connectivity. Second, e-business standards have the highest relevance in those sectors, which also rely most strongly on traditional technical standards, like the electromechanical and electronics industries and the telecommunication and software sectors. Consequently, the progress towards e-business in these sectors is accompanied by a strong reliance on the respective e-business standards. The relevance of e-business standards is average in other sectors of the manufacturing sector. In the remaining service sectors, the use of e-business standards is below average, which is inline with the general argument that standardisation in services is an emerging field of activity (DIN 2002). Research activities to investigate the options for standardisation in services and service industries are still in its early stages.

Sector / **Function**	**Internet connectivity**	**Use of e-standards**	**ERP / SCM[25]**	**Sourcing & procurement**	**Marketing and sales**	**Overall significance**
Textile	▲▲	▲▲▲	▲▲▲	▲▲	▲	▲
Chemical	▲▲▲	▲▲▲	▲▲▲▲	▲▲▲	▲▲	▲▲▲
Electronics	▲▲▲	▲▲▲▲	▲▲▲▲	▲▲▲	▲▲▲	▲▲▲
Transport equipm.	▲▲▲▲	▲▲▲	▲▲▲▲	▲▲▲▲	▲▲▲	▲▲▲
Craft' & trade	▲▲	▲▲	▲	▲▲	▲	▲
Retail	▲▲	▲▲	▲▲▲	▲▲	▲▲	▲▲
Tourism	▲▲	▲▲	●	▲▲	▲▲▲▲	▲▲▲
ICT services	▲▲	▲▲▲▲	▲▲	▲▲▲▲	▲▲▲▲	▲▲▲▲
Business services	▲▲▲	▲▲	▲▲	▲▲	▲▲	▲▲▲
Health	▲▲	▲▲	▲	▲▲	●	▲▲
▲= low relevance / diffusion; ▲▲= average relevance / diffusion; ▲▲▲= above average relevance /diffusion			▲▲▲▲= high relevance / diffusion; ●= in some sub-sectors only			

Table 2: The relevance of ICT and e-business in 10 sectors in 2003/04 (source: European E-Business Report, 2004)

[25] ERP: Enterprise Resource Planning; SCM: Supply Chain Management.

According to the e-Business W@tch 2004 survey (European E-Business Report 2004; section 1.5), the exchange of standardised data is recognised as an important indicator for e-business activity. To allow for automatic processing, the information exchanged between trading partners has to be digitised in a structured and consistent form. Common e-business standards help to organise and exchange information in a way that is consistent across enterprises and IT systems. The survey asked companies whether they exchange standardised data with buyers or sellers, and which standards they used for doing so. The results confirm the obvious observation that larger companies are more likely to exchange data in a standardised way than small firms. There is much variation between countries, even within the same sectors. Regarding the various standards available, a sector-specific preference structure can be observed. EDI based standards are mainly used in manufacturing sectors and in retail, because their strong EDI legacy fosters the reluctance to switch to other standards. The younger XML based standards appear to be widely used by firms from the business services sector, where web-based services play a very important role in delivering services and information to customers. XML based standards (including, for example, RosettaNet) are also preferred by high-tech sectors (electronics, ICT services).[26] The STEP standard which is widely used in the USA (Gallaher et al. 2002) is used only by a minority of firms.

The sector specific reports within the European E-Business Report 2004 (European Businss Report, 2004, Part 2) also contain some information about the importance of e-business standards exchanging structured data and Web services and XML based standards and future potential. Table 2 and Table 3 give the respective overviews. The pattern of the importance of data exchange standards reveals a higher importance in the sectors of the manufacturing sector than in the service sectors. Regarding the future perspectives, there is obviously significant potential to improve the processes in the value chain, e.g. in procurement processes, both in the industries of the manufacturing sector and the service sectors by using standards for exchanging structured information. According to results of the e-Business W@tch survey 2004 the importance of standards for Web services and XML based services was in general of lower importance compared to the standards for the exchange of data. Furthermore, a reluctance to implement these standards could be observed in most sectors. However, the future potential of XML standards was already perceived in some sectors and is meanwhile confirmed by recent trends.

Sector	Importance	Remarks
Textile, clothing and footwear industries	●●●●	Textile companies could largely benefit from standardisation to favour the flow of information along the value chain
Chemical industry	●●●	Chemical industries are in a preferred position to benefit from standardisation since many of the products traded can easily be categorised (e-catalogues).

[26] The future importance of XML based standards for e-business is also limited to 25% of the companies (European Commission 2004, p. 36.).

Electrical machinery and electronics industries	●●○○	The use of e-business standards for exchanging structured data is more widely used in the sector than on average. Most electronics manufacturers use electronic business applications via EDI. E-business standardisation processes have a generally high relevance in the electronics sub-sector and an average relevance in the electrical machinery sub-sector.
Transport equipment industries	●●	EDI and proprietary standards still dominate.
Craft and trade sectors	●●○	Electronic procurement is an important application for craft companies. In this context, standards for electronic document exchange are important.
Retail industry		
Tourism industry	●○	Below average use of exchanging document, an element which is yet carrying little focus in the sector.
ICT services sector	●●	The exchange of structured data remains a crucial issue as the ICT market becomes more and more global, in particular in the software services sector.
Business services sector	●●	Not a key issue yet, most of information ex-change takes part informally, companies usually exchange Microsoft Word and Excel files
Health & social services	●○	Except for large organisations, the exchange of standardised data is very limited. Proprietary standards still dominate, thus hindering interoperability.

Table 3a: The future importance of standards for exchanging structured data in 10 sectors (Source: European Business report 2004, own presentation)

Sector	Importance	Remarks
Textile, clothing and footwear industries	●●●○	It is important to foster migration to tools and standards which offer data access flexibility, openness, ease of usage and low cost
Chemical industry	●●	Companies themselves are not yet convinced about XML. However, it could become the main standard for electronic transactions in the future.
Electrical machinery and electronics industries	●●○	Companies themselves remain to be convinced about XML. However, it could become the main standard for electronic transactions in the future.
Transport equipment industries	●	XML is not yet widely used.
Craft and trade sectors	●○	There does not appear to be a great need for XML among craft firms. Web services could become fairly important in the construction sector.
Retail industry	●	Companies are not yet convinced about the importance of XML.

Tourism industry	○	SMEs are reluctant to invest in XML as they are not yet convinced of the benefits and it is a costly investment.
ICT services sector	●●○	Companies themselves are only moderately convinced about XML. However, it could become the main standard for electronic transactions in the future.
Business services sector	●●	Not a key issue yet due to the small company sizes and the rather basic applications used.
Health & social services	●[●●]	The great importance of XML-based standards for the future integration of services has not yet been recognised by the sector players.

Table 3b: The future importance of standards for Web services and XML based standards in 10 sectors (Source: European Business Report 2004, own presentation)

A more general pattern of the special needs of service companies or companies providing services involved in e-commerce for specific standards can be derived from the results of a survey among European service companies This survey addressed the question in which service-related categories formal and informal standards are implemented (Blind 2004). In total 364 European service companies responded to an on-line survey performed in 2003. Almost 60% of the sample have less than 250 employees. One third of the sample represents business services, one fifth education and social services, but also financial, transport and communication service companies. Furthermore, around one fifth of the sample is already active in e-commerce.

The service companies were asked to assess the importance which standards have for 23 service-specific and standards-related aspects of their business. Figure 1 presents the ranking of the importance of standards for service related aspects. Standards are highly important for data security regarding customer interaction and internal data security. This is an issue which is very closely related to information and communication technologies, which are also characterised by a high degree of standardisation. The same high importance of standards emerges for the issues of quality management and customer satisfaction. Furthermore, standards for qualifications and skills of employees, regarding the evaluation of services by customers, and for information systems and the service process are still of high importance. In contrast, standards for environmental management and ergonomics are at the bottom of the ranking and just above medium importance.

The companies active in e-business attribute a higher importance – by comparison to the rest of the sample – to all those kinds of standards which try to standardise the interaction with the customers, e.g. the code of conduct with customers. This reflects the need of companies active in e-business to compensate for the lost personal relationship to the customer by different kinds of standards, which allow a higher degree of customer satisfaction, and help secure the quality of the services and goods delivered.

Summarising the information presented about the actual use of e-business standards and future potentials, we find that e-business standards have already a high importance in the ICT related manufacturing and service sectors. Furthermore, the relevance of e-business standards is currently higher for the industries in the

manufacturing sector than for the service industries. Among the e-business standards standards for the structured exchange of data are most important. Here, the use of EDI dominated in the past, whereas the reluctance to implement XML based standards is going to decrease, since the potential applications of these standards are more and more promising. Finally, there is obviously a strong need for service companies active in e-commerce to develop and implement standards, which intensify and stabilise the crucial relationships to its customers. This is a major challenge for future standardisation activities.

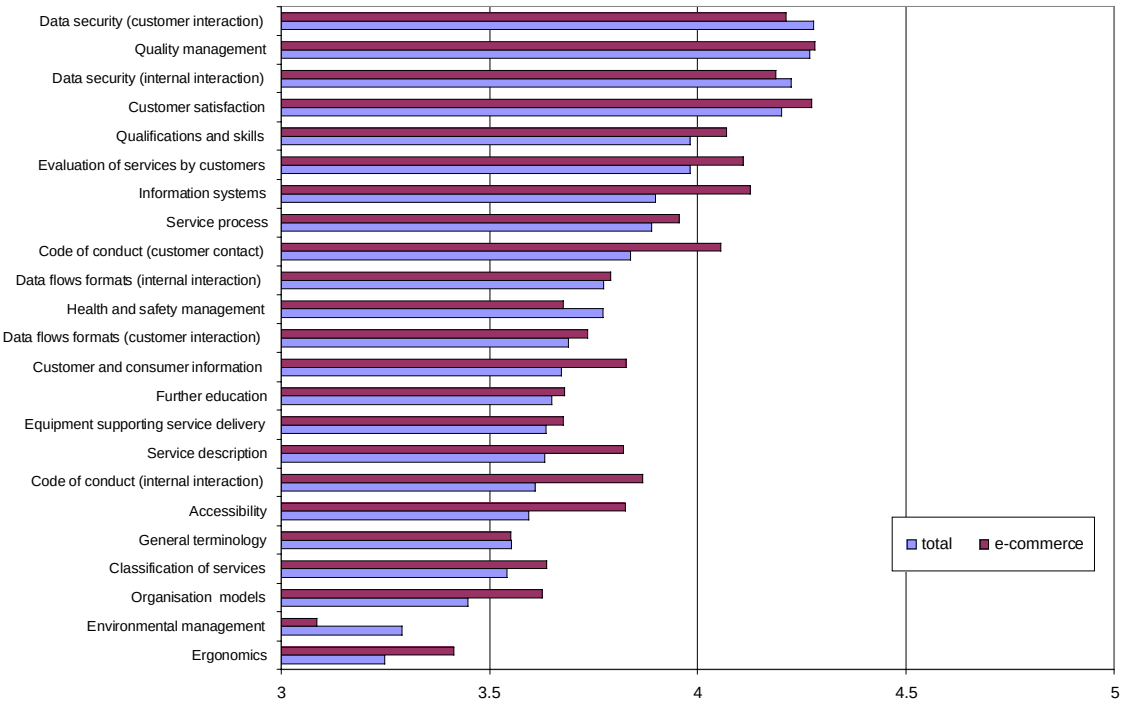

Figure 4: Importance of standards for service-related aspects (3 = medium importance to 5 = very high importance) (Source: Blind 2004)

2.3.1 A Brief Analysis

Comparing the insights from the overview of the use and future demand of e-business and e-government standards reveals the following patterns. The use of e-business standards is certainly more advanced than the use of e-government standards. Furthermore, based on the country overviews of both running and planned activities related to e-government standards and the regional e-business indicators, we observe a positive correlation between advanced positions in the diffusion of e-business activities and standardisation related initiatives in e-government. There are obviously regional spill-overs from the private e-business to the public e-government activities, which cover also the area of related standards. These potential spill-over effects have to be exploited more efficiently. However, as already argued above there are distinct differences between the requirements of standards for e-government solutions and e-business solutions especially regarding

the issue of participation. Consequently, specific standardisation efforts driven or even funded by governmental organisations have to be made in order to satisfy these special requirements. Published standards, e. g. in the area of accessibility or security, can later be also implemented in private e-business solutions – another way of creating positive spill-overs. Here, the relative lack of customer oriented standards in e-business could benefit from such spill-overs. For the generation of transnational spill-overs common European guidelines and directives, e.g. on interoperability, are an efficient means to generate common European standards for e-government and to solve the free-rider problem.

2.4 Demand for Standards: Standardisation and Business Models

The range of actors in the development and implementation of standards is diverse: the marketing specialists of technology companies, business strategists in user organisations, technical specialists in user organisations and, most heterogeneously, the end-users. In the development of e-business standards for the exchange of patient records in healthcare, for example, actors in specialist software suppliers, administrators co-ordinating government e-health policy, hospital managers and patients whose data will be exchanged all may benefit from standardisation, so may act to generate the demand for standards, and all may act to shape the implementation of standards. The social processes underpinning the demand for standards and their supply are therefore potentially very complex. To simplify these complex processes this section will develop a two-stage institutional model of the dynamics of the demand for standards and the process of its supply: first we shall argue that business models act as the mechanism enabling disparate actors to reach consensus on the benefits and functionality of standards, both within organisations and between organisations; and second, that SSBs, including standards consortia and formal standards bodies, become the institutional embodiment of the shared elements of these models and manage the process through which the demand for standards embedded in the models is met.

As noted in the introduction to this report, classical studies of standardisation have focused on the benefits of standardisation over variety and the battles for market supremacy between competing standards, neglecting the negotiation of standards amongst diverse groups of stakeholders. Specifically research on ICT standardisation has concentrated on wars between competing standards, for example DVD or digital telephony, and has been less interested in standardisation where the negotiation of standards and their dynamic evolution have avoided the emergence of directly competing standards. E-business is one standardisation arena characterised by a paucity of so-called standards wars.

Economic analysis of ICT standardisation has largely started from the point where the producers can see a potential market for the system and must decide whether to develop a proprietary solution or co-operate in developing standards. For this reason the study of standards has been dominated by models of their supply rather than their demand. However users and developers of e-business must continually be thinking about their needs for standards, either to initiate them or shape their evolution. The techniques used to assess potential value, and by extension demand, include market research and scenario building. With novel technologies it is difficult to assess user utility through surveys, so the emphasis falls more heavily on scenario

building. Essentially scenario building is the developers of the technology socially constructing archetypal prospective users. The elaboration of scenarios runs an inherent risk of locking into technology trajectories, for example a belief that users want access to faster internet connections or to possess smaller mobile phones. For every trajectory that turns out to be substantiated there are others, for example the assumption that commercial air travel would increase in speed, that come to an end. The importance of trajectories in technology development is increased because, either singly or collectively, they represent business models. For example in developing location-enabled services for smart phones scenarios of potential use will be developed. These might include "Marie: tourist with children seeking buildings of interest", "Peter: local government planning inspector" and so on. From these scenarios specifications for the information required by the user can be derived, the number of potential users estimated and studies of tourists and planning inspectors undertaken to estimate the value of a service. The scenarios may be used to identify existing standards which may be appropriated, for example in this case GPS, and to explore the choice between developing a proprietary solution or building a network of other organisations to formulate a standardised solution. Put simply, this is just another manifestation of the strategic dilemma: compete or co-operate.

The scenarios act not only as a technical template but also as a pattern for how the technology will generate revenues: the scenarios become the bridge connecting technologists and business specialists. Similarly in SSBs the scenarios act as the glue holding together disparate communities of technologists, marketers and business policy specialists. If every supplier accepts a trajectory and its associated scenarios the trajectory will become self-fulfilling, irrespective of its utility. The most extreme example of this is where the acceptance spreads to regulators who can mandate the technology, as currently seen in several countries planning to turn off the analogue television signals: it will be left to the politicians to explain to users who have not invested in digital receivers why their television sets no longer function.

As discussed earlier, e-business standards are diverse: from generic infrastructural standardisation, for example communication protocols and XML itself, through to the standardisation of the information exchanged between trading partners. If we consider the application of e-business in a defined sector, which could be private or public, the actors in the sector are aware of accepted technological trajectories, as seen in public administration targets for the roll-out of e-government services or in the finance sector's belief in that internet banking will grow in importance. The first choice that faces organisations is between developing proprietary solutions and collaborating with other organisations with similar processes. This is a stark choice between competing business models: between aiming for strategic competitive advantage and aiming for efficiency improvements which will be shared across the sector. It is also clearly a choice between adopting standards versus developing proprietary solutions.

The history of sectoral e-business saw a small number of classic early strategic implementations, including airline reservation systems, followed by the vast bulk of EDI standardisation developed within collaborative SSBs. We can make a distinction in the demand for sector-specific standards where the standardisation processes are dominated by user organisations, as exemplified by the European Committee for

Banking Standards[27], and generic standardisation where the processes are dominated by system suppliers, as exemplified by the UDDI standards process within OASIS[28]. Sectoral organisations have little incentive to be active in generic standardisation as someone else could provide their expertise, essentially a free-rider problem, and system suppliers are either passive or uninvolved in sectoral initiatives because they want the standards to embody user needs and the standards legitimacy not to be undermined by a suspicion that they were not shaped by users. Because the development of sectoral standards is less motivated by an expectation that they will generate revenue participants will tend to develop more open standards, albeit often still trying to generate sufficient revenues from licensing to fund the development and maintenance of the standards.

The demand for e-business standards may therefore be seen as two parallel processes: end users coalescing to form collaborations to spread costs and maximise network externality benefits and system suppliers, collectively identifying a user need that generally crosses sectoral boundaries, collaborating to maximise their strategic advantage. In each case there is a tension for each organisation involved between co-operating to hold the coalition together and acting selfishly to ensure that their particular objectives are met, which in the case of sectoral standards centres on ensuring the standards closely match their own processes and functional requirement or in the generic alliances ensuring that their strategic advantages are optimised. We would argue that this divide between generic standardisation being colonised by pushers and sectoral standardisation being the preserve of end-users is very marked in e-business standardisation and is due to these differences in business models. For example the global health standardisation organisation HL7 is dominated by health users, with the providers of health systems lurking in the processes to ensure they have awareness of the emerging standards (Bunduchi et al, 2005) whereas the Web Service and Grid standards development process are dominated by systems suppliers including IBM and Microsoft: they can see these standards fitting in with their strategies but few users can see these standards as being so strategically important that they need to become involved.

The final area in which business models shape the processes of standardisation is in the scope of the standards development process that emerges. We can imagine e-business standardisation emerging in the widget manufacturing sector as individual widget manufacturers, exposed to a belief in the inexorable rise of e-business and pressure to remain internationally competitive, start to explore how they can use the technology. They develop scenarios and soon realise the benefits of co-operation. Naturally they start by talking to their domestic competitors with whom they may have links through trade associations. As their processes are similar and there is a high level of trust the benefits of co-operation are high and the extra costs are low. As the community grows however a point may be reached where widening participation increases costs but has little impact on benefits: if processes are diverse the business model will become more complex, the co-ordination of the network will become more complex and it may be that if people only trade widgets locally there is no benefit in a global standard. If the widget sector exhibits wide diversity of

[27] www.ecbs.org.

[28] See http://www.uddi.org/members/.

business processes, is highly dispersed and not concentrated we would expect to see the emergence of local standardisation. It is unsurprising that the most advanced e-business standardisation is in sectors with high concentration and low process diversity such as electronics and automotive. It may also be that someone in the widget industry believes that their standardisation business model may be translated effortlessly into the grommet sector because their processes are similar. If it is found that their processes are not similar it will lead to additional complexity, a wider range of scenarios and extra costs. The problem of sharing scenarios and business models across international networks is particularly stark in e-government standardisation: in many areas of public administration centuries of national autonomy has led to wide process diversity. In developing e-government standards this either leads to complex standards incorporating a wide range of scenarios, a specification of 'best practice' which expects all users to converge on one process model or the emergence of parallel national standardisation initiatives. We can see why the lack of competitive motivation avoids e-business standards, especially sectoral e-business standards, fighting 'standards wars' but there is in the sharing and institutionalising of scenarios in business models the danger that parallel communities will become locked into incompatible standards. However the history of EDI standardisation, with the emergence of parallel but converging ANSI and EDIFACT communities, demonstrates that the inherent flexibility of e-business standards and the evolutionary dynamics of their use enable convergence to occur progressively (Graham et al, 1995).

We can therefore identify a process in which the scenarios developed by users lead to a convergence within organisations and across organisations of how standards will create benefits for users. The conglomeration of these scenarios and the shared plan for co-operation to turn the concept into reality represent a standardisation business model. The inchoate needs for standardisation coalesce as the organisations agglomerate into SSBs: the greater the diversity of organisational forms the more likely it is that distinctive requirements will emerge geographically and will then be manifested in local SSBs. Standards consortia are therefore the institutionalised embodiment of the demand for standards.

The two failures in the demand for e-business standards are excess momentum and excess inertia. In cases of excess momentum individual organisations or small consortia plough ahead developing local standards creating barriers to wider e-business or developing standards duplicating existing standards. In cases of excess inertia organisations are unaware that they share the same requirements as others so there is no mechanism to achieve a critical mass in an SSB. The solution to both of these failures is predicated on the insight that for most users of e-business standards their motivation is to improve efficiency and service rather than to gain sustainable competitive advantage. This drive for efficiency lowers resistance to co-operation to develop standards and also increases the willingness to share the outputs and expertise beyond the community. However to co-operate and to share expertise it is necessary to make links with other organisations that face the same problems. It is no coincidence that two of the earliest successes in e-business were in sectors with strong existing networks developing business standards: cheque clearing in banking and bar code scanning in retailing. It is not necessary that there is a central repository of scenarios, standards and business models, rather it is necessary that actors who may be widely dispersed can find details of equivalent standards activities.

2.4.1 Evolving Analytical Perspectives in Standardisation

The study of the development of standards has evolved rapidly in the last 25 years. Historically standards were viewed as public goods with high social welfare characteristics. This perspective was a result of a focus on standards developed within established, formally recognised standards development organisations (SDOs). Although the strategic dimension of these standards was recognised, the analytical emphasis was upon institutional forms, processes and controls.

Two major perturbations upset this view: the inclusion of standardisation with wider economic theories of innovation and the emergence of new institutional patterns of standardisation, in particular Internet standardisation. Traditionally innovation theories have assumed that standardisation occurs late in the innovation process when the technology is mature. New theories of innovation maintain that standards can influence the directions of technical change much earlier, mainly by creating positive returns to adoption and generating path dependencies (e.g., in (Arthur, 1989), (David, 1985), (Katz & Shapiro, 1986)).

Many additional perspectives have been added to this 'new school'. Many social scientists focussed upon the *process* of standardisation ,. opening up critical investigations into the roles and public interest ramifications of standards institutions (see e.g., (Salter, 1988), (Hawkins, 1999)). It led also to the exploration of the strategic role that standardisation could play for suppliers in co-ordinating technologies and in organising markets ((Schmidt & Werle, 1998), (Spinardi et al., 1997)). The overall results of this research were an expanded taxonomical framework, a much more critical view of the social welfare potential of standardisation and an increased focus on the strategic use of standards in line with commercial agendas (mainly of technology suppliers).

The other major perturbation was the rapid diffusion of digital technologies which challenged traditional views of standardisation and reinforced some of the key ideas of the 'new school'. In particular, the phenomenon of positive returns to adoption, where the incentive to produce the same item increases with the use of this item, were seen to be particularly strong for information and communication technology (ICT), thus drawing much increased attention to the strategic importance of standards (see e.g., (David & Steinmueller, 1990), (Katz & Shapiro, 1986), (Arthur, 1989)).

ICT standardisation also generated institutional challenges. Although early standards like OSI and ISDN were developed within established institutions, by the late 1980s centrifugal forces were rupturing this structure. By the late 1990s, spurred largely by the burgeoning Internet phenomenon, most of the significant standardisation activity in computing and telecommunications was located in consortia that were dominated by proprietors of key technologies (Hawkins, 1999). These developments prompted more investigation of standardisation outside traditional institutional contexts. In particular, more attention was shifted from formal standardisation activity in SDOs, to 'market' driven standardisation through the procurement behaviours of users rather than formal negotiations between stakeholders.

In economics, this market-selection process itself became a major concern of theory and research. The positive impacts of standardisation were seen to flow primarily

from the efficiency with which optimal technological characteristics were selected that would not impede innovation. However it was suspected that the cumulative effects of market decisions could lead to the emergence of de facto standards embodying unproductive path dependencies. The policy issues raised problematised the relationship between formal and market standards and to the questioning of equity, stakeholder motivations and institutional legitimacy.

The outcome of all of the above was a general view that standardisation and innovation were connected systemically along with a broader definition of what standardisation was and how it occurred. But this view generated many new questions about how demand for standards was actually generated and fulfilled. It suggested in particular that the 'market' for ICT standards was extremely complex, involving diverse motivations for creating and adopting standards, as well as many potentially diverse outcomes.

Thus, the impact of any particular standard could be expected to be different for each stakeholder group. The obvious concern was the possibility that a standard which might have a positive impact on technology suppliers could have a negative impact on technology users, or *vice versa*. This is especially important in the ICT context because the producer goods sector is not the most significant source of innovation in ICT. Increasingly, innovation lies in the applications. This level of value is added by industries, organisations or even by individual users outside of the producer sector.

All of this implies that in order to examine the impacts of standards in e-business, we first need a framework to organise knowledge and research about the relationships between stakeholders in the standard and about differences in stakeholder awareness, motivations and expectations. In this section, a framework is proposed that focuses upon the structural relationship of various stakeholder groups to standardisation, described in terms of how different stakeholders demand and acquire standards and their corresponding motivations and/or capabilities to influence the standardisation process.

To this end, the concept of the *'business model'* will be explored. *Business models* describe commercial and organisational topologies for the exchange of goods and services from the perspective of value creation and exchange. As such, they are a useful device to characterise the complexity of the standardisation environment – which for most stakeholders is closely connected to the procurement and deployment of ICT in commercial or public service contexts.

However, before we can explore these matters, we must first assess the structural relationships of stakeholders to standards. We must then examine some of the characteristics of standards in terms of how their value is determined by different stakeholders and on what basis they are produced and disseminated (or 'exchanged') among stakeholders.

2.4.2 Structural Stakeholder Groupings

The old school of standards analysis would have regarded the formal standardisation process as a way to balance producer and user interests through an intermediary who imposes a neutral set of rules. A frequent assumption was that formal standardisation would offer a better opportunity for overcoming market

failure and including particularly non-economic interests that otherwise might not be represented in the standardisation process.

Nevertheless, even if formal processes were to operate to maximum efficiency, there are two inadequacies in stakeholder equity. First, in most cases information flows will be biased in favour of some stakeholders over others. Vendors of technology producer goods usually have an incentive to restrict the public dissemination of information relevant to the standards. This may place non-producers at a disadvantage in the negotiation process.

The second weakness in the simple producer/user distinction is that technology producers are also users of standards, indeed, in many cases they are the only users who explicitly are aware of the standard. In general most standards are acquired as already embedded in producer goods or services and thus transparent to most users. Certainly, this distances the end-users (especially consumers) of these products from the standardisation process, but there is no guarantee that all producer interests will be represented in the standard either. Producers use many standards but obviously cannot and do not play a role in developing all of the standards they use.

In order to set up scenarios in which we can envisage these much more complex user dynamics, we first have to identify some key sets of variables.

2.4.2.1 Relational Variables

One set of variables clearly must consider the relationship of various stakeholders to ICT itself – i.e. to the technology domain for which the standards are developed. Rather than thinking in linear terms of producers and users, we could consider instead an interactive ***triad of constituencies***:

- ***producers*** supply electronic components, systems and discrete software products (i.e. embedded software and/or software 'packages');
- ***appliers*** procure and configure producer components to provide specific value-added functions for other types of products and services (including custom software and ICT consultancy services and non-commercial public services);
- ***consumers*** procure pre-configured producer goods and services and/or marketed ICT-enabled value-added goods and services.

Each of these constituencies holds a distinctive and often different stake in standards. As illustrated in Figure 5, there is no linear relationship between the three, but rather many interdependencies. Consumers may acquire both producer and applier goods or services. Likewise producers can elect to supply pre-configured items to both consumers and appliers, or to adapt at least some of their production facilities to meet applier specifications.

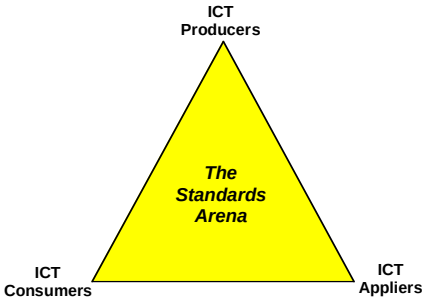

Figure 5: The stakeholder triad

Thus, each constituency is linked to the others. In most circumstances this places at least limited constraints upon independent standardisation actions by any one constituency. The space bounded by these interdependencies is the *arena* in which standards requirements are defined and the interests of the three stakeholder constituencies in these standards are played out.

However, a further major complication is that various auxiliary institutions also interact in this arena. In other words, as illustrated in Figure 6, the standards arena typically is populated by several types of intermediary. In the past, observers tended to regard SDOs as the dominant intermediaries. But in the ICT field at least, there have long been many others, ranging from industry associations (IA), and consortia and public service organisations (PSO) to public administrations (PA) in the form of various national and international regulatory bodies. Indeed, the distinction between informal (market, *de facto* etc.) standards and formal (consensus, *de jure*, committee, industry-wide etc.) standards has long since become blurred.

Thus, the intriguing issues are:

- how and why different intermediaries might act in concert with particular stakeholder constituencies;
- how intermediaries might compete with one other for the support of stakeholders;
- how and why different types of intermediaries might co-operate;
- how intermediaries might engage in entrepreneurial behaviour involving the development of standardisation business models in their own right.

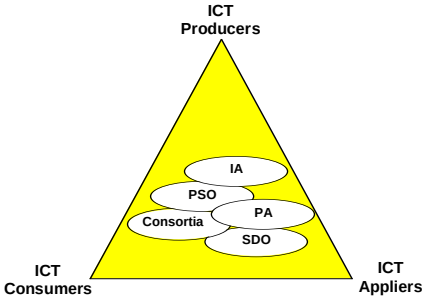

Figure 6: Intermediation of the standards arena

These issues (particularly the possibility of entrepreneurship) are now much more visible in the intermediation structure. Particularly in Europe since the introduction of the Single Market and the 'new approach' to standards and certification, the markets of national SDOs in particular have dwindled steadily as more standardisation activity shifts to regional and international levels. This has led in some cases to increased reliance on auxiliary income sources (like certification) or to action to induce standardisation in areas where no clear bottom-up demand can be shown. Prominent examples are standards for services and some environmental standards. The phenomenon also exists at the international level and raises questions as to whether SDOs are abdicating their traditional 'third-party broker' status in favour of active market creation strategies

2.4.2.2 Contextual Variables

Within these arena boundaries, we can start to think in terms of a further set of variables – namely how and at what point standards are applied in the technology production and application cycle. We could propose that there are at least three main ***standards application contexts*** in this cycle :

- ***Primary application*** of standards occurs where they are incorporated into producer goods and services;
- ***Intermediate application*** of standards occurs where they are acquired as embedded in procured producer goods and services by intermediate users who then build up further tiers of value-added products and services based on these standards;
- ***End-use application*** of standards occurs where end-users acquire the standards-enabled functionalities of goods and services.

We could consider the case of mobile telephony as an example of how these application contexts might join up in a simple chain. Manufacturers engineer terminal and exchange equipment that conforms to the requirements of, for example, the GSM standard (primary use). The equipment is then applied by network operators and service providers who add value by configuring the functionalities provided by the GSM in various ways so as to offer commercially viable mobile services (intermediate use). The resulting features supported by the standard are then acquired by the consumer in the form of a conforming handset (end use).

2.4.2.3 Motivational Variables

The remaining set of variables concerns motivations for stakeholders to influence and/or contribute to the technical content of a standard. In principle (although not always in practice), all constituencies can influence standards content. Even if they do not participate directly in the technical design of the standard, different constituents can nevertheless shape its content through procurement decisions where one standard is preferred over another, or by prioritising certain characteristics and functionalities of the standard in specific application contexts. Thus, we might again suggest at least four types of roles which could be assumed in different instances by any of the stakeholder groups:

- ***Controlling influence*** is exerted in the form of substantial financial and technical contributions to the development of the standard. This can occur in any modality

– within SDOs (to a lesser degree) and standards consortia in the case of nominally public domain standards, or through joint ventures, alliances, or firm level activities in the case of proprietary standards.

- ***Contributing influence*** is exerted in the form of general support for the standards initiative including at least limited participation in developing, approving and / or applying the standard.
- ***External influence*** is exerted in the form of expressing standards preferences, mainly through procurement decisions and standards application practices.
- ***Tacit influence*** is exerted in the form of collective preferences, for example the collation of market research data on user preferences. Individually end-users may be weak and underrepresented but this does not mean that they are collectively impotent and lack influence.

2.4.3 Generating Standards Stakeholder Hypotheses

From the above three sets of variables – relational, contextual and motivational – we can begin to construct scenarios about how stakeholders will interact in making and selecting standards. Several possible scenarios are outlined below as illustrations of how research hypotheses can be generated from them.

Figure 7 exemplary illustrates a scenario in which the *producer* constituency plays both a controlling role in the standardisation process and is also the primary user of the standard[29]. In this case, we could hypothesise that a relatively straightforward top-down application chain would develop. Certainly with proprietary standards, we could argue that this is a realistic scenario. We could hypothesise nevertheless that primary users will always have more incentive to take a controlling role in the standards process than intermediate or end-users. We could hypothesise also that if the locus of primary use were to change, the incentive to control the standard would change accordingly.

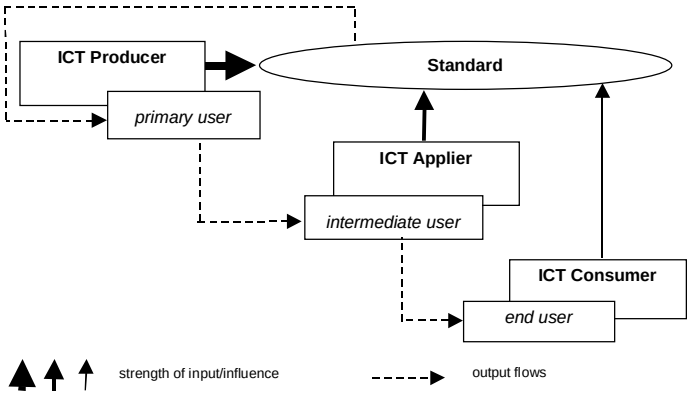

Figure 7: A producer scenario

[29] Analogously, an 'applier scenario' or an 'alliance scenario' could be pictured.

2.4.4 The Business Model as an Analytical Device

The business model concept is one way of describing the standards development and application environment in terms of how the motivations of different stakeholders to standardise are affected by factors that generate pressures for change in product/service functionalities. Nevertheless, the term is introduced in the present context with considerable caution. Its wide use is a relatively recent development and prior to the late 1990s the concept had only a loose association with any coherent body of theory or evidence. Therefore, it is important first to review briefly how the term came to prominence and to what it actually refers.

Particularly in the last ten years, ICT has been applied intensively to an unprecedented array of commercial processes. Apart from the many technical and practical challenges this has created for businesses and consumers, the scale, scope and pace of technological mediation in the marketplace prompted increasingly fundamental re-examination of longstanding assumptions about the interaction of buyers and sellers. It is possible that in some cases new forms of interaction with technology altered buyer-seller relationships and behaviours. But it is possible also that through the 'lens' of technical change many existing assumptions about market behaviour simply came under fresh scrutiny.

In particular, the more narrow economic perspectives on market behaviour, which focus predominantly on the instrumentality of prices, encountered many difficulties in accounting for the effects of technical change in the ways goods and services were exchanged. If the new electronic market modalities consistently generated lower prices, conventional economic theory would predict that buyers always would switch to on-line forms of trading. The problem was that it was easy to show empirically that many buyers switched even though prices did not decline.

Aside from the problems of hidden and transferred costs or enforced use (where the conventional market interface was either withdrawn or curtailed), a very different social dynamic appeared to apply to electronic trading. If the price differential was not favourable, or entailed other costs that were not obvious to the buyer, what would prompt a purchase on-line that could be made off-line at the same or even a lower price?

Questions like these focussed attention on the relationship between how value was perceived and how it was exchanged. Various intangible factors – like enhanced transaction convenience, increased range and quality of transaction services, or greater selection – were generic to many electronic market environments. These factors had little to do with the price of individual goods and services as such, but they appeared to be integral to how products and services were valued and hence how they could be sold in the market.

These intangibles became especially visible in the electronic marketplace, but probably were not unique to this environment. Although price theories had become dominant in analysing market behaviour, the phenomenon of electronic markets favoured a much broadened analytical scope that encompassed the social psychology of the marketplace, where observations had been accumulating for some time regarding the problem of unpredictability in market behaviours and the role of 'irrationality' in market decisions (see e.g., (Lane, 1991), (Leiss, 1988), (Kahneman, 1994), (Scitovski, 1976)).

Out this controversy emerged a lively debate about *business models*. At first, the term was applied rather indiscriminately – each instance of electronic trading was regarded as a new business model. Although subsequent use of the term has became more discerning, definitions still range widely from the abstract to the normative. Particularly at the more normative end of the scale, many definitions are somewhat redundant in that they encroach upon concepts like business plans and business process modelling that are already well developed in the management and information sciences.

The additional and somewhat unique element that emerged from the business model debate is that *a relationship exists between how goods and services are exchanged and how their value is determined*. In other words, at least part of the value of an item is construed from the context in which it is exchanged. This context encompasses both the social relationships of production and consumption, but also the financial and market structures that pertain to any given group of goods or services.

All of this implies that some types of contextual changes might actually increase product / service value. In commercial markets, sellers may transform these changes into additional revenue at the margin or into entirely new revenue streams. In non-market situations (e.g. public services) contextual changes may likewise enhance value for the provider and the recipient. Implied also, however, is that ill-advised contextual changes, or inability to change where required (due to internal or external reasons) can destroy value. Forces that motivate these contextual changes include:

- the introduction of entirely new products or services
- changes in product / service use patterns
- customisation possibilities
- emergence of new revenue streams (e.g. migration from product to service based revenues)
- changes in product / service functionalities
- product / service obsolescence.

Developments like the above typically require different processes, practices, technological configurations and actor topologies. Increasingly, these changes are linked with investment in ICT goods and the procurement of various value-added ICT services.

The basic building blocks of business models include many obvious modes of commercial exchange – retailing, wholesaling, leasing etc. Each mode describes a specific type of relationship between buyers and sellers. Business models describe how such modalities are linked to value creation and hence usually into commercial viability in terms of turning customer value into revenues. The whole process is influenced by many contextual and motivational stimuli and constraints.

In some cases, the exchange modality also may be the business model. For example, a firm could operate a simple retail model where all of the revenue was earned from mark-ups on a wholesale price (minus costs). But most models are far more complex. In many cases, only part of the revenue is generated directly by the sale of a good or service, the rest coming from complementary products or services. One of the most common models in the software industry has been to distribute basic code at little or

even no cost, the revenue being earned on tools, upgrades and services. Indeed, the core code in this case often functions as a standard.

Nevertheless, not every exchange modality (and business model) is necessarily appropriate to every product or service domain. Wholesaling, for example, is restricted by definition to transactions within supply chains and leasing would be inappropriate for non-durable goods. Nevertheless, often several modalities can be employed at the same time with respect to the same product or service. For example, a newspaper or periodical could be retailed to some customers and sold by subscription to others, whereas a third element of the revenue stream could be the sale of advertising. Variety in this form is in many cases a generator of increased value for both buyer and seller. Moreover, it has been demonstrated that one of the advantages of applying ICT to commerce is that it can widen the scope of models that are available for a given product or service and / or facilitate migration from one model to another.

Typically, business models are not applied exclusively by individual vendors, but rather in complex networks that may involve the intersection of various models that are specific to individual stakeholders. The rollout of GSM, for example, was dependent upon an interconnected set of models in which the nominal price of equipment was subsidised at several stages in order to encourage rapid adoption of the technology. The strategy was to absorb the subsidy costs quickly by generating a large service revenue base. This generated very complex business models. For example, the nominal 'retailer' did not actually earn much if any revenue from the sale of a handset or subscription to a customer but rather from a premium paid by the network provider for each signed-up subscriber. In effect, the business model was not to sell networks to subscribers, but to sell subscribers to networks. Similar situations applied all the way up the value chain, meaning that the business models of the network provider, the retailer and even the equipment manufacturer were entirely interdependent. The value for the customer was lower initial investment costs.

The business model concept provides a framework for describing dynamics like these systematically. Business models can range from the discursive to the formulaic and may include linkages to organisational, process and technology models. Analysis of a given product or service domain using this device begins with the assumption that in order to produce revenue, an enterprise must have developed a business model that is appropriate for the specific functionality of a specific asset (or system of assets) in a specific marketplace. These assets include capital investment in the form of ICT, the value of which can be enhanced and / or limited by standards.

Although in the first instance this kind of analysis is *ex post*, it also identifies those specific variables that may induce evolution and migration phenomena in the business models of various goods and services. This creates a dynamic framework within which to consider standardisation demand. A direct linkage between business modelling and standardisation can be established in that many of the relational, contextual and motivational variables that we see in the standardisation process have analogues and complementarities in the business modelling process.

2.4.4.1 Relational Variables

In business modelling, we encounter three principal interactive stakeholder constituencies that are somewhat analogous to those in the standardisation process:

- ***Originators*** produce goods and services (both ICT and non-ICT producer goods) as traded in the market or otherwise distributed by public agencies.
- ***Intermediaries*** assist and facilitate the distribution of goods and services through provision of enabling technologies and transaction-related value-added services.
- ***Consumers*** use up all of the value created by originators and intermediaries.

As illustrated in Figure 8, these relationships are configured in a similar way around what we could call a ***'business modelling arena'***. Current thinking about business models concentrates on the interactions between these stakeholder constituencies in establishing models in the market. The business modelling stakeholder triad as shown in Figure 5 is similar but not identical to the standardisation triad as shown in Figure 2.

The point of closest correspondence lies in the consumer constituency, which can be comprised of essentially the same types of stakeholders in both triads. Otherwise, the originators and intermediaries *may or may not* correspond respectively to the producers and appliers in the standardisation triad.

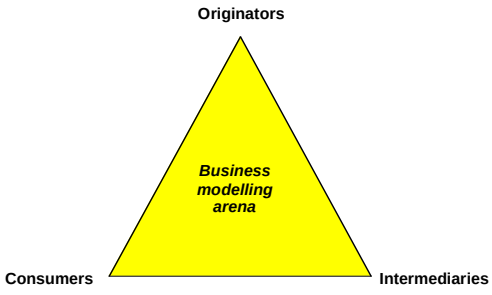

Figure 8: Stakeholders in the business modelling arena

If the business model concerns producer goods (e.g. a model for retailing PCs or software), then the analogue is fairly exact. Relationships in the standardisation arena can be expected to mirror directly those in the business modelling arena. However, as illustrated in Figure 9, where other types of producer goods are concerned, producers and appliers *both* assume the role of intermediaries in the business modelling triad. This reflects the fundamental intermediate goods characteristics of ICT and implies that the vortex of ICT standardisation activity lies in the intermediary domain. It can also imply either co-operation or conflict with the intermediation structure of specific *non-ICT* product / service environments.

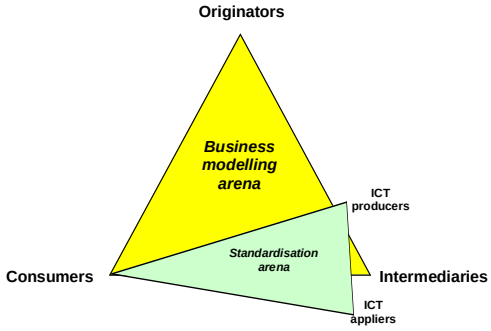

Figure 9: Juxtaposition of the standardisation and business modelling stakeholder triads

The problem is that the interests of producers and appliers may or may not be congruent with those of other intermediaries (or indeed originators), especially if they are oriented to exploiting the same value source. For example, both producer firms and financial institutions could have divergent commercial interests in standards for Internet banking platforms. suppliers may see value in promoting as many informal standards possible in order to create favourable path dependencies and network externalities – i.e. to promote services platforms tied to their own proprietary technologies. The financial institutions, on the other hand, may wish to control the interface technology themselves, preferring to rely on formal standards to ensure basic connectivity, but otherwise leaving the interface open for the development of competitive service features.

As noted above, except under conditions of market power, business modelling typically involves various degrees of consensus formation between the stakeholders in the triad. Originators, intermediaries and consumers alike have to 'agree' (or at least acquiesce) in some formal or informal way that a particular model creates value for them. This process also may involve standards in that aspects of the business model may only be workable or acceptable to stakeholders if a degree of standardisation is assured.

This creates various demands for standards which can be expressed by any stakeholder constituency. For example, if consumers of financial services perceive that security standards for on-line banking are inadequate, or they are required to purchase additional technology to access each provider of these services, they could be expected to express a demand for standards (e.g., by refusing to use the services). On the other hand, service originators who operate unique service environments behind proprietary standards may incur uncompetitive costs if they have to develop their own middleware rather than procure these services in the market. These are only two of many possible examples.

When we juxtapose the two triads, we see that wherever a product or service domain encounters the requirement to deploy ICT, the dynamics of business modelling intersect the dynamics of standardisation in the ICT producer goods sector. But although the two stakeholder triads are linked, by no means will all business modelling processes be congruent with standardisation processes – indeed there could be more scope for conflict than compromise.

Standardisation agendas in the ICT domain can be expected to reflect the competitive pressures within this domain. Clearly, this can set up tensions between the processes of business modelling and standardisation and these can have an impact upon how demand for standards is expressed. Moreover, noting again how the stakeholder triad typically is populated by several types of intermediary (Figure 6), it must be considered that the intermediation structure will be configured not only according to various stakeholder interests, but also to the emerging strategic and commercial interests of SDOs and consortia.

2.4.4.2 Contextual Variables

Contextual variables in the standardisation process concern where and how the standards are applied. With business models, however, the application context is formed more by the asset characteristics of individual products and services and the relationships between various stakeholders in exploiting the value contained in these characteristics. Each different source of value becomes a separate context in which business modelling can occur.

Problematically, just how stakeholders interact in order to create value is as yet the least well developed part of the business model concept. Most current explanations centre on the 'value proposition', which unfortunately is yet another term of dubious provenance. Most commentators regard a value proposition as a 'statement of value' upon which both buyers and sellers can agree in a specific product and market context. The proposition need not be made only in terms of price. Aspects like transaction convenience and efficiency may complement or even outweigh price signals in buyer decisions.

The problem is that usually the originator is identified as the source of the value proposition, taking into account various demand signals in the market. But possibility can be predicated only on the assumption of a high (and quite theoretical) degree of information symmetry between potential buyers and sellers. Figure 10 illustrates the structure of a value proposition under the assumption of information symmetry.

This construction is problematical where ICT is concerned in that so much ICT utility is undefined or latent. Appliers and consumers typically adapt the generic functionality of an ICT device or system according to their own specific needs or preferences, thus creating value-added applications. In turn, this action can create new markets for producers as critical mass develops around specific user-developed functionalities. Thus, once the financial services and transport industries had pioneered EDI, telecom network operators began to exploit this new market with Value-Added Network services. Or, once enough consumers had 'discovered' the additional utility of SMS on their mobile telephones, this originally ancillary service became a major part of the service and revenue portfolios of GSM providers.

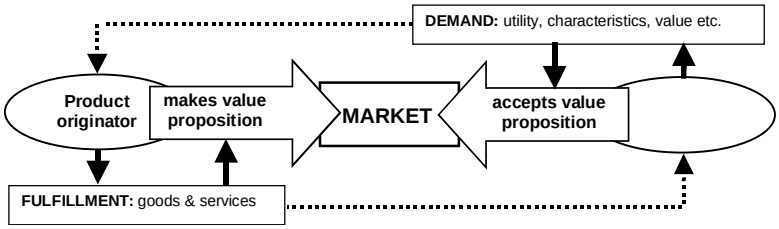

Figure 10 Abstract value proposition with information symmetry assumptions (Hawkins & Ballon, 2004)

Clearly, in the ICT case at least, the value proposition works both ways in basically an asymmetrical and constantly evolving information environment. These dynamics are illustrated in Figure 11 which presents the seller / buyer relationship in terms of continuous interaction between the fixed value assumptions of producers and the evolving preferences of buyers.

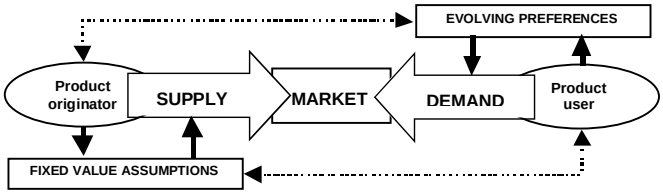

Figure 11: Value proposition with evolving information

Most producers cannot respond to user preferences on a completely dynamic basis for the simple reason that they have a fixed asset base (made up of tangibles and intangibles) that cannot always be changed as rapidly as evolution in buyer preferences. Thus producers have to assume that at least part of this sunk investment base can be transformed into value for the buyer at any given time. Product and service strategies are planned accordingly. Thus, we can view market relationships in terms of tension between what buyers indicate they prefer at any given time and the degree to which producers are able or willing to respond. In situations of market power, there may well be no incentive to respond.

Moreover, investment in new or different business models can be highly strategic. Even though a model developed by one firm or organisation may be transferable – in some cases as a kind of public good with positive externalities – there can be considerable first-mover advantages in developing a new model. Similarly to process innovations, these advantages occur where technical control or influence is maintained over key interfaces and systems along with supporting standards.

We must also consider the value proposition from the standpoint of institutional providers of standards – SDOs and consortia. The business model concept is basically that the forms in which value is realised (exchanged) also affect determinations of value. Thus, it is conceivable that value propositions involving standards may be connected to different forms of intermediation. The value proposition of most SDOs is that open processes and quasi-juridical procedures yield higher-value standards by maximising consensus and increasing the potential for

adoption. The value thus invested in these standards could be exploited by SDOs in a variety of ways, although heretofore most of them have linked value to publication or in some cases to certification and information services.

But new value propositions can be constructed around perceived inadequacies in this system. An obvious example is the longstanding issue of time-to-market. One of the original rationales for standards consortia to operate outside of the SDO system was that they could deliver the standards in a more timely fashion. The value proposition was that a standard had more value if delivered on a schedule that was linked to the actual progress of R&D and that specialised independent consortia could deliver this value better than SDOs.

We know from subsequent investigations that this proposition was at best superficial – that consortia were not always more efficient or timely and that they increased co-ordination costs. But this begs the question of what the real value proposition was. The massive rise in consortia numbers indicates that there is such a proposition and that it is accepted by stakeholders. But as discussed earlier on, often the apparent model is not the real model. The task for research in a case like this is to determine what the actual value proposition is and how the business model relates to it.

2.4.4.3 Motivational Variables

Although contexts may vary considerably, we can propose that in each case the motivations to develop and/or adopt a business model will depend upon the degrees of asset specificity and risk that apply to different stakeholders in a given commercial or public service enterprise.

The asset contributions of originators and intermediaries (including ICT producers) consist of the various forms of capital investment, physical infrastructure and human resources that they contribute to any enterprise (basically the conventional economic factors of production).

In terms of the enterprise – i.e. the supply mechanism for goods and services (originators and intermediaries) – we can identify at least three basic types of assets:

- ***Structural assets*** are non-substitutable and specific to a particular enterprise. If any of these assets were withdrawn, the enterprise would fail. An obvious example would be the IPR in a crucial innovation.
- ***Contributing assets*** are specific to a particular enterprise, but may be substituted in that more than one source of these assets could be used, or one type of asset could be supplanted by another for the same function. For example, a retailer of insurance services can procure these from several underwriters.
- ***Supporting assets*** are entirely generic and available to any enterprise on equivalent terms. For example, all on-line services use essentially the same public switched telecommunication infrastructure.

All three types of assets are needed before a model can function, but likewise, various business models will operate within each of these asset profiles. Thus, an asset could play supporting or contributing roles in some enterprises, but structural roles in others. For example, the public switched telecommunication infrastructure is a supporting asset for most businesses, but a structural asset for the telecommunication operators. Their business models are geared to this asset and any

change in these models incurs risk. Each individual business model must therefore be seen as part of an interactive configuration of models. We can propose that the viability of any given enterprise will depend upon the degree to which conflicts between the models can be managed.

But it is not only manufacturers and suppliers who must contribute assets to a business model. Consumers bring many assets to the marketplace as well. These are of two obvious types:

- ***Disposable assets*** in the form of the accumulated wealth that they exchange for goods and services.
- ***Fixed assets*** in the form of investments that contribute at least in part to the viability of various business models.

Similarly to firms, consumers also incur a type of transaction costs which, arguably, are significant (although not always sufficient) factors in determining what level of value consumers are willing to add to a product or service vs what level they expect to be contained in that item at the time of purchase. A simple example is value added fresh food products. Some consumers are willing to purchase whole raw vegetables and preparing them for cooking themselves. Others are willing to pay more for vegetables that are already prepared. Even if this value added is not 'realised' (in that none of it is sold onwards), these types of decisions about where the value chain or system will terminate are critical elements in the consumer interaction with business models.

Equally important is consumer willingness to contribute fixed assets. For example, consumers must absorb the depreciation on a motor vehicle that they use to transport themselves to a point of sale and/or to transport purchased goods to their own premises. Individually, these costs may be small, but when aggregated they represent a major contribution to the ubiquitous cash-and-carry business model that underpins many retail enterprises. Without consumer willingness to participate in such a model by contributing these assets, the model would not be viable. It is part of the economic structure of the retailing model. Likewise, in order to do electronic transactions, the consumer must be willing to contribute a capital investment to electronic commerce models in the form of a computer and the required services that make it available for transaction purposes.

In principle, every asset holder can motivate business model evolution. However, in order to determine what motivates stakeholders to participate in a new or different business model, we have to consider all of the above asset contributions in terms of the degree of risk that a stakeholder would consider appropriate relative to an expectation of benefit. Clearly, the more structural these assets become, the higher the risk. Where product choice is limited and/or where key contributing and supporting assets are unavailable on a competitive basis, stakeholders may compelled to use a specific model. Otherwise, throughout the value chain (or value network) each purchaser has to be willing to incur the costs (and risks) of using a given business model.

2.4.5 Using Business Models to Describe the Standardisation Environment

Although the origins of the business model concept lie in the commercial arena, use of the device need not be confined to this context. The business model also can be a useful analytical device wherever it is necessary to examine the relationships of different actors to the same product or service, especially in an electronically mediated environment. A case in point is public services which have many of the same actor relationships as commercial services and are subject to many of the same challenges posed by technical change. Indeed, public service elements are now conceptualised commonly as 'business areas' for internal management and public relations purposes. Moreover, some are provided on a commercial basis by contractors, or in public-private partnerships, all of which emphasises this dimension.

In either a public or private sector context, the key dynamic is that in order to function, a business model must to some extent be 'acceptable' to all stakeholders, each of whom plays a role in the construction of value, which over and above the economic process of production is also a social and psychological process. Indeed, at least to the extent that some degree of competition is present for the provision of a product or service, business models could be seen to represent a kind of (at least tacit) consensus among these constituencies. Herein lies the pivot for using business models to illuminate the standardisation process.

The basic task for research is to determine the characteristics of the relevant business models for traded goods and services and then to identify the forces that might generate changes in these models or shifts from one model to another. From this standpoint, the complementary pressures upon the enabling and supporting technologies like ICT can then be identified, along with the implications for standards and in many cases the structures and methods of the standardisation process. Assessments of the business models of suppliers become relevant at this point as do assessments of the models of SDOs, consortia and other relevant institutions. All can be analysed in essentially the same way.

In each of these contexts and regardless of the business modelling framework employed (whether discursive or formal), *ex post* analysis of business models should reveal such characteristics as:

- which actors are invested where and to what extent in a given enterprise;
- enterprise structures and actor topologies;
- market and financial structures;
- revenue streams;
- critical asset dependencies;
- critical actor interdependencies and feed-back mechanisms;
- links between technological infrastructure and commercial or public service infrastructures;
- stress points where new functionalities (and innovations) are likely to occur.

By mapping such variables in each context and then superimposing them to some degree, it should be possible to detect relationships, interdependencies and even perhaps causalities. The aim of research would be to show how demand for standards is generated within actual environments in which goods and services are

produced and exchanged and how standards are related to the construction of value for these goods and services. This in turn would illuminate one of the critical elements in determining whether the application of a standard was having positive or negative impacts and what might be the forces for change in the content of a standard over time.

Comparative analysis of the business model contexts should indicate any asymmetries between standards requirements and the abilities of various standardisation institutions and methods (including market selection) to respond. Also, it should indicate how new demand for standards will be issued and preferences for how this demand should be fulfilled.

It was proposed above that standards demand is issued primarily in the form of signals between constituents of the ICT stakeholder triad to the effect that existing functionalities either should evolve or be decommissioned and/or that new functionalities should be added. Many of these changes will depend on standards (as for example where new functionalities require greater interconnectivity or interoperability), but not every constituency will necessarily issue the demand for change explicitly in terms of demands for standards as such. Some constituencies may be unaware of the standards implications, or, for a variety of reasons, elect not to invest directly in developing the necessary standards. Others will take direct roles in standards development and may engage in highly strategic behaviours.

In order to unpack the elements of this problem using a business model perspective, value propositions would first have to be derived for a standard that corresponded to the value propositions underlying the products and services to which that standard applies. This would amount to a statement of why a specific standard, or a specific degree of standardisation, or even the elimination of an existing standard would add value for each of the constituencies in the triad with respect to that product or service. At a micro or meso level, impacts could be assessed in terms of these expectations.

In principle, any of the stakeholder constituencies could be involved in formulating these value propositions, but, following the expression given in Figure 10 (above), propositions would require a degree of feedback from the other constituencies to become valid or operational, except under conditions of market power where a dominant producer and/or applier is in a position to dictate standards. Indeed, where little or no correspondence can be found between the value propositions and business models of standards and those of traded products and services, it would have to be considered that the standard was a instrument of market power or even of entrepreneurship by SDOs and/or consortia.

Observed demand for change in functionalities – and standards – could be expressed in terms of 'evolving preferences' which shape demand signals according to the requirements of particular business models. The evolving preferences of each constituency likely are shaped by many forces, but all stakeholders in the triad are bound to some extent by fixed value assumptions. For producers, these typically are generated by such factors as sunk R&D investments, asset specificities and path dependencies, all of which open up gaps between the preferences as expressed and the degree to which they can be fulfilled.

2.5 A Business Modelling Framework

In the discussion of standards and business models that appears above, it was suggested that the standardisation and business modelling arenas intersect. In keeping with the function of most ICT products as intermediate goods, the main locus of interaction was seen to occur at the 'intermediary' corner of the business modelling arena. In other words, we suggested that on the basis of current knowledge and practice, most standards are developed by producers and/or appliers who supply goods and services that intermediate between the originators of traded products and services and the consumers of these items.

This relationship is illustrated in Figure 12. The circle indicates the 'hot spot' where most of the standards making occurs. This is located at the 'intermediary' corner of the business modelling arena because most of the participants in standards-making are suppliers of intermediate goods and services.

However, for purposes of constructing a business modelling framework, we need to select a very specific business segment with specifically observable actor dynamics. Moreover, this segment must be

- congruent with the interests of the main stakeholder community to whom we addressed our impact survey (which is made up mainly of telecommunication equipment suppliers and network operators),
- relevant in the context of the project as a whole, which is concerned with the impact of standards on such areas as e-commerce, e-business and public services.

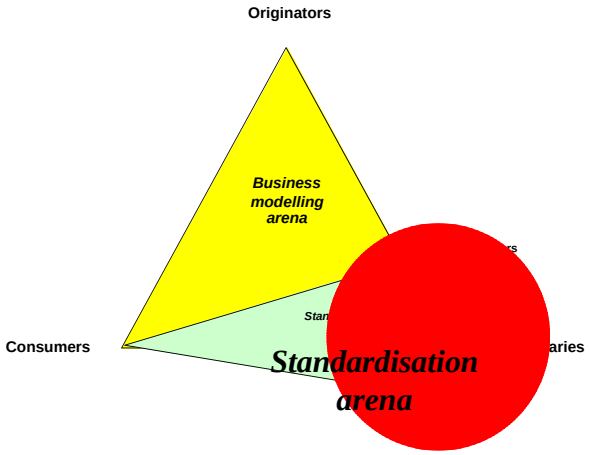

Figure 12: The standardisation 'hot spot'

Applying these criteria to the project case studies, we have selected '***broadband service platforms (fixed and mobile)***' as the business segment displaying the most comprehensive set of characteristics for demonstration purposes.

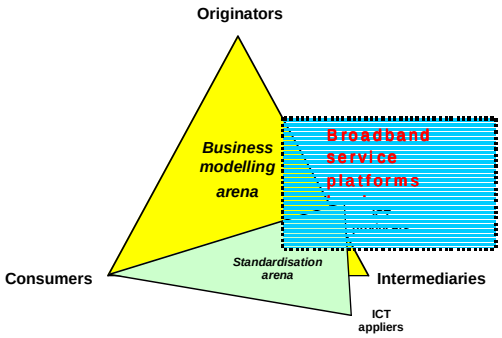

Figure 13: The broadband service platform product group relative to the standardisation and business modelling arenas

A ***broadband service platform*** is basically an environment that allows various types of applications to be offered using a single common interface and service management package. Developers and purveyors of these platforms are all producers in the sense that the platforms form basically a product group which appliers can deploy and consumers can access. Some broadband service platforms are available as commercial products in their own right (e.g. portals), whereas others are embedded in other product and service environments (e.g. financial services and electronic market platforms).

The position of the product group relative to the standardisation and business modelling arenas is illustrated in Figure 13. Broadband services platforms are relevant also to the originator and consumer communities in the business modelling arena and we could choose to model the business dynamics in this broad context. But given that our impact assessment data is centred mostly in the producer domain, we will concentrate for purposes of our demonstration only on the business model dynamics within the ICT producer community itself.

2.5.1 Constructing a business modelling framework for broadband service platforms

Before we can begin to describe business models pertaining to broadband service platforms, we must consider the structural position of these platforms in the overall electronic services infrastructure. Figure 14 illustrates their most common position which is that they intervene between the public data network and various broadband service applications. There are of course many possible specific architectures for these platforms. Figure 13 illustrates only the basic elements of a typical platform, which are:

- an ***Operating System (OS)*** that is oriented to the characteristics of a specific terminal device, e.g. a mobile telephone or PDA;
- a ***User Interface (UI)*** that provides the 'look and feel' of the service environment to the use.

The diagram illustrates also a third and underlying element in the service platform which is comprised of various assorted ***middleware*** (encompassing APIs and various supporting software development methods and tools). Middleware is software that connects application functionalities to a network, thus enabling data to be passed

from one application to another. The user interface in Figure 14 contains middleware elements. However, the Application Programming Interface (API), which is a key middleware building block, can be a means of decoupling the exchange of data from any particular operation system.

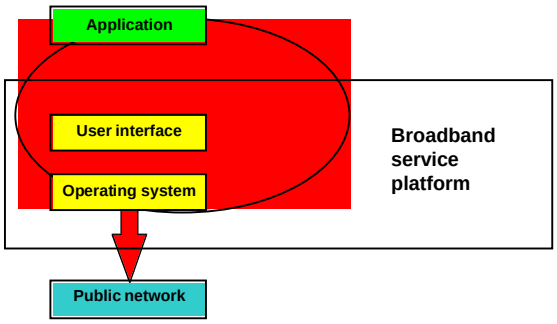

Figure 14: Structural position of broadband service platforms

It is possible that all of these elements could be developed and provided by one supplier. Typically, however, there is now competition among suppliers of different elements. Thus, in principle, broadband services can be provided on three types of platforms:

- ***Integrated platforms*** allow data to be exchanged between applications only via a specific UI linked to a specific OS (e.g. both being supplied by the same proprietor or by an alliance of proprietors). An example is Microsoft Windows for Mobile.
- ***Dependent platforms*** in which data can be exchanged between applications via various UIs, but linked to a designated operating system (either proprietary or non-proprietary). An example is the Symbian initiative.
- ***Independent platforms*** in which data can be exchanged between applications independent of operating systems. Independence can be provided by specific APIs (like Java 2 Micro Edition) but it is also linked to broader initiatives (like Parlay) to provide a general open service architecture.

These platform types are not necessarily exclusive of one another. For example, the Symbian OS could still function within the Parlay open service architecture. Nevertheless, each type of platform portends different standardisation strategies, all of which relate mainly to the operating system. In the case of integrated platforms, the strategy is to establish a proprietary OS as the industry standard, thus leveraging the position of the OS proprietor in the UI market. The independent platform is a counter-strategy strategy to the integrated platform, the standard acting to circumvent lock-in to any one OS. The dependent platform strategy sits in the middle, the standardisation strategy being to open the interface between the UI and the OS thus (likewise counter to the integrated strategy).

To varying degrees, each standardisation strategy is connected to different competitive opportunities which may be expressed in the development of new business models or in the take-up of existing models by enterprises not heretofore

associated with these models. For example, enterprises that traditionally were equipment vendors may also participate in retail services models.

2.5.2 Determining the value proposition for broadband service platforms

The earlier discussion about the nature of value propositions stressed that they are not linear – i.e. constructed by the supplier and accepted or rejected by the buyer. Rather, they are reflexive, representing an interplay between expressed customer preferences that are always in a state of evolution and the various factors that limit suppliers from responding symmetrically to these preferences. These factors can include sunk investment in R&D as well as in existing product lines.

In such a framework, the value proposition is a kind of tacit agreement that within parameters understood by both buyers and sellers a good or service represents a appropriate balance of value to the buyer and remuneration to the seller. However, these parameters include more than just price. The way in which the good or service is provided and by whom is also a component of the value proposition to which the business model is oriented. Thus, in the present case, we could hypothesise that under some conditions a broadband service platform that is vendor independent might offer better value that one that is vendor dependent – or *vice versa*.

The structural characteristics of broadband service platforms and the various competitive strategies behind the three platform types as discussed above suggest three obviously related value propositions, each of which offers advantages under different circumstances to various stakeholders. These are:

- **VP_1**: ***vendor specificity*** – The value is generated in that all of the functionalities of the platform are controlled by an OS that is proprietary to one vendor. The proposition is that in exchange for acceding a measure of market power to the OS owner, the intermediaries and users gain quick and efficient generation of positive market externalities. The assurance of stability lowers the risks of developing broadband products and services.
- **VP_2**: ***vendor neutrality*** – The value is generated in that the functionalities of the platform are controlled by an OS that is common to several vendors. The proposition is that by assuring an open OS, the same level of risk reduction and product and service development flexibility would apply as under the vendor specific proposition, but without acceding market power to any OS proprietor.
- **VP_3**: ***vendor by-pass*** - The value is generated in that the functionalities of the platform are independent of any proprietary or non-proprietary OS. The proposition is that by eliminating linkage to any specific OS, product and service developers have maximum flexibility in an environment free of rents.

Each of these propositions may appear more-or-less attractive from the perspective of each of the constituencies in the business modelling triad. In the present case, these are defined as follows:

- the ***originators*** are the platform developers who design and/or integrate the basic components of the service platform;
- the ***intermediaries*** are the various enterprises that configure these platforms to the requirements of specific service environments;

- the ***users*** are the enterprises that actually deploy the platforms in order to sell broadband services to consumers.

As shown in Figure 15, however, the positions of specific types of enterprises in this triad are not fixed. For example, public telecommunication network (PTN) operators and telecom equipment vendors were the traditional originators of all communication platforms. Early digital network architectures like ISDN assumed that the primacy of this liaison in the design of service platforms would continue. Except for basic switched facilities, this has changed completely. With respect to broadband service platforms, computer and software vendors are now plating major roles. Moreover, PTNs are now frequently just carriers of service platforms developed independently of the telecom industry as such.

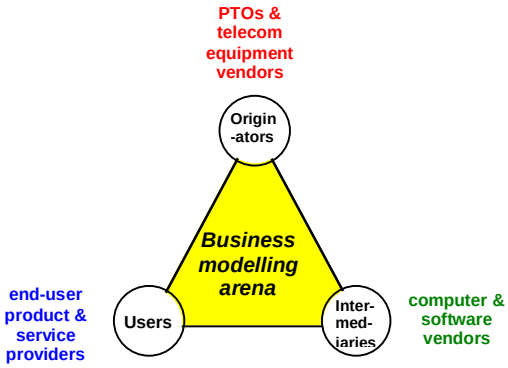

Figure 15: Traditional stakeholder positions in telecom service platforms

Historically, the positions of specific types of enterprises in this triad were mostly fixed. Public telecommunication network operators (PTO) and telecom equipment vendors were the traditional originators of all communication platforms. Indeed, the position of the PTOs in this structure was largely mandated by regulation. Early digital network architectures like ISDN proceeded on the assumption that the primacy of this liaison in the design and operation of service platforms would continue. This is illustrated in Figure 16.

In the present environment, however, except for basic switched facilities, the basic alignment shown in Figure 6 has changed completely. With respect to the current and planned generations of broadband service platforms, computer and software vendors as well as product and service providers are now playing major roles in shaping the service platform environment, including standards. The current environment is more like that illustrated in Figure 17 with frequent role redistribution among traditional stakeholder constituencies.

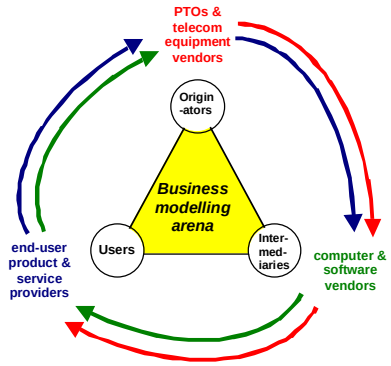

Figure 16: The current dynamic environment for development of broadband service platforms

Particularly in the mobile sector, equipment vendors have attained a high degree of autonomy in the design of service platforms. PTOs are now frequently just intermediaries, providing network facilities for service platforms developed by mobile equipment vendors, or in other cases by computer and software vendors. Increasingly, significant user entities develop various broadband multi-media platforms and platform specific applications independently of the telecom sector or even the computer producer goods sector. This can lead to the situation where PTOs can become 'users ' in that they provide not just the carriage facilities but also the active market interface for service platforms developed in other industry segments.

In the current highly dynamic environment, virtually any of the stakeholder groups could at some point act be observed to be acting as originators, intermediaries or users of broadband platforms. The circumstances governing their role in any particular instance are connected to the evolution of various new business models for broadband services.

2.5.3 The evolution of business models for network services

Virtually from its inception, the telecommunication industry was based upon a single simple business model. Revenue was generated in the form of fixed and variable rents charged for access to the public infrastructure. Tariffs were linked to pre-defined and fixed units of consumption calculated on the basis of factors like time, duration of use, volume of use and distance. Until well into the period when data traffic began to exceed voice traffic, regulated tariffs were determined mostly on a cost-of-service basis.

As a consequence both of market liberalisation and technical change, particularly the rapid increase in data traffic through Internet proliferation, the basic business models of the telecommunication industry have changed substantially. The nature of data networking and the social patterns of internet use mandated a pricing structure based on continuous access backed up by various 'intelligent network' management facilities. User demand shifted decisively away from business models oriented to 'dial-up' session-based access. Thus, PTO investment in broadband technology was linked as much to commercial pressures to instantiate these new business models as it was to specific service environments.

A great deal of the subsequent innovation in business modelling has occurred in the mobile market. In this case, high R&D and technology acquisition costs were often supplemented by high up-front spectrum access costs. Faced with slow take up of new service offerings in the 3G environment, mobile operators have sought new business models to make the functionalities of these new services more accessible and attractive to more users.

This has involved movement in some cases from cost-of-service models (typical of fixed network operations) to value-of-service models. Business models are being explored that are based on dynamic pricing rather than on fixed tariffs for fixed service levels. Variable prices can be charged depending upon the nature and level of usage of various services. For example, users who access a financial service can be charged low fees for occasional or speculative access (i.e. to preview the service) and progressively higher fees as service levels increase in volume or sophistication.

The important linkage in all of the above is that for each new business model a corresponding investment is normally required in new technology – hardware and/or software. Some business modelling occurs *ex ante* and forms a reason for the technology investment. Intelligent Network investments by PTOs exemplify this practice. Other business modelling occurs *ex post*, often taking advantage of revenue producing possibilities that become apparent only after the technology has been implemented. A good example is SMS, which was designed to be an auxiliary service but which soon became a product in its own right.

2.5.4 The dynamics of new network service business models

New business models can develop out of competition between industry segments – e.g. between the computer and telecommunication segments. The mobile broadband services domain illustrates the tensions very well. Alliances to exploit this market are forming both in the mobile equipment vendor segment and in the computer segment. Mobile telephone vendors seek to emulate PC functionalities on their handsets whereas computer and software vendors seek both to emulate mobile telephone functionalities and also to dominate the emerging environments for mobile devices.

Such differences are compounded in that different technical solutions for mobility do not offer the same opportunity to every stakeholder for the development of new models. For example, WIFI offers no obvious new model to network providers and in many ways it competes with mobile telephone solutions for wireless Internet access. However, WIFI does offer business model development opportunities to service firms who can exploit what are essentially ‘free’ internet access nodes linked to the full capabilities of PCs rather than the more limited capabilities of mobile telephones and PDAs.

Thus, although there is much technological convergence between the telecommunication and computer sectors, neither the commercial interests nor the frameworks within which service platforms are developed in each sector are necessarily congruent. Moreover, there are differences between different segments within either sector; for example, the mobile telecommunication sector displays often different commercial dynamics than the fixed sector.

We can observe two basic paradigms for acquiring and configuring technologies in order to provide network services:

- ***Hierarchical organisation*** of technical change characterised most of the early ICT developments and still dominates in many key markets – fixed network infrastructures and computer operating systems being prominent examples. Here the practice is for new technology – the development of which can be widely distributed among many firms – to be organised and co-ordinated by a dominant system integrator or group of integrators into an otherwise fixed architecture as defined by the integrators. The contributors of new technology have the advantage of a relatively stable technological and market environment, but the disadvantage of very limited independent scope to develop new business models that might increase the value of the technology they develop such that their own returns are increased.
- The alternative paradigm is the ***community*** in which much more autonomy is distributed to various suppliers and appliers of ICT to determine both the evolution of the service architecture and the relationship between network capabilities and the requirements of specific service environments. In such a paradigm, groups of technology producers and service providers co-ordinate their activities (including R&D and standardisation) around new business models. The effect can be also to leverage technology procurement costs and network access conditions.[30]

We can array our three basic value propositions for broadband service platforms between these two poles. As indicated in Figure 17, the vendor specificity proposition has the strongest affinity to a hierarchical mode of organisation whereas the vendor by-pass proposition favours the community approach. The vendor neutral proposition has both hierarchical and community characteristics.

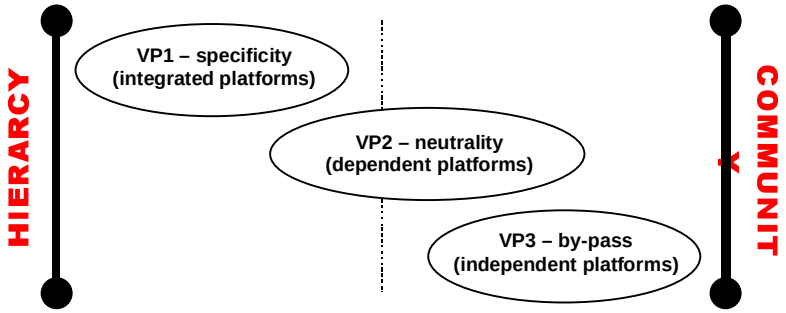

Figure 17: The polarity of value propositions

[30] The terminology and description of these paradigms is derived from Mansell & Steinmueller (1998), who in a somewhat different context indicated that these two paradigms of technology organisation were already well established by the mid-1990s and were largely the products of technological convergence and the increasing R&D input of user constituencies.

Significantly, as the structural positions of actors in the business modelling arena is now quite fluid, there is no necessary configuration of stakeholder interests at either pole or oriented to any particular value proposition or business model. Thus, as illustrated in Figure 18, the choice of propositions and models is not fixed and can be determined according to which industry segment plays which role in a particular broadband service environment.

We see in the case studies, for example, that as mobile vendors began to achieve more independence from public network operators they began to adopt more vendor independent solutions and community forms of R&D organisation. But whereas some intermediaries (particularly in the computer industry) favoured more communitarian and vendor independent systems, as Microsoft (basically a provider of intermediary products) began to explore the mobile telecommunication market, it sought to impose its own existing hierarchical organisation on the market. In the user domain, likewise, we could surmise that as more large network providers become marketers of broadband platforms, we may begin to see consolidation and concentration of platform offerings, eventually leading back to more hierarchical forms of organisation.

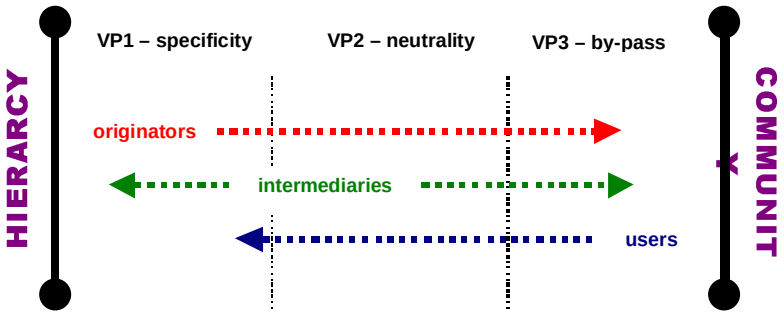

Figure 18: Fluid stakeholder alignments

We could envisage many possible new business models by which revenues could be generated from broadband service platforms. Among the most obvious are:

- *service sales models*:
  - retailing services to end users
  - wholesaling services to commercial users
  - leasing or renting service functionalities
  - subscriptions to service functionalities
- *access sale models*:
  - selling wholesale platform access to service providers
  - selling retail platform access to service users
  - selling network management services
  - selling service development tools
- *licensing models*:
  - licensing operating systems

  - licensing user interfaces
  - licensing service development software and tools
- *auxiliary models:*
  - service as a vehicle for generating advertising revenues
  - service as a vehicle for capturing marketing statistics
- *indirect revenue models:*
  - outsourcing network traffic generation to independent service providers

The above is by no means an exhaustive list of business model possibilities, but it illustrates the variety of models that are available for broadband service platforms. In practice, however, the supply or value chain for any particular electronic service likely incorporates several business models, each oriented to the position of specific industry segments in the chain. Thus, as illustrated in Figure 18, a typical broadband service platform can be expected to support an interconnected cluster of business models, each attached to the supplier of specific assets necessary for the provision of broadband services.

For each model in any given chain, some participants will take leading roles in devising and applying the business model. Other participants will take supporting roles in that they will provide assets (like network facilities or tools) that are necessary for the operation of the model, but not necessarily specific to that model alone.

These dynamics are illustrated in Figure 19 with reference to a retail service sales model (in white) joined to a supplementary advertising carriage model (also in white). This is a typical model that could be adopted by many types of service firms. This combined model is supported by a variety of other models. But if we were to focus on any of the other models, the retail model would assume a supporting role. For example, for a PTO whose main model is data traffic generation, all service providers are to some extent a generic component in the value chain for that model.

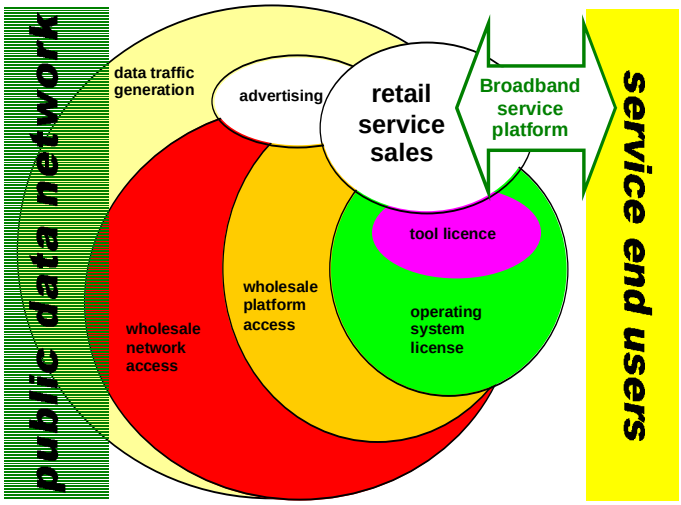

Figure 19: Business model clustering

The intriguing factor is that in different markets, the same stakeholder could activate several of these models. For example, a PTO could be a generic data carrier in some markets, but a retailer of services developed by other stakeholders in other markets.

2.5.5 Business model evolution and standardisation dynamics

All of the above models must be co-ordinated to some degree. This involves technology co-ordination at the network level as much as it does commercial co-ordination at the market level. Indeed the evidence from our case studies is that these two requirements often reciprocate.

Integration of any new technology into the overall network environment is dependent obviously on standards. Perhaps not so obvious is the role of standards in supporting specific business models within specific stakeholder constituencies.

The previous discussion indicates how one industry segment can play different roles and adopt different business models in different value chains. However, the asset base of most industry segments is still predominantly oriented to specific models. In other words, although firms may profit from many models in many markets, most are likely to earn most of their revenues in just a few of these markets, where they have leverage over a specific type of asset – carriage facilities, service design capabilities, market segment knowledge, network management etc.

Both our case studies and our survey of actor preferences as to the institutional location of standardisation activities indicate strongly that these tensions – rather than considerations of speed and efficiency – may be at the heart of the current massive decentralisation of standards activity. But these preferences are likely linked also to the different approaches to technology development and organisation that can be observed to apply in different segments of the ICT industries. These in turn are linked to standardisation approaches and priorities.

Thus we can propose a very direct link between business models and standards – namely, that standardisation and business modelling are part of the same activity and in some cases are exactly the same activity.

As new and/or different actors assume different roles we can expect that they will try to shape the standards environment such that the business models most advantageous to them are enabled and supported. This inevitably will generate tensions between hierarchical and communitarian approaches to market building for electronic services, which spills over into architectural configurations in the various public and private network segments.

Much of the increased activity in consortia makes sense in this context. If standards are linked to specific kinds of business models, the model that is most appropriate for a given service functionality likely will determine the choice of the standardisation method and the institutional framework. Accordingly, opportunities to exploit new or different business models can be expected to exert pressure for standards to be developed, organised or abandoned in specific ways.

3 Taxonomy of Standards Setting Bodies in the ICT and E-Business Sectors

These days, a web of SDOs (Standards Developing Organisations) operate at various geographical level. These include, for example, ISO[31] and ITU[32] at the global level, ETSI[33] and PASC[34] at regional level, and ANSI[35] and BSI[36] at the national level. They issue what is commonly referred to as 'de-jure' standards – although none of their standards have any regulatory power[37]. Likewise, a plethora of industry fora and consortia (a recent survey found more than 190 (ISSS, 2004)), such as, e.g., the World Wide Web Consortium (W3C), the Organization for the Advancement of Structured Information Standards (OASIS), or the Open Group, to name but a few of the longer standing ones, produce so-called 'de-facto' standards.

In addition, one may also distinguish between voluntary, regulatory, pro-active, reactive, public, industry, and proprietary standards; this list is not exhaustive.

As a result, there exists an almost impenetrable maze of what is generally referred to as 'standards', ranging from company specific rules, over regional and national regulations, up to globally accepted norms. As Andrew Tanenbaum put it: *'The nice thing about standards is that there are so many to choose from."*

This highly complex structure implies that organisations wishing to become active in standards setting (for whichever reason) need to consider their options very carefully. For one, pros and cons of joining the standardisation bandwagon vs trying to push a proprietary solution need to be taken into account. Standards based products or services may imply price wars and lower revenues, but may also open new markets and widen the customer base. Offering a proprietary solution may yield (or keep, rather) a loyal customer base, but may also result in a technological lock-in and, eventually, marginalisation.

Once having decided to go for a standard, a firm normally wants to make sure that the 'right' standard emerges (not necessarily, though; sadly, trying to prevent the emergence of a standard may well be a motive, too). Yet, what exactly characterises the 'right', or at least a 'good' standard is far from being clear. Indeed, different companies may well have very different views here, largely depending on factors such as, e.g., their respective own technological base, corporate strategies, business models, etc. These factors determine the level of involvement in standards setting (an organisation wishing to create a new market in a certain domain is likely to adopt a different approach to standards setting than a company which only needs to gather advance intelligence for its business), and also the best platform for doing so (that is, the selected standards setting body's characteristics should be compatible with the

[31] The International Organization for Standardization.

[32] The International Telecommunication Union.

[33] European Telecommunications Standards Institute.

[34] Pacific Area Standards Congress.

[35] American National Standards Institute.

[36] British Standards Institution.

[37] It should be noted, however, that references to standards in EU Directioves, for example, well may give them quasi-regulatory status.

company's goals). Standardisation may thus be seen as an interface between technical and non-technical (e.g. economic, organisational and even social) factors. Standards are not only rooted in technical deliberations, but also result from a process of social interactions between the stakeholders and also, probably most notably, reflect the economic interests of the major players.

3.1 Open Standards

The term 'open standard', albeit widely used, is not clearly defined. It therefore holds competing connotations for different actors. Its basic idea draws much on the implicit opposition to the situation of a pure market standard. An open standard means that the involved actors deliberately set about to codify the standard as non-proprietary knowledge, that in effect no individual commercial interests control the resulting products, and that in fact the open standard is made accessible and usable to all interested parties on reasonable and equal terms, even where proprietary technologies are implied (see, for example, (Glimstedt 2003)).

These general aspects of open standard however invite interpretation, for example on what terms constitute open terms. The IDABC European Interoperability Framework's[38] recent attempt at a formalised definition illustrates the type of difficulties that such interpretations lead to. According to this document, *'... the following are the minimal characteristics that a specification and its attendant documents must have in order to be considered an open standard:*

- *The standard is adopted and will be maintained by a not-for-profit organisation, and its ongoing development occurs on the basis of an open decision-making procedure available to all interested parties (consensus or majority decision etc.).*
- *The standard has been published and the standard specification document is available either freely or at a nominal charge. It must be permissible to all to copy, distribute and use it for no fee or at a nominal fee.*
- *The intellectual property – i.e. patents possibly present – of (parts of) the standard is made irrevocably available on a royalty-free basis."*

Unfortunately, all three elements of this definition may potentially cause problems. The requirement for a standard's maintenance is the least critical one. Nonetheless, many SSBs do not have a formal systematic review mechanism in place to ensure a standard's maintenance[39]. In many of these cases, however, a standard can be adapted to new requirements or changing environment condition by having a new version go through the same approval procedure any other new standard would have to go through (Jakobs, 2005).

Also, few standards are actually available for free (e.g., neither CEN/CENELC nor ISO/IEC standards are, with very few exceptions; those from ETSI are, though). It is unclear whether or not the fees charged by ISO are 'nominal' and if they represent a barrier for the diffusion of the standards. Moreover, the requirement to be allowed to copy a '*for no fee or at a nominal fee*" standard is clearly at odds with, for instance,

[38] http://europa.eu.int/idabc/servlets/Doc?id=19528.

[39] See also sect. 3.1.5. ISO, for example, has a well-defined maintenance process which requires ISs to be subject to a systematic review every five years (ISO, 2001).

ISO's document licensing policy. This suggests that the enforcement of the IDABC definition would need to go hand in hand with accompanying measures to compensate SDOs for the resulting loss of a significant share of their income.

In particular, however, the discussion about this definition evolved around the requirement of IPR being made available on a 'royalty-free' basis. In practice, this excludes the products of the vast majority of both formal SDOs and industry consortia from the list of producers of open standards. With very few exceptions (the W3C being the most prominent one) SSBs typically ask for any IPR to be included in a standard to be made available on a (fair), reasonable and non-discriminatory ((F)RAND) basis[40]. The study described in (Blind et al., 2002) revealed that it remains rather intransparent even for those running SDOs how this rule is actually implemented. As a general rule it is reported that the license should not be higher than 1% of the final product price.

The latter requirement is also likely to deter IPR holders from participating in standards setting. Even applying FRAND leads to this 'adverse' selection process (Blind, Thumm 2004a). IPR holders may well consider other avenues more worthwhile following in order to reap the benefits from their IPR[41].

This requirement also indicates a hardly comprehensible limitation, in that it limits IPR to patents. This raises the question why other forms of IPR (e.g., copyrights) are not covered by this definition, although they are relevant for the software which is the basis for numerous e-business and e-government standards[42]. Furthermore, trademarks play an important role e.g. for e-catalogues, like BMEcat or eClass.

In general, the recent initiative to define open standards as royalty free should analyse in-depth the consequences and discussions after the unsuccessful attempt of ETSI to change its licensing scheme to allow for compulsory licensing (Iversen 1999). Finally, the European Commission was argued that consumers and users may benefit in the short run, but the incentives to invest in R&D would dry up in the long run. The United States even complained that such a rule would lead to the expropriation of its knowledge assets.

The absence of a requirement for due process is also surprising. It is one of the cornerstones of all SDOs' processes, and also included in the processes adopted by many consortia. Due process is more than just '*... an open decision-making procedure available to all interested parties..",* in that it also includes the existence of an appeal authority[43].

Even if this definition were to be used only as 'reference definition' against which the 'openness' of a specific standard could be measured, it would need to be revised (to address different types of IPR, and to include due process).

[40] Without going into too much detail about what exactly this is supposed to mean.

[41] For a discussion of IPR-related issues see sect. ??.

[42] Iversen analyses the problems with copyright in TETRA (in (Blind et al., 2004)).

[43] Historically, the definition of due process (Mott, 1926) has included notice and hearing, allowing the defendant to speak and state his/her case, the right of appeal, judicial process, fairness, reasonableness, impartiality, equality, common law and settled usage (the acid test of due process), and equal protection of the law Quoted in (Gray & Bodson, 1995).

In the light of the IDABC definition's shortcomings discussed above the ICTSB's[44] definition could be a good starting point for discussion:

"*An open standard…should be:*

- *developed and/or affirmed in a transparent process open to all relevant players, including industry, consumers and regulatory authorities…;*
- *either free of IPR concerns, or licensable on a (fair), reasonable and non-discriminatory ((F)RAND) basis;*
- *driven by stakeholders, and user requirements must be fully reflected;*
- *publicly available (but not necessarily free-of-charge);*
- *maintained*".

This definition avoids most of the issues discussed above[45], and also adds some requirements which refer to valuable characteristics of a standards setting process. It avoids the problems associated with the need of a standard being available, and reproducible, for free. It is also more generic in its coverage of IPR. Most prominently, it does not require royalty-free licensing of patent related IPR.

An interesting element, which is absent from the IDABC definition, is the need to fully reflect user requirements. While this may be hard to enforce in practice (see e.g., (Jakobs et al., 1998)), incorporation of (reasonable) user requirements is certainly a crucial characteristic of an open standard.

One of the Consumer Project on Technology's definition of an 'open standard' (CPT, 2005) could be another starting point. According to this definition[46], an open standard must

"i. be published without restriction (e.g., potential implementers are not restricted from accessing the standard) in electronic or tangible form, and in sufficient detail to enable a complete understanding of the standard's scope and purpose;

ii. be publicly available without cost or for a reasonable non-discriminatory fee for adoption and implementation by any interested party;

iii. Any patent or data rights necessary to implement the standards are made available by those developing the specification to all implementers on reasonable and non-discriminatory (RAND) terms (either with or without payment of a reasonable royalty or fee); and

iv. The process to develop, maintain, approve, or ratify the standard is by consensus, in a market-driven standards-setting organization that is open to all interested and qualified participants."

A well thought-trough definition of an 'open standard' is all the more important as it is likely to have repercussions on policy. In particular, whether or not the output of a

[44] ICT Standard Board; "*an initiative from the three recognised European standards organisations and specification providers to co-ordinate specification activities in the field of Information and Communications Technologies."*

[45] Again, with the exception of 'due process'.

[46] This document includes two different definitions of an open standard, without any further explanation. The second definition given is the IDABC one.

given SSB is considered as 'open' will need to be based on a thorough analysis of this SSB's process, and matched onto the definition of what exactly establishes an open standard. Such a matching exercise, which must not be influenced by the 'nature' of the SSBs (i.e., consortium of SDO), could then result in a 'White List' of SSBs which produce potentially policy-relevant deliverables (i.e., which could be referenced in public procurement, or integrated in the regulatory framework).

However, this analysis should not stop at the process level. Other characteristics of an SSB should be taken into account as well, including, for example, an SSBs membership, which give an indication of its market relevance. A list of such characteristics will need to be developed.

To summarise: given the IDABC's definition of an open standard no major SSB qualifies as a producer of open standards (with the possible exception[47] of the W3C). Also taking into account the potentially deterring effect the requirement for royalty-free IPR may have on stakeholders it seems highly desirable to reconsider this definition.

3.2 Types of deliverables and services

Traditionally, formal SDOs used to produce what was frequently referred to as 'de-jure' standards, whereas consortia's products used to be called – sometimes somewhat derogatorily – 'de-facto' standards. Typically, a higher level of 'value' or 'credibility' has been associated with the former. However, the proliferation of consortia especially in the ICT/e-business domain triggered the need to reconsider the perceived difference in value between the two types of deliverables. In fact, SDOs faced the problem of how to maintain their influence, how to compete with the rising number and importance of consortia, and how to adapt their processes and output in order to do so.

The most frequent criticism of the 'formal' process referred to a perceived lack of speed and the resulting inadequate capability to quickly respond to market demands. As one way of regaining lost ground most (if not all) SDOs have streamlined their processes[48], and/or introduced new, abridged ones[49], and/or increased their respective portfolio of deliverables. Depending on the SDO in question these may include 'Workshop Agreements' (CEN, ISO, DIN), 'Technical Specifications' and 'Technical Reports' (ETSI, CEN ISO), or 'Publicly Available Specifications' (ISO, BSI, DIN). Whilst there are differences between them, these new deliverables share the characteristics of codifying technical specifications in publicly available documents, like the 'traditional' standards, but also of sacrificing the level on required consensus for speed. That is, the level of consensus required is typically limited to the originating working group.

[47] This would depend on the importance assigned to a formal standards maintenance process.

[48] "*The ITU-T ... used to approve its recommendations every four years. .... Faced with growing criticism, the ITU revised its mode of operation first by shortening the cycle to 2 years then by abolishing it entirely. Today, ITU-T Recommendations are adopted as soon as they are ready and, in some cases, the time interval from start to finish could be compressed to 18 months. Nevertheless, the ITU is still being considered a 'slow' organisation*" (Sherif, 2003)

[49] ISO's 'Fast Track' procedure and its provision for Publicly Available Specifications (PAS) are cases in point (see; (ISO, 2004)).

Offering deliverables other than full-blown standards is frequently seen as a necessity for the ESOs in order to improve their chances in the market, where they have to compete with consortia. After all, the argument goes, the factor 'time' is crucial in many cases, and ENs are not always necessary in cases where an agreed specification is needed.

However, the variety of new types of deliverables, and their respective status with respect to legislation and other public policies, is of particular importance e.g., in the context of the New Approach, or in public procurement. The new deliverables' status may have major policy implications here.

The Commission Staff Working Document 'The challenges for European standardisation' (European Commission, 2004a) identifies the emergence of industry fora and consortia as a major challenge to the current standardisation system. The document states that '*It is considered doubtful whether, in the light of the speed of development and the limited participation of experts, the fundamental principles for accountability of standardisation such as openness, consensus and transparency are followed in a robust fashion*". At the same time, the ESOs are commended for having introduced new deliverables. However, an analysis of the processes adopted by many larger consortia, and of those leading to the ESOs' new deliverables, does not reveal any major differences (Jakobs, 2005). For instance, some major consortia (most notably, OASIS) require full balloting at both the level of the originating TC and at the OASIS level, where every organisational member has a vote. Also, OASIS publishes Committee Drafts, which only require consensus at TC level. Certainly in this case (and, to a slightly lesser degree, also in the case of the W3C) a consortium's process and type of output is hardly distinguishable from those of the formal SDOs.

In fact, the process leading to, for example, a CEN Workshop Agreement (CWA) is based on a considerably lower level of consensus than an OASIS standard. According to the 'Principles of the operation of CEN Workshops'[50], it only '*... reflects the consensus of identified individuals and organizations responsible for its contents*".

The same document states that '*The Workshop Agreement ... is not designed to support legislative requirements (e.g the New Approach) or to meet market needs where significant health and safety issues are to be addressed*". Also, CWAs are definitely at odds with the definition of an open standard given in the IDABC European Interoperability Framework ((IDABC, 2004); see sect. 3.1). Moreover, if CWAs, or other new deliverables emerging through a similar process, were recognised in the legislative context, it would appear difficult to argue why specifications from certain consortia are refused the same status[51].

[50] http://www.cenorm.be/cenorm/businessdomains/businessdomains/isss/about_isss/guidelines+cen+workshops.asp

[51] It should be stressed once again that the ESOs' New Deliverables are very useful tools. Especially CWAs can be extremely valuable as a means to express the emerging demand of lead users and an instrument of knowledge codification and transfer from the inner circle of those developing these documents to all those stakeholders possible being affected by the issues addressed.

Against this background it seems a bit questionable (to put it mildly) whether it makes indeed sense that '*New deliverables may be used to support European legislation and policies, as it is already the case in the ICT area .....*"[52].

Pretty much in line with the views expressed in the document discussed above, COM(2004) 674 (European Commission, 2004b) finds that '*... consortia and fora are playing an increasing role in the development of standards, challenging the role and structures of the ESOs as well as the intervention of public authorities at the EU level*". This 'challenge' is primarily based on the perceived ability of consortia to work more effectively and efficiently than formal SDOs, and to thus be able to react quicker to new market needs and changed market conditions. However, not only are the processes of SDOs and consortia converging, but also their respective time frames. An analysis of the processes adopted by OASIS, OMG, W3C, CEN / ISSS (WSs), ETSI, and ISO / IEC / JTC1 (Jakobs, 2005) reveals that they do not differ that much with respect to the time from the start of the work on a new work item until completion (typically between 12 and 24 months).

Unfortunately, the ESOs are the exception here. It may take ETSI up to 48 months to produce an EN but the typical time frame is 24 to 36 months, and CEN has only recently (February 2005) published a document[53] designed to bring the time required for the production of an EN down to 36 months. On the other hand, production of a CWA or a Technical Specification typically only takes 12 – 24 months.

Yet, one should be careful not to focus too much on the 'time' aspect. As also (European Commission, 2005) points out, ICT infrastructure technologies exhibit characteristics very different from those of other ICT systems. If infrastructure with a life span measured in decades rather than months is to be standardised, the standardisation process needs to take this time horizons into account. That is, in the 'infrastructure' case speed is less important than other aspects, including e.g., consensus, meeting user requirements, technical soundness, and flexibility.

Considering the above, and also taking into account that ESOs should make available '*... procedures by which the needs of consortia can be better accommodated in ESOs. ESOs should fully exploit the potential for synergies by improving their co-operation and reinforce their mechanisms of coordination for subjects of common interest*" (European Commission, 2004a), it may be concluded that a certain division of labour would be a potentially beneficial option. That is, the ESOs' 'traditional' process in the ICT sector would focus on infrastructure technologies, whereas short-lived technologies would be dealt with by consortia and by ESO processes producing New Deliverables.[54] In

[52] Obviously, the authors share at least some of these concerns: *"... the decision on whether to use a new deliverable should be explored early in the process and then the final document would need to be assessed for its suitability against the policy*". Yet, whether or not such case-by-case decisions are actually practicable and feasible will have to be established.

[53] This document, entitled 'Guidance - Faster delivery of European Standards and other deliverables' may be found at http://www.cenorm.be/boss/supporting/guidance+documents/gd+-+faster+delivery+of+standards/gd+-+faster+delivery+of+standards.asp.

[54] (Blind and Gauch, 2005) highlight another aspect regarding the relationship between infrastructure and application standards in the life cycle of telecommunication and technology. They show that in the emerging phase of these technologies infrastructure standards dominate in the activities of SDOs. In later phases, standards for applications and services become more relevant. Furthermore, consortia are also more active in these fields compared to infrastructure standards. Consequently, there is not only a division of labour between SDOs and consortia in the static perspective, but also in the dynamic perspective in the sense, that SDOs pave

many instances this would require close co-operation between consortia and the ESOs. Also, a certain level of co-ordination of work done within consortia would be required, in order to enable and maintain interoperability between infrastructure and other ICT systems and artefacts. In a way, this approach would combine the best of both worlds, leaving fast-moving technologies to flexible SSBs, while leaving long-lived infrastructural systems to the ESOs' processes with their focus on the widest possible consensus.

Another important aspect relating is also observed in (European Commission, 2005): '*Standardisation is essential, but is not sufficient to achieve network interconnection and interoperability of services at international level*". Most notably, different implementation of a standard may lead to interoperability problems. Whether or not such interoperability problems are created deliberately varies between individual cases. For instance, companies may introduce incompatibilities (frequently disguised as 'improvements') in order to lock-in their customers (Besen and Farrell 1994). Yet, also ambiguities in the specifications, characteristics of a local implementation environment, and the dynamics of the standards setting process itself may be sources of interoperability problems[55].

To overcome, or at least reduce these problems, interoperability testing of standards implementations is crucial. SSBs are in the optimal position to offer such services. In fact, interoperability and conformance testing now represents a significant part of ETSI's activities. Going one step further, some SSBs have incorporated the requirement of the existence of independent interoperable implementation into their standards processes (for example, the IETF; (IETF, 1996)).

3.3 Classifying Standards Setting Bodies

SSBs can be categorised according to very different criteria. The most popular, albeit not particularly helpful distinction is between formal SDOs and consortia. Typically, the former are said to be slow, compromise-laden, and in most cases not able to deliver on time what the market really needs (see e.g., (Rada, 2000)). In fact, originally the formation of consortia was seen as one way of avoiding the allegedly cumbersome processes of the SDOs, and to deliver much needed standards on time and on budget. Consortia have been widely perceived as being more adaptable to a changing environment, able to enlist highly motivated and thus effective staff, and to have leaner and more efficient processes. Accordingly, attributes typically associated with consortia include 'speed', 'short time to market', and 'meets real market needs'.

The adopted standards setting process is another popular, and related, discriminator. While speed is a directly related issue here as well, other aspects are also playing a major role. For one, the level of consensus required for a specification to become a standard differs between SSBs. For instance, ISO/IEC and CEN/CENELEC require consensus of the respective national members, the IETF[56] ask for 'rough' consensus at working group level only, and some consortia do not disclose the required level at all

the way by providing infrastructure standards for subsequent applications which standards´ needs likelier to be satisfied by standards´ consortia.

[55] See No-Rest Deliverables D07 and D08 for an in-depth discussion of these aspects.

[56] The Internet Engineering Task Force, the Internet's standards body.

(e.g., cXML.org). On the other hand, many major consortia's processes are hardly distinguishable from those of most SDOs.

An SSB's output is another important aspect. Frequently, SDOs' output has been referred to as 'Norms', setting it apart from the 'standards' or 'specifications' produced by consortia. Yet, more recently, and in an attempt to be able to better compete with the consortia, many SDOs have started to also produce 'lightweight' specifications, which are primarily characterised by a lower level of consensus. That is, the clear-cut differences between SDOs and consortia are obscured here as well.

The same holds for due process (Gray & Bodson, 1995). In short, this means that '... *any 'person' with a direct and material interest in the activity's outcome has a right to participate in the activity*". Traditionally, this has been a cornerstone of the SDOs' processes. Due process is particularly important in order to provide a level playing field for everyone, not just for large multi-nationals. In particular, consumers and SMEs[57] may need to have some such mechanism to make themselves heard in the process (see also e.g., (Fabisch, 2003), (Jakobs, 2004)). These days, several of the larger consortia have mechanisms in place that may be equated with – but is not necessarily called – 'due process'.

In any case, it is safe to say that such static classifications, including the over-simplifying associated attributes, are not particularly helpful as they convey only part of the picture. This holds all the more as an organisation's requirements on an SSB, its process and other characteristics very much depend on a combination of factors specific to this particular organisation, and to the specific case at hand.

Accordingly, a more flexible approach towards classification was adopted. Rather than pre-defining certain categories, a set of attributes has been identified that can be applied to describe SSBs. The attribute types will be discussed below, the associated values need to be identified individually for each SSB. The resulting description can than be matched onto an organisation's requirements on SSBs, thus allowing companies to identify those SSBs that best meet their specific needs.

The attributes fall into four categories:

- General
- Membership
- Standards setting process
- Output

The attributes associated with each of these categories will be discussed below.

3.3.1 'General' Attributes

These attributes serve to provide some high-level information about the working environment an SSB has defined for itself. The form of governance chosen, for instance, provides information about which body, and who, is making the ultimate decisions, which in turn may help reveal the level of transparency in the SSB's decision making process. This is also of interest to those who wish to exert a certain level of influence.

[57] Small and Medium-sized Enterprises.

Finance and staffing are important for an evaluation of an SSB's ability to survive. These are also valuable indicators for the commitment of the SSB's (leading) members – if they are prepared to invest (heavily) into its activities they are also likely to try and make sure that the objectives are met.

The IPR policy adopted may have significant impact on the attractiveness of an SSB to holders of relevant IPR. An SSB needs to find a reasonable balance here – the policy must neither deter IPR holders (who may be afraid of loosing valuable assets) nor potential users (who may be afraid of implementing a standard with high licensing fees attached to it). Thus, this policy may also have implications on the level of openness envisaged by the SSB.

The latter also holds for the number and types of an SSB's liaisons. They are a good indicator of an SSB's openness towards relevant work done elsewhere. Moreover, liaisons are one means of co-ordination (see above), thus at least somewhat reducing the risk of standardising on a technology that is at odds with other standards.

The level of competition an SSB faces indicates one aspect of the risk to be associated with going for its standards, with a high level suggesting a high risk of eventually being stranded with a loosing technology. Conversely, a 'monopoly' situation may indicate a reasonably safe bet.

Along similar lines, a good reputation of an SSB (albeit possibly somewhat hard to quantify) may suggest higher chances of its output to succeed in the market (see chapter 5 for a more detailed discussion relating to this aspect).

3.3.2 'Membership' Attributes

Information on the membership base of an SSB are relevant with respect to the level of its openness, and its decision making process (both formal and informal). A small number of hand-picked members, for instance, or membership levels with very different associated fees and rights suggest the idea of a rather more closed group of decision-makers (possibly despite a huge overall membership base). Likewise, it may reveal an SSB's support of the needs of a specific clientele (e.g., large manufacturers).

The overall number of members serves as a very rough first indication of the success factors of an SSB's output. A broad membership base may provide valuable support for a standard.

More important than the number of members, however, is the 'quality' of the membership. That is, an SSB's chances of being successful in the market are much better if large potential users and major vendors / manufacturers or service providers are among its members, and thus likely to support its output.

In addition ,the level of membership of these companies is of interest – it indicates whether they are only interested in e.g., intelligence gathering, or if they want to play an active role in the standardisation process, and in the SSB in general.

Who is actually working actively in an SSB is probably even more important. A company's active participation in an SSB's standards setting process is a very good indicator of this company's support of the SSB's standards setting activities.

Finally, the individual member representatives may be supposed to act as corporate representatives, or in an individual capacity. In the latter case the points listed above

may become slightly less relevant, as it is not necessarily ensured that WG members actually represent the corporate goals of their respective employers.

3.3.3 'Standards Setting Process' Attributes

An SSB's standards setting process not only reflects its ability to quickly adapt to a changing environment and newly emerging requirements, to meet a window of opportunity, or to support real-world implementations. It also shows the level of 'democracy' considered desirable by the SSB, and again, whether or not certain stakeholders are more equal than others. A high a level of 'democracy', in turn, may be attractive for some stakeholders, but a deterrent for others.

'Time' is a crucial factor for many standards setting initiatives. That is, on most cases standardisation should be at least in sync with the technical development[58], maybe even ahead of it. Certainly, lagging behind for too long will make a standard irrelevant for most purposes. In fact, 'shorter time to market' has always been one of the major arguments in favour of consortia. Also, meeting a window of opportunity is a crucial success factor for a potential standard. Accordingly, the time it takes from submission of a proposal to form a working group to address a specific topic until the final acceptance of the standard is an important factor. This time span, in turn, comprises three elements:

- the time it takes to establish a work item and where required a working group,
- the time it takes this WG to do the work, and
- the time for the final ballot and publication.

Obviously, this depends very much on, for example, the level of consensus sought, and on the decision mechanisms adopted by the respective SSB.

That is, there are other aspects of an SSB's standards setting process that may be of interest to potential proposers, which may have a negative impact on a process' duration, and which need to be addressed as well. Particularly, these include the degree of openness of a standards setting process, its transparency, the required level of consensus, and the observation of due process.

Basically, these attributes describe the level of 'democracy' observed by a standards setting process. Are the elements of the process, the decisions taken, and the reasons for these decisions well documented and available? Does everyone have the right to speak, and to be listened to? Is there a way to appeal against a decision, and how does it work? Which level of consensus is required (e.g., at working group level, at membership level)? In many cases, it will be necessary to balance the requirement for speed and the need for a broad consensus.

In many instances a standards setting process should not stop once a standard has been described on paper. Other aspects may at least be as important as a base standard. Most prominently, these include the availability of conformance testing methods, interoperable implementations of the standard, and proof of an implementation's conformance with the standard. Whether or not an SSB's process

[58] This does not necessarily hold for infrastructural technologies (such as, e.g., ISDN), where getting everything right the first time is more important than speed (see e.g., (Jakobs, 1998)).

requires the former, or if the SSB provides for the latter, may well be important aspects to be considered.

3.3.4 'Output' Attributes

Finally, the types of deliverables produced also give an indication about an SSB's flexibility. For instance, full-blown formal standards indicate a lengthy, democratic, consensus-based process, whereas technical specifications or similar types of deliverables suggest a faster, more adaptable process with a lower level of consensus[59]. Information about the number of implementations shows the relative 'importance' of an SSB, as does, to a certain level, the fact that it is accepted PAS submitter to ISO. The latter also indicates an SSB's willingness to meet the associated requirements on its process. A standard that is maintained, and possibly developed, over time suggests that it is envisaged to be long-lived, and also says something about the SSB's willingness to adapt its deliverables to changing environments.

In order to improve a standard's chances of success in the market it will help if it originated from a well accepted source (see section 4 for a detailed discussion of this aspect). The number of implementations of other standards from an SSB may serve as one indicator of this SSB's 'credibility'. Also, the free availability of a standard's specification may help disseminate it more widely.

In some instances, especially for a more long-term planning, it may be of interest whether of not an SSB maintains its standards, or whether it has adopted a 'fire and forget' approach. A standard's maintenance will need to cover, for example, the addition of technical corrigenda, of addenda covering additional functionality, and maybe eventually the release of a follow-up version of a standard. In each of these cases, backward-compatibility has to be ensured. A well-managed maintenance process is extremely helpful if longevity and adaptability of a standard are or concern.

Along similar lines – an SSB should make sure that a new standard does not contradict other, established ones. At the least it should have a mechanism in place to ensure consistency of its own standards, ideally this should extend to all standards (although this will be next to impossible to achieve).

Last, but not least, an SSB might want to consider the impact a standard might have. While hard to do, this might be a worthwhile exercise that may well safe serious money which might otherwise be wasted on a standard with little or no chances of success in the market.

The individual descriptors discussed above are summarised in Table 4 below

[59] A technical report is an informative document while technical specifications and formal standards are normative documents.

General	Description
Internal	
overall goals business models	These provide some general background information. ‘Business models’ should be helpful for matching with ‘demand side’s’, well, demands.
governance	‘Governance’ is important for those who wish to influence the goals and activities.
finances staffing	‘Finances‘ and ‘staffing‘ are important to evaluate the chances of an SSB’s long-term survival.
IPR policy	IPR policy should not deter any stakeholders.
External	
reputation	Joining an SSB with a poor reputation, or with a poor record, will not make too much sense in many cases.
competition	Do competing SSBs exist, or are they likely to emerge in the near future?
liaisons	Is the SSB prepared to co-operate with other entities?
Membership	**Description**
Quantitative: • overall # of members • membership levels • membership fees	Provides some information about the relevance of the SSB. In many cases, some are more equal than others. Who decides, who does the work, and are these the same? May also help to determine a prospective new member’s chances of active contribution and decision.
Qualitative: • key players involved? • ‘active’ members • individuals’ capacity	Are those organisations important in the specific sector on board? Which are missing? Which members are prepared to invest resources into activities like e.g. editing documents, leading WGs, etc? Is there a ‘corporate whip’, or do reps decide independently? What are the SSB’s rules?
Standards setting processes	**Description**
Timing: • time for TC/WG establishment, • average time until finalisation	Indicates the effort/time required to finalise a new standards project. Helps to determine whether or not a (perceived) window of opportunity can be met.

Process characteristics: • openness • transparency • required level of consensus • observation of due process • decision mechanism	Basically to determine how fair the process is? Do I have a say, or do the big guys determine? Can I complain, and to whom? Etc.
Beyond standardisation: • implementations required? • proof of interoperability required • conformance testing	Indicate a more 'praxis-oriented' approach; crucial if products/services are to hit the market pretty soon.
Output	**Description**
Types of 'products'	Do an SSB's deliverables suit my needs? I do not always need a full blown standard, and may be prepared to swap consensus for speed.
Quantitative aspects: • standards output • # of implementations	Do they actually produce standards, and are they implemented on an adequate basis? Indicates importance of output; if nobody implements the stuff it's hardly worth the effort.
Dissemination: • PAS submitter? • specs for free?	Related to 'liaisons' above. Is an SSB prepared to bring its specs into the public domain? And are they prepared to do it for free?
Follow-up activities: • standards maintenance • impact considered? • consistency checks in place?	How does an SSBs react to changes in technology/requirements? And to errors/inaccuracies? Do they reflect on what they are doing? Are standards checked for consistency with others?

Table 4: SSB descriptors

3.3.5 Applying the Criteria to Some Relevant SSBs

The criteria identified above are applied (in Table 5 below) to a number of SSBs which are of importance in the e-business / ICT sector.

	OASIS	**OMG**	**W3C**	**CEN/ ISSS**	**ETSI**	**JTC1**
IPR policy	RF (members) RAND (others)	RF	RF	RAND	RAND	RAND
Liaisons	Numerous (including e.g. ISO, JTC1, ISSS, W3C)	Cross-membership (OASIS, W3C, NIST)	Numerous (including e.g. ETSI, IETF, ITU, JTC1)	On WS basis (e.g., ISO, ITC1, OASIS)	Numerous (including e.g. ISO, JTC1, ITU, national/regional SDOs many consortia)	Numerous

	OASIS	OMG	W3C	CEN/ ISSS	ETSI	JTC1
Overall # of members	Ca. 400 organisations Ca. 200 individuals	Ca. 800	Ca. 360	N/a (varies considerably between WSs	600+	67 (member states at JTC1 level)
Key players involved?	Yes	Yes	Yes	Often	Yes	Yes
Membership levels	3: Sponsors, Contributors, Individual (may not vote)	5 (three main): Contributing Domain Platform Influencing Residual: Test and Analyst	2: Full, Affiliate (both have same rights)	1	4: Full, Associate, (may vote) Observer, Counsellor	2: (P)articipating (may vote) (O)bserving
Membership fees	Sponsors: 13,500 USD Contributors 5,750 USD (not-for-profit: 1,000 USD) Individual 250 USD	Contributors: $10K-70K (based on revenue) Domain and Platform: $5K-35K Influencing: $2.5K-20k	Full: 172,500 USD Affiliate: 17,250 USD (for first three years)	Very little, possibly free	Based on turnover; 6,000 euros for SMEs	Based on GNP
Individuals' capacity	member representative (but individual vote at TC level)	member representative	WG: member representative; AB: individual	member representative	(member representative)	individual
To establish new activity	3 'eligible persons[60]'; business plan; decision after 15 days, BoD[61] may veto	RFP: initiated in TC (also SIG), TF elaborate RFP, approved by AB. Accepted by TC (vote). RFC: bypasses RFP.	Initiated by W3C staff, general review at least 4 weeks; decided upon by Director	Business plan	4 supporting Members prepared to contribute; decision after one month	No time frame specified
Average time until finalisation	16 – 24 months	12-15 months from RFP: shorter for RFC	Typically around 24 months	Varies; typically 1-2 years.	Around 4 years for a European Norm	Up to 48 months; ca. 12 months for PAS process
Openness technical activities	Every 'eligible person' may participate,	Eligible members may submit proposed solutions Information (RFI) may be invited from outside	Open to all members,	Open to everyone	Open to Full and Assoc. ETSI members; external experts for STF[62]	Individual WG members must be authorised by national SDO.
Trans-parency	description of process and voting procedure publicly available	Ability to track the adoption process. Finalized documents are publicly available	info on process and outcome publicly available; public may comment; TRs undergo public review	Comments phase recommended, but not mandatory	Limited (largely to members) transparency	Limited (largely to members) transparency
Required level of consensus	Balloting mechanism at TC and OASIS level; BoD may keep proposal from balloting	2/3 majority of eligible voters on finalized submission. Submitted to BoD for final decision.	Consensus based, at both technical and W3C level, but W3C director's approval is always required	Consensus based at WS level.	At TB level: consensus/voting At ETSI level: consensus/weighted individual voting by members	Balloting should only take place once consensus has been achieved; P-members cast votes.
Due process	Yes	n/a	Yes	Yes (limited)	Yes	Yes
Implementations required?	Yes (three inter-operable implementations)	A precondition. Non-implemented can be 'retired'	Yes (one implementation)	No	No	No

[60] Employees of member organisations or individual members

[61] Board of Directors

[62] Specialist Task Force; a group of external experts hired for rapid specification development.

	OASIS	OMG	W3C	CEN/ ISSS	ETSI	JTC1
Types of 'products'	Committee Drafts Standards	OMG specification ('adopted technology')	Working Notes Recommendations	CWAs[63]	ETSI Standard, ES European Standard, EN ETSI Technical Specification ETSI Technical Report, TR ETSI Guide, EG Special Report, SR	ISO Standard ISO/PAS ISO/TS Technical Specification ISO/TR Technical Report International Workshop Agreement (IWA)
Number of implemen-tations	?	Return to this	?	?	?	?
Output	15 standards (since 2002); 17 Committee Drafts (excluding ebXML specifications prior to 2002)	130+ in total http://www.omg.org/technology/documents/spec_catalog.htm	80 Recommendations; around 80 Working Notes (1996–2004)	73 CWAs (many of which are multi-part) plus 21 withdrawn CWAs (since 1999)	Ca. 1,800 deliverables in 2003, 14% standards	120+ Technical Standards in 2002
Specs for free	Yes	Yes	Yes	Yes (almost all)	Yes	No
Standards mainte-nance	No official mechanism, but new versions are produced relatively frequently	Codified revision process, including bug page.	Error tracking is part of the process; dedicated 'errata page'; approval of new version follows same procedures as for new TRs	CWA revision/ withdrawal after 3 years	No official procedure for most deliverables; reaction to comments; approval of new version follows same procedures as new deliverables	Regular reviews every 5 years (3 years for PAS submissions); Amendments are also used
PAS submitter	No	?	No	No	No	N/a
Impact considered	?	Viability is reviewed.	?	?	?	?

Table 5: The Characteristics of the SSBs

3.3.6 Coping With Changes in the Market

The above list of attributes may also be used to establish whether or not an SSB is likely to be able to cope with changes in the market, or to actually trigger them.

In order to (actively) trigger changes in the market, an SSB's membership is the most important aspect. If a sector's key players participate in a standards setting activity its impact may be expected to be much higher than in a case where a standard has been put together be a group of 'nobodies'.

To attract the group of participants necessary to enable a future standard to be successful in the market, a number of pre-requisites need to be fulfilled. Here, an SSB's IPR policy is one of the most important single factors – it must not deter IPR holders to participate, nor put off users because of a fear of license fees attached to the deployment of the standard. (Blind & Thumm, 2004) find evidence that companies with strong patent portfolios are more likely to stay away from formal standardisation processes. The type of deliverable offered by the SSB is also important here, a point that is closely related to the speed of the process and thus

[63] CEN Workshop Agreements.

also to the decision making process applied. Moreover, liaisons are an important criterion – if an SSB is co-operating with others, and willing to align its output with the (emerging) standards developed elsewhere, the chances of success will improve considerably. Accordingly, the following subset of SSB descriptors may be used to evaluate an SSB's ability to trigger change (see also Table 6).

Descriptor	Value
• IPR policy	Must not deter any important stakeholders.
• liaisons	Co-operation with other SSBs is important.
• overall # of members • membership levels • key players involved? • 'active' members	A critical mass is helpful. A levels to guarantee strong influence should be available. Important actors need to be on board, competition should be limited. Important members need to be prepared to invest resources
• decision mechanism	Does the process provide adequate influence for the 'leaders'
• Types of 'products'	The process must be able to meet a window of opportunity

Table 6: Descriptors and values indicating an SSB's ability to influence

(Passively) adapting to changes requires different but related capabilities. Here, the ability to attract new or emerging key players is of primary importance. To be able to do so, the overall characteristics of an SSB need to be in line with the business models of these companies. Again, its IPR policy will be important, as well as sound finances, an adequate staffing, and membership levels providing for companies' desired level of influence.

An SSB's previous track record in adaptability to changes would also be of interest here. A major, yet simple indicator here would be the lifespan of the SSB – one that has been around for decades may be expected to be able to adapt to changes; otherwise, it would already have gone out of business.

3.4 Standards Users

So far, we have only considered the 'supply side' of standards in this section. Yet, different potential standards setters (i.e., entities of the 'demand side') will consider different attributes of SSBs as important. Also, the specific characteristics of each individual situation where the need for either a new standard, or to influence an ongoing activity, has been identified will be taken into account. That is, the importance assigned to a standard setting activity will determine the respective role

they will assume in this process. This role will then, in turn, determine the attributes (types and values) of the SSB to be selected for the activity.

The roles that may be assumed include 'Leader', 'Adopter', and 'Observer'. The characteristics of the members of each respective category will be elaborated below in terms of how their respective strategic goals lead to requirements on SSBs.

3.4.1 Leaders

When deciding about joining an existing SDO or consortium (the latter preferably as a founding member; in most cases founding members have a greater say concerning the goals and strategies of a consortium), as opposed to founding one, Leaders specifically need to analyse an SSB's governance – does it provide for the level of influence they want to exercise? Or is a strong group with incompatible goals already well established, and likely to block any new activities? Also, the IPR policy is of crucial importance – with too lenient a policy many important players may be hesitant to join, a too restrictive policy may prevent users from adopting any standards of this SSB.

In addition, Leaders will need to carefully analyse several characteristics of an SSB they are considering to join, and match them to their strategic goals. The most important of these characteristics are summarised in Table 7 below.

Strategic Goals	Most important SSB characteristics
• To create a market	**Governance**: Does it provide for strong influence of interested players? Or is it rather more 'egalitarian'? **Finance**: Are finances sound? Will the SSB have the stamina to survive the process? Does it depend heavily on individual entities/contributors? **IPR policy**: Is the IPR policy adequate? Will it eventually put-off users who are afraid of high licensing fees? Will it deter holders of important IPR from joining? **Reputation**: Is the SSB well respected in the area in question? Related to that – are its standards widely implemented? **Competition**: Are there competing SSBs? Are competitors likely to emerge, or are all relevant players members? **Membership levels**: does the highest membership level available guarantee the necessary level of influence? Who else is at this level? Are leading users represented in the 'upper' levels? **Key players involved?**: Who are the active players, and which roles do their representatives assume (individual capacity / company rep)? Are the 'right' companies represented? Are all relevant stakeholders represented? Are leading users on board? Are any key players

	missing? Is the combined market power adequate? **Timing**: Will I be able to meet a window of opportunity?
• To create a (successful) standard	**Governance**: Does it provide for strong influence of interested players? Or is it rather more 'egalitarian'? **Finance**: Are finances sound? Will the SSB have the stamina to survive the process? Does it depend heavily on individual entities/contributors? **IPR policy**: Is the IPR available inside the SSB adequate, or is licensing of third-party IPR necessary? **Reputation**: Is the SSB well respected in the area in question? **Membership**: Are there potential allies/ opponents? Is adequate technical expertise available, at both corporate and individual level? **Key players involved?**: Is the combined market power adequate? Are relevant stakeholders represented? Are important stakeholders absent? **Timing**: How long will it take to develop a standard? Will the window of opportunity be met? **Process characteristics**: Can the process be used against me; e.g., to delay the standard? For how long? What are the decision mechanisms? **Products**: Does the SSB offer an appropriate type of deliverable? **Dissemination**: Will the specifications (and possibly reference implementations) be available for free?

Table 7: Leaders' criteria

In addition to the 'positive' goals identified above, the analogous 'negative' goals may also be observed. I.e., to prevent the creation of a new market, or of a successful standard, may also be strategic goals of an organisation. In both cases, the considerations concerning the important characteristics of an SSB remain the same.

3.4.2 Adopters

Most companies will be in this category. Their goals will be rather more tactical than strategic. Accordingly, they will rather more aim at technically influencing the actual standard rather than the market, and would like the new standard to be in line with their own developments. In addition, they will want to gather specific intelligence early on, and maybe adopt their developments accordingly. Another motivation for adopters to actively participate in standards setting may be the desire to share development cost by moving part of this work into the standards body.

Given the above goals, companies in this group tend to go for full rights of participation in all technical activities, but may be less interested in influencing the strategic direction of the efforts and goals of the SSB.

Adopters – Strategic Goals	Most important SSB characteristics
• To influence standard development	**Governance**: does it provide for strong influence of interested players? Or is it rather more 'egalitarian'? **Membership**: Is a membership level available that provides for adequate influence? Who else is at this level? Who are the 'active' members? **Key players involved?**: Are the important players on board? Who are potential strong opponents or allies? **Individuals' capacity**: Do I need to know the individual reps and their views, and the roles they are likely to assume? **Required level of consensus**: Is it possible to exploit the consensus requirement in order to delay the process or to cripple the outcome?
• To share development costs	**Membership**: Are enough (important) members with similar interests on board, at an adequate membership level (to indicate sufficient interest)?
• To gather specific early intelligence	**Membership**: Is a level available that offers a good RoI; i.e. one that does gives access to all relevant information without costing a fortune

Table 8: Adopters' criteria

3.4.3 Observers

Many companies and individuals will have a need to know what an SSB is working on but will not be interested – or will not have the means – to actively participate in any form. That is, their main interest lies in the gathering of general knowledge (Table 9; important, for instance, for consultants).

Observers – Strategic Goals	Most important SSB characteristics
• To gather general (early) intelligence	**Membership**: Is a level available that offers a good RoI; i.e. one that does gives access to all relevant information without costing a fortune?

Table 9: Observes' criteria

4 Perceived Relation Between ICT Standards' Sources and Their Success in the Market

Standards emerge from very different sources, ranging from sufficiently powerful individual companies to voluntary global standards developing organisations. Each of these entities has its own rules and bylaws, works in a specific environment, attracts a certain group of stakeholders, and can be described by a unique set of attribute types and values.

It could be hypothesised that stakeholders select a specific standards setting body (SSB) for (some of) their future standardisation activities based on best matches between an SSBs characteristics and their own business models, strategies, and/or technical needs. Likewise, it could be assumed that a stakeholder's selection of a specific standard (out of a set of competing ones) will be based on similarly objective criteria (such as, for instance, functionality, technical fit, performance, etc).

On the other hand, one could also suspect that other, less tangible reasons may also play a role in such selection processes. Fore example, aspects like individual preferences and prejudices of working group members, reputations of a technology's source, technologies that are considered 'hot', even media hype, may have considerable impact. One typical example here is the common wisdom that the outcome of the formal SDOs' process is of 'higher value' than the outcome of an industry consortium (recently, the number of those who subscribe to the opposed view has been increasing, though).

In this chapter, the impact of an SSB's perceived 'credibility', or reputation, on the success of its products in the market will be studied. That is, the more 'intangible' factors that may have an impact in the process of selecting either a platform for standards setting, or a standard for implementation, will be analysed.

A brief review of the relevant literature (to be found in Annex A) led to a set of hypotheses on the intangible factors that also play a role in the selection of an SSB or a standard. These hypotheses were translated into a questionnaire which served as the basis for a study, the outcome of which will be discussed.

4.1 The Study

4.1.1 Motivation

By now, the web of standards setting bodies has become an enormously complex environment, with a very large number of players with almost incomprehensible interrelations and overlapping work areas.

In particular, rise in the number of consortia which could be observed over the last two decades may lead to the (actually quite popular; see e.g. (Cargill, 2002)) conclusion that the importance of SDOs is declining. This assumption is further underpinned by the fact that many SDOs had to adopt new processes and to come up with new types of deliverables to remain competitive in the standards market.

With the number of competing SSBs increasing it also becomes more and more important to select the 'right' body for a planned standards activities. Backing the

wrong horse (i.e., picking an inadequate SSB), and as a consequence, being stranded with a non-standard technology, may well lead to massive losses for the champion of the unsuccessful standards proposal.

The above suggests that the choice of an SSB is an important contributor to the success or failure of a standards setting activity.

Moreover, intangible reasons may exist for the selection of a specific SSB for a given purpose. If this were the case it would be important to learn about these reasons, in order to get in a position to provide and disseminate information relevant to counter any misconceptions in this area.

All these considerations have ramifications for the impact assessment of a standard. Therefore, the study presented below is intended to serve as an additional input to an impact assessment. In particular, the outcome of the study should provide some insight into the possibly more intangible reasoning behind the selection of an SSB.

As George Paolini, JavaSoft's Director of Corporate Marketing acknowledged (cf. (Garud et el., 2002)): "*In today's world, it's really about first creating mindshare and awareness about a technology, and then driving that technology to reality. That's really what Java has been about*."

4.1.2 Some Technicalities

A questionnaire, comprising 22 open-ended questions was developed. These questions were subdivided into four sections, entitled

- 'General background information'
- 'Knowledge and perceptions of standards setting bodies'
- 'Selecting standards'
  Here, respondents were asked to assume they had to select one out of a number of competing standards offering similar functionality for implementation either locally within their organisation, or for integration into a product / service their organisation is planning to sell.
- 'Actively contributing to standards setting'
  Here, respondents were asked to assume they had to select the most suitable SSB for a standards setting activity that is crucially important for their organisation.

The questionnaire was sent to

- a selection of individuals from industry who could safely be assumed to be knowledgeable,
- two distribution lists the subscribers to which are primarily standards researchers and / or active in standards setting,
- selected members of relevant professional organisations (eema, an independent trade association for e-Business; SES, the Standards Engineering Society; and IFAN, the International Federation of Standards Users).

This is hardly a representative sample, as all addressees are very knowledgeable about standards and standardisation processes. However, the selection was largely dictated by practical issues.

Overall, 22 responses were received. Out of these, seven respondents come from universities, another seven have an industry background. SDOs, contract research organisations, and user associations are represented by two respondents each. Of the remaining respondents, one is a consultant and one is with a regulator.

All but one industry representatives state that they are associated with companies selling ICT standards-based products or services (and even the exception is a bit questionable in this respect). Thus, except for the two respondents representing user associations no indirect users are represented.

With the exception of four universities all employing organisations have actively been involved in ICT standards setting. Personally, all but four university representatives and one contract researcher have been directly involved in ICT standards setting or in standards implementations.

4.1.3 Hypotheses - Discussion

(H1) International/regional SSBs are considered more important than national ones.

A large majority of the respondents stated that international (global) bodies are the most influential ones (specifically in the e-business and telecommunications sectors). While this view was expressed across the board, it was particularly stressed by respondents from industry.

> *"I subscribe to the view on standardisation: do it once, do it internationally. Formal international standards are the first choice, then national standards."* (industry representative 2).

However, at the same time respondents were cautious not to generalise

> *"Huge differences, but difficult to generalize. As an international company we focus on globally recognized SDOs."* (industry representative 5).

This caution would seem to suggest that even in the inherently global areas of e-business and telecommunications industry sees a role for national or regional standards. This, however, would be in stark contrast to the view (also expressed by some) that regional standards bodies are not really desirable.

> *"... If the goal is to increase European economic success, ETSI is doing well. If the goal is to support world-wide compatibility, ETSI is more of a problem, than a solution."* (consultant).
>
> *"I regard regional standards, en CEN, CENELEC, as an unfortunate temporary phase."* (industry representative 2).

Yet, the same respondent qualified this statement, observing that

> *"..., there are areas where international standards are not appropriate because of cultural, climatic or other differences between countries. International standards which try to cover such areas frequently end up so bland as to be useless or contain so many options to cover all eventualities as to be totally confusing for the general user."* (industry representative2).

Likewise, national bodies are said to be hardly in a position to contribute meaningfully:

> *"National bodies like DIN, AFNOR, NIST… have a great difficulty in having a good international view of what is happening in the standards field, where all the big decisions are now taken ....."* (SDO representative 2).

One explanation for the continuing importance of national bodies, and for the motivation that led to the establishment of regional bodies, would be that:

> *" ... Governments will perceive national and/or regional standards as tools for regulation and policy setting, ..."* (industry representative 1).

Yet, smaller companies (i.e., SMEs) will have major problems following, let alone contributing, to international standardisation. For them, a narrower geographic scope is of benefit.

> *"ESOs are the major driving force for us; nationals come after. World bodies are difficult to follow and to influence ....."* (association representative 2).

Another respondent from industry associated the geographical scope of an SSB with the size of the potential market for a standard.

> *"Standards arising from international SDOs have the potential to create massive network externalities. This is limited in the case of regional SDOs."* (industry representative 7).

Along similar lines, another one suggested that the origin of a standard may not be as important as its envisaged usage. The level of acceptance is said to be key.

> *"That would probably depend on the particular usage for which a standard is intended. Industries tend to give more value to standards that are more likely to gain widespread acceptance, wherever they might come from, and, in certain cases, will fight to promote consortia or even proprietary specs that best fit their strategies."* (industry representative 3).

This aspect will come up again, and will be further discussed below. (Blind, 2004) shows in his studies the more positive impact of international standards at least on trade.

(H2) Formal SDOs are seen as being more 'trustworthy' than consortia.

Extending the analysis from formal SDOs to also include standards consortia, common wisdom has it that the standards produced by formal, accredited SDOs is of a higher value than those produced by organisations outside the system of formal national, regional, and international SDOs. This holds for consortia as well as for industry fora or any other form of alliance.

Respondents' comments indicate rather mixed perceptions. Indeed, most respondents from the research domain subscribe to the popular perception that consortia are able to move quicker, are market-driven and more responsive to market needs. However, there seems to be a little confusion about the term 'consortium' – one respondent considered the W3C as a formal body and compares it to a 'newcomer' on the scene, who is working on topics also covered by the W3C – the 'Web Services Interoperability Organization'.

> *"Yes, in my view, industrial consortia are more dynamic and quick in response, and they are more indicated for integrating advances and innovations ..... Another example is that of the WS-I consortia, that was much more dynamic than the W3C in setting up detailed implementation specifications for Web Services."* (university representative 5).

Following up on this perception might be interesting – it indicates the view that some long-standing, well-known consortia are hardly distinguishable from formal SDOs. An analysis of the processes and IPR regimes suggests that this view is not too far off the mark, at least in this respect (see also Annex A).

Along similar lines, two responses from practitioners suggest that the process adopted by an SSB is the decisive point. In this respect, both see advantages on the side of the formal SDOs:

> *".... formal SDOs can be expected to offer full guaranty for due process and fairness, which is reflected in the IPR policy and all other operational rules. This fundamental difference is reflected in the recognition provided by respected international organizations such as the UN, the WTO and the European Commission based on conformance to stringent requirements of openness, transparency, consensus and global relevance."* (SDO representative 2).

> *"Formal SDOs are preferable to consortia if they are available. Consortia with open membership and transparency like DVB are preferable to ad-hoc consortia with closed membership."* (regulator representative).

It is quite telling that the latter comment was made by a representative of a regulatory body.

Related to the above, it was noted that the products that result from the different processes may have different characteristics, specifically in terms of IPR.

> *"Standards are in the public domain or owned by consortia."* (association representative 1).

Overall, the views expressed by the practitioners are a little more differentiated; no prevailing perceptions (or prejudices) can be identified. Here as well some respondents stress that consortia are quicker and more flexible, but market relevance and also maintenance of standards are considered important.

> *... for voluntary standards the main criterion is acceptance by the market ..."* (industry representative 5).

Speed, though, may well be important. However, in the opinion of another respondent from industry, not only the speed of standardisation should be considered, but also the speed of adoption of a standard. Here, he sees an advantage for the SDOs.

> *"Consortia standard bodies come out with standards at a much shorter time than formal SDOs, owing to industry backing. However, the presence of splinter consortia bodies may affect the adoption of standards. Formal SDO, take a longer time to come out with standards, but once the standards are formed, the adoption is faster."* (industry representative 7).

Obviously, once the use (or non-use) of standards has legal implications, SDOs' products enjoy a clear advantage.

The issue of standards maintenance came up several times. On the one hand, this assumes a reasonable longevity of a standard, and also its originator's capability to adapt it to new (technical) developments. Here, it may assumed that formal SDOs have a certain edge, as many consortia a comparably short-lived, and only few care about standards maintenance (see also Annex A).

> *"... However, they* (consortia) *do not have a long life so there is a problem with respect the maintenance of the specifications."* (industry representative 4).

A number of respondents, again all from an industry background, also point at the links that exists between consortia and SDOs.

> "*Consortia are a little bit faster because they use the work of formal SDOs in specific problems.* (industry representative 4).

This is certainly true for some cases (the example of XML, which is based on SGML, developed by ISO in the mid/late eighties, comes to mind). However, the 'typical' course of events is the other way round – specifications developed by consortia are passed to formal SDOs for approval.

> *"Consortia have an important role in DEVELOPING standards but the end product should be published by an SDO..."* (industry representative 2).

A recent prominent, albeit eventually unsuccessful, example of this a approach would be SUN's activities to get JAVA standardised by JTC1 (see e.g. (Egyedi, 2001)). This, however, carries the risk that SDOs will degenerate to 'rubberstamping entities':

> *"I sometimes hear comments in SDOs from people that fear that the body will ultimately be converted into a 'rubberstamping' agency for standards developed elsewhere ....."* (industry representative 2).

Indeed, the PAS-process may be interpreted as a means for JTC1 to stay relevant in an environment that is largely populated by consortia.

(H3) Perceptions of an SSB differ for different technologies.

In addition to, and complementing, the aspects discussed above experience seems to indicate that several SSBs are 'specialists' in certain areas, and not really relevant in others. For example, IEEE are *the* force behind the development of local area networks (both cable-based and wireless), but are of hardly any importance at all in other sectors of mobile communication.

Obviously, some SSBs were founded with a very specific scope:

> *"ATM forum is for ATM only. Frame relay forum is for frame relay only."* (industry representative 4).

Yet, several other more general cases were also noted by the respondents, where SSBs proved particular competence in certain areas. Two examples:

> *"... JTC1 had to rely on ECMA for its standards on magnetic and optical memory units, W3C is probably more relevant presently for XML than any other SSB,*

> *MPEG had a dominant contribution of consortia (e.g. DAVIC), etc. (the list could probably go on indefinitely).”* (industry representative 1).
>
> *“CEN/ISSS and UN/CEFACT for B2B .....”* (research representative 1).

Similarly, a division of labour may occur between co-operating bodies. This may, for instance, be based on perceived specific competencies.

> *“... Even when there is cooperation (like JTC1 with ITU-T, for example), you can always find a division of work: JTC1 had the leadership in OSI, while (the old) CCITT SG 7 leaded in MHS.”* (industry representative 1).

Some respondents also identified certain SSBs as poor performers in some domains:

> *“Take the IETF. High respect concerning some of their protocols like SIP, but less for issues like OAM or MPLS (here they are promoting company specific proposals and do not listen to the requirements of operators).”* (industry representative 5).

One observed that SSBs may also move into areas where standardisation is considered inappropriate:

> *“CEN has produced good standards but has ventured into areas where national guidance is appropriate rather than standards .....”* (industry representative 2).

(H4): The origin of a standard is important for its success in the market.

If charged with the task of selecting one out of a number of competing standards offering similar functionality (either for implementation locally within an organisation, or for integration into a product/service to be sold) most respondents would, first and foremost, want to have information about the degree of global recognition of a standard and, particularly, about its level of acceptance in the market (critical mass of users). In fact, the latter aspect is crucially important; one respondent from telecommunications industry even stated that he

> *“... may have to recommend a standard that I don't believe in because everybody is using it.”* (industry representative 4).

Related to the above, information about the standards incorporated in both competing and complementing products would be of interest, as well as information about potentially relevant legal requirements in major target markets.

Somewhat surprisingly, ‘standards maintenance’ was mentioned by only one respondent.

Various criteria would be applied during this selection process. Overall, the fit of the standard into the envisaged environment within which it would be applied would be important. This includes several aspects. For one, existence of competing standards (both existing and emerging) would be important. Also, the degree to which requirements are met would be important, including the standards ability to interoperate with existing applications and standards, as well as its fit into the implementer’s existing product/service portfolio. Suitability for certain types of customers (e.g., SMEs) might also be an issue (depending on the type of standard). Moreover, IPR aspects (no proprietary elements, no licensing fees) play a role as well.

Respondents expressed a slight preference for international standards, but this doesn't seem to be a hard requirement. A representative response was:

> *"The source is of less relevance, as long as certain criteria are fulfilled: e.g. market acceptance, IPR policy."* (industry representative 5).

Characteristics of the originating SSB (previous track record and its 'respectability') were also mentioned, albeit only by some.

> *"a track record is relevant, but limited. It may also be beneficial, to start a consortium."* (industry representative 5).

Asked to list the criteria they would apply for the selection of the most suitable SSB for a standards setting activity crucially important for their respective organisation respondents identified three broad sets of such criteria:

- The SSB's process' characteristics – efficiency, speed, consensus, IPR policy, scope (geographical, sectoral).
  Overall, however, none of the aspects one would expect to be considered important seems to play a significant role for a majority of respondents. An SSB's IPR policy was mentioned by many, but even this does not quite seem to have the overriding importance one would have thought. Likewise, speed does not seem to be such an important issue for the respondents either (with one exception). The fact that an SSB's process is well defined and that the body is capable of actually managing this process appears to be as important as the individual characteristics of said process.
- Market aspects, including factors such as, for instance, user requirements, characteristics of complementing/competing products, differentiation form competition, etc.

  > *"Standard body supporting the standard. Role of industry leading players and their stance regarding the standard. Presence of complementary/ competing standards. Level of adoption of the standard. Presence/absence of communities of practice."* (industry representative 7).
- Compatibility between an organisation's strategy (or underlying policy) and an SSB's characteristics.
  Judging by the number of respondents who listed this aspect it seems to be much more important than the process' characteristics.

  > *"... I would probably try to develop in the SSB that best fitted my strategy. ..."* (industry representative 1).

  > *" It is important that* (we) *can bring in the principles behind* (our country's) *regulatory policy (ie. promotion of competition, ensuring interoperability, maximising benefits to endusers, protection of consumers) into the standards debate."* (regulator representative).

Some respondents also mentioned preferences with respect to the geographical/ sectoral scope of an SSB, a preference for European standards available in different languages was also mentioned (by the representative of an SME umbrella organisation).

Opinions were equally split with respect to the importance to be associated with earlier successful standards produced by an SSB (its 'track record'). Comments ranged from

> *"Generally, I do not see a direct relation between the previous track record of an SSB and its ability to successfully handle a new work item."* (industry representative 1).

to

> *"ISO TC184/SC4 has one* (a track record). *It is very important."* (university representative 2).

However, it also emerged that information about track records (or lack thereof) are not as widely disseminated as one might expect, and not necessarily, albeit frequently, considered important.

Rather than looking in the past (for a track record) the expected future level of adoption of a standard is also considered important.

> *"We judge the standards based on their adoption, especially by the major product vendors. We also analyse standards from the point of view of their potential. Values vary based on the participation and support of industry leading players, which play a key role in their adoption."* (industry representative 7).

Along similar lines, one respondent also observed that rather than looking for a track record it might be worthwhile considering the option of forming a new SSB (which would, obviously, not have any such track record per-se).

The scope of a standard is another distinguishing factor. Here, both applicability (i.e., sector-specific vs general) and the level of detail (specific vs generic) were identified as sources for differing values of standards. In the former case, sector-specific standard are associated with a lower value, as many SSBs are said to not attempt to make their standards compatible with those from other sectors.

> *"... too many purely sectoral standards that don't look at what is being done in other industrial sectors; ..."* (SDO representative 1).

On the other hand, standards that are too generic because they follow the 'one size fits all' approach are also considered rather worthless. A similar argument was put forward in relation to international standards (see H1).

> *"... IEEE LOM is a 'least common denominator' standard, reluctant to including advanced capabilities, since it targets 'the whole population" of practitioners. ..."* (university representative 5).

Finally, asked if the type of an SSB would make a difference (for active participation), two camps emerged. One group of respondents made it very clear that they would normally prefer a formal SDO for such endeavours.

> *"With very few exceptions preference for formal SDOs."* (regulator representative).

The other group stated that the type of SSB would not be that important; rather, the characteristics of an SSB , as well as other aspects, which are unique to each case and cannot really be pre-determined would have to be considered.

> *"... depending on the type of intended usage, the status of development of the associated artifacts, and many other circumstances, a particular SSB might emerge as preferred."* (industry representative 1).

Quite surprisingly, only one respondent (from a university) expressed a preference for consortia, because of the perceived slowness of formal SDOs.

Looking at the 'true' origin of standards (i.e., at working group level), various comments stressed the impact of individuals on the outcome of the process. This is particularly troublesome for the selection of a suitable SSB, as it adds another dimension which is extremely hard to take into account adequately. Some sample quotes:

> *"It depends on many factors. E.g., in the same committee, depending on the project leader or convenors, the results can be of very different value."* (industry representative 2).
>
> *"ISO work is impacted strongly by the approach of each committee's chair."* (consultant).
>
> *"CEN is dependent on the quality of the people managing projects; ..."* (SDO representative 1).

Related to this, one respondent also pointed out some typical differences in membership between individual SSBs.

> *"The ITU is more formal .... ISO work is impacted strongly by the approach of each committee's chair. ETSI work is greatly improved by the advantages of hiring technical experts to address technical areas. Committee T1 is dominated by telco operators and vendors who have become more myopic as their industry changes. IEEE, as an individual membership organization, attracts a younger and more technically driven set of experts. IETF has the huge advantage of some ground breaking past work and an ability to attract young and bright engineers ...."* (consultant).

4.2 Summary and Conclusion

4.2.1 Summary

A number of hypotheses have been derived (largely) from the literature study. The most relevant of these were used as the basis for the development of the questionnaire. These will be discussed below.

Especially in the ICT sector, European and international standards have long played a crucial role. Most national bodies adopted relevant ISO or CEN standards as national ones; just adding a national foreword and possibly a translation of the most important technical terms used in the document. Accordingly, the importance of national standards in this sector has diminished over quite a number of years.

Also, for many formal SDOs still have some sort of competitive edge over industry consortia and other SSBs. This is partly due to their importance in (government) procurement activities, but also to the widely held perception of fairer and more open processes adopted by SDOs. These observation led to the following hypothesis:

- (H1) International/regional SSBs are considered more important than national ones.
- (H2) Formal SDOs are seen as being more 'trustworthy' than consortia.
- (H3) Perceptions of an SSB differ for different technologies.
- (H4) The origin of a standard is important for its success in the market.

They will be discussed in the following.

(H1) International/regional SSBs are considered more important than national ones.

The responses here were fairly homogeneous overall. National SDOs are considered by most as being of rather little relevance in the e-business and telecommunications sectors. Likewise, the potential market size may be larger for international standards. Possibly a bit surprising, regional (e.g., European) SDOs were also not regarded too favourably by several respondents. This is understandable given the inherently global nature of the sectors in question.

That is, (H1) seems to be only partially correct; over-estimating the role of regional bodies by equating their importance with that of international bodies.

On the other hand, and considering the importance attributed to the adequate participation of SMEs in standards setting (see e.g. (European Commission, 2001), (European Commission, 2004b)), particularly NSOs may enjoy a renaissance. They may well become the channel through which the needs and requirements of those stakeholders which cannot realistically participate in standards setting at the global level (due to, for example, lack of expertise, but also because of such rather more mundane reasons as lack of adequate financial resources) can be fed into the global standards processes.

(H2) Formal SDOs are seen as being more relevant than consortia.

Perhaps somewhat surprisingly, perceptions of SDOs and consortia differ only marginally. A slight edge is conceded to the former in terms of acceptance and adoption of their products, for the latter, in terms of speed of the standards setting process. Neither aspect is considered crucially important, though. Accordingly, (H2) must be considered as wrong.

That is, a general preference for either SDOs or consortia cannot be concluded. While certain constituencies do seem to have specific preferences (regulatory bodies for international/European SDOs, European SMEs for European/national SDOs), especially practitioners from industry point at the different, yet complementing roles of consortia and SDOs.

(H3) Perceptions of an SSB differ for different technologies.

This seems to be definitely the case. Several reasons may be identified for this. For one, certain SSBs were founded with a very specific purpose, and never ventured beyond that. In other cases SDOs rely on the specific expertise of other bodies for the production of international standards. It may also happen that the type of membership of an SSB (as opposed to the SSB per se) is considered more appropriate for a given task. This was the case for the standardisation of an electronic messaging system. Here, the national PTTs were seen by many as the most suitable institutions

to ensure the widest possible implementation of the standard (and as the guarantor of interoperability of the implementations). Accordingly, CCITT was the standards body of choice.

(H3) may thus be considered correct.

On the other hand, it also seems that an SSB should not regard widely recognised previous successes as a license to also adopt other areas for standardisation.

(H4): The origin of a standard is important for its success in the market.

Selection of a standard for local implementation, or for integration into commercial products or services, hardly seems to depend on its institutional origin per se (i.e., whether it originated from a formal SDO or a consortium). IPR issues are the one exception in this context.

Rather, more practical aspects seem to be important, most notably a standard's fit into the environment within which it will have to operate, the fit into the product portfolio in case of a manufacturer or a service provider, as well as its likely future adoption by the market.

Somewhat in contrast to this, the characteristics of an SSB's process seem to play a role for the selection of an SSB for pro-active standards setting. However, here as well they are not assigned the importance one would expect. On the other hand, this lack of perceived importance is in line with the responses regarding the relevance of different types of SSBs.

The most important aspect to be considered for potential standards-setting activities is the match between an SSB's characteristics and the proposer's strategy. That is, any platform for standardisation activities would need to be able, and flexible enough, to accommodate potentially very different strategies. These might require, for example, to focus on technical details, or on the emergence of a new standard. Likewise, various degrees of influence are likely to be required, also depending on the underlying corporate strategy.

All in all, the requirements listed form a very mixed bag – no single dominant demand can be identified.

The 'track record' of an SSB appears to play a more important role for a company assuming the role of a potential active contributor to standardisation than it would if the role of a user were assumed. While by no means agreed upon by all, the importance of such a track record was mentioned far more frequently for standards setting than it was for standards deployment.

Here again, the type of SSB is considered not relevant by many. While some (notably regulator and SME association) expressed a preference for SDOs, many others stated that this would (have to) be a case-by-case decision.

Finally, it was observed by many that the impact individuals (most notably, chair persons) may have on the process must not be under-estimated. A consequence of this observation would be that aspects such as, for example, the individual make-up of a working group, and the previous track-record of the convenor/chairman (or absence of it), and possibly even the make-up of the committee will have to be taken into account if the suitability of a particular SSB for a new standards initiative is to be evaluated.

It follows from the above that (H4) cannot be considered correct.

4.2.2 Conclusions

The one conclusion that immediately suggests itself is that companies who need to either implement or set standards are not that much interested in issues like 'consortium vs SDO'. In fact, it seems that this distinction is hardly valid any more. This is further re-inforced by the fact that several respondents mixed up formal SDOs and consortia. This is understandable if one considers that the rules and regulations of several (of the long established) consortia (such as, e.g., OASIS or W3C) can hardly be distinguished from SDOs. Likewise, within ETSI a company's number of votes depends on the membership fee it is paying.

Rather, considerable importance is assigned to the processes adopted by an SSB. Here, IPR aspects seem to play the most important role. More generally, an SSB's characteristics need to be compatible with a company's strategy and its business model. Accordingly, preferences will frequently depend on the characteristics of the individual case; there's hardly any general 'SSB of choice' (with the possible exception of 'specialist' SSBs, which are – at least temporarily – the sole occupants of a market segment (e.g., the ATM Forum)). This finding nicely confirms the approach towards an SSB taxonomy adopted elsewhere in this document (sect. 3.3). Obviously, SDOs may enjoy a competitive advantage in cases where regulatory requirements call for 'formal' standards. However, given the above, this increasingly artificial distinction may need to be revisited.

Finally, the important role the individual can play in the process has been highlighted by many. Whilst difficult to evaluate, it may be worthwhile – and indeed inevitable – to integrate this aspect into any future evaluations of an SSB and its processes.

With respect to the overall project, the outcome of the study re-inforces the deliberations on the links that exist between stakeholders, business models, standards, and SSBs (see sects. 2.4., 2.5). Moreover, it adds further legitimacy to the classification of SSBs introduced in sect. 3.3.

4.2.3 Limitations of the Study

Unfortunately, the study suffers from an unfortunate limitation:

All respondents have considerable experience in the standards business, and are not necessarily representative of the 'average' employer in charge of standards-related questions within an organisation. It may be assumed that this holds particularly for individual SMEs[64] and for indirect users (both of which were represented in the study only through the user associations).

Thus, the conclusions above cannot necessarily be generalised for the whole ICT sector. Rather, additional studies will be necessary, specifically focussing on SMEs and indirect users[65].

[64] For more infomration on the topic of SMEs in ICT standards setting see also (Jakobs et al., 2003).

[65] (Blind et al., 2002) discuss the motivations to join formal and informal standardisation processes.

5 Implementable Findings

A number of practically relevant lessons may be learned form the above. These will be summarised and briefly discussed in this section. A number of high-level recommendations fill be followed by a set of specific recommendations towards an improved IPR policy.

5.1 General Recommendations

High-level, general recommendations, which address a wide variety of open issues, are given below.

- **Provide a useful definition of what establishes an 'open standard'**
  This definition is likely to have potentially significant policy implications. Therefore, a meaningful definition should be provided through the collaborative efforts of all interested parties, taking into account the needs of policy makers, ESOs, and users.
- **Revisit the distinction between SDOs and consortia**
  Similar to the above, the outcome of the study on the relation between ICT standards' sources and their success in the market suggests that the widely used distinction between formal SDOs on the one hand and informal consortia on the other should be revisited. In the light of increasingly similar membership, processes, and IPR regimes of major consortia and SDOs this distinction seems more and more artificial.
  In particular, this revised view on the relative 'value', 'relevance', or 'credibility' of standards issued by formal SDOs vs those produced by formal consortia should be taken into account in public procurement. Here, a decision whether or not consortium standards are to be considered should be done on a case by case basis. The standards issued by some of the larger, well-established and recognised consortia (such as, for instance, the W3C and OASIS) should be considered equal to those of the formal SDOs. Along similar lines,
- **Improve co-ordination between ESOs and consortia**
  The fragmentation of the standards setting universe is likely to be here to stay. To minimise the negative impact this fragmentation has on the overall standards setting in e-business mechanisms should be implemented to improve the co-ordination between ESOs and consortia. This could be achieved through an adequately flexible and speedy transposition process, and/or through a division of labour, whereby long-lived 'infrastructural' technologies would be dealt with by the ESOs through their 'traditional' process, and short-lived other technologies would be within the realm of consortia and the ESO's New Deliverables. The sequentiality between infrastructure and subsequent applications and services have also to be taken into account in the standardisation activities of SDOs and consortia and their co-ordination efforts.
- **Improve co-operation of ESOs in e-business standardisation**
  The current split between standardisation in 'ICT infrastructure' and 'e-business' is unhelpful. Mechanisms for improved co-operation and co-ordination between the organisations involved (i.e., ETSI and CEN/ISSS) should be established.

Alternatively, the responsibilities could be re-assigned, e.g., through a joint e-business task-force.

- **Coordinate e-business and e-government standardisation**
  The similar requirements of e-business and e-government should be considered in the standardisation processes, but it has also to be taken into account the specific demand of e-government standards, e.g. regarding accessibility.
- **Move away from the 'user – supplier' or 'direct users – indirect users' dichotomy**
  The above distinction has been quite popular in the literature. Unfortunately, the boundary between these groups is increasingly blurred, as more and more formerly indirect users turn towards selling ICT systems. The automotive industry is a case in point – modern cars are equipped with fairly complex electronic systems communicating via 'Car Area Networks'. Likewise, technology suppliers like e.g. SUN or Ericsson have always also been users of their own systems.
  Also, the outcome of the credibility study shows that organisations' decisions about the level of active involvement in standards setting are taken on a case by case basis, depending on a number of individual factors, like their intentions and objectives . Consequently, they do not necessarily always assume the same pre-defined role as leader, but may choose in another case to be an adopter or just an observer.
- **Determine policy-relevance of SSBs' Deliverables**
  Also related to the above. Depending on the characteristics of the underlying development processes SSBs' deliverables may or may not be considered 'worthy' to be of relevance for policy, e.g. public procurement and legislation, and the New Approach. A thorough analysis of the individual SSBs' processes and other characteristics should be performed, and an initial 'white list' of policy-relevant types of deliverables should be established. This list should not distinguish between the respective status of an SSB (formal vs consortium), but be solely based on the SSB's characteristics. The list would need to be monitored and updated regularly.
- **Encourage industry associations act as a 'broker'**
  Such associations are best placed to link actors (i.e., their members) interested in exploring e-business initiatives. In doing so, they should follow 'best practice' guidelines
- **Encourage SSBs to be open beyond their sectoral community**
  This is especially relevant for the description and communication of their scenarios, process models and business models within their e-business standards.

5.2 IPR – Regimes and Recommendations

The relation between IPR and standardisation is a relatively new phenomenon, which is especially virulent in network industries, like e-business and telecommunications. There is empirical evidence suggesting that many conflicts between IPR and standardisation are not adequately resolved.

Numerous different aspects are associated with the relation between IPR and standards setting. From the IPR holders' point of view the prospect of RAND, and perhaps even RF, licensing of IPR relevant to an emerging standard may not be very promising. It may deter IPR holders from supporting formal or open standardisation activities that might affect their IPR, and which might be affected by it.

For obvious reasons, potential future users of a standard have an entirely different view. From their respective, standards should not incorporate any IPR that is not licensed royalty free. For them, all other IPR regimes hold the prospect of license fees that are incalculable up-front. This possibility may well suffice to keep them away from standards setting activities that may experience such problems with incorporated IPR.

Given these almost mutually exclusive interests, SSBs are faced with a dilemma. Their IPR regime may have significant impact on their attractiveness to both potential users and holders of relevant IPR. An SSB needs to find a reasonable balance here – the regime must neither deter IPR holders nor potential users. Thus, it may also have implications on the level of openness envisaged by an SSB.

This tension between IPR and standards setting needs to be addressed from different angles. Only some of these angles relate directly to SSBs; policy makers and IPR holders also need to contribute to a solution. In the following, some recommendations to the different stakeholders are formulated.

5.2.1 IPR Policy

The characteristics of an IPR policy have a major impact on the effectiveness and the efficiency of standardisation processes. The following recommendations are focused on changes in the patenting regime or practice:

- Assure a high level of quality of issued patents, thus reducing the risk of conflicts arising from weak patents.
- Promote a world-wide harmonisation of national IPR regimes in order to decrease the likelihood of conflicts, e.g. in the case of software patenting, caused by cross-border application of technical standards.
- Improve the transparency and accessibility of IPR material in order to make the monitoring activities in the IPR minefield easier.
- Allow for compulsory licensing provisions as last resort in the court system.
- The IPR Helpdesk, funded by the EU, should also provide services concerning the role of IPR in standards.

5.2.2 Standardisation Policy

The following recommendations are addressed to SSBs. They are mostly directed to general strategic standardisation policies, including licensing and disclosure rules.

- Encourage SDOs to identify promising new technologies in their very early stages and to start new standardisation processes instead of waiting for them to mature, since in the very early pre-competitive stage of technology life cycles there is some pressure on the actors to converge their interests.

- Increase the awareness among participants of standardisation processes of possible inputs from science and technology.
- Prefer standards which do not specify the design of components, but their performance, in order to avoid conflicts with patents protecting these components.
- Limit the duration and the scope as well as the level of detail of a standardisation process, in order to restrict the probability for IPR conflicts.
- Change the framework conditions of standardisation in such a way that the incentives of innovative R&D-intensive companies to join standardisation processes become more attractive in general (e. g. allow attractive licensing schemes, see below).
- Standardisation processes should become faster, cheaper and more flexible.

5.2.3 Disclosure Rules

Disclosure rules enable SSBs to obtain information about whether technologies under consideration for inclusion in the standard are proprietary and subject to licensing. They thereby reduce the potential for a technology to be included in a standard without the knowledge that a technology owner, with intellectual property that impinges on the standard, may try to extract royalties for the use of his technology.

- Because of differences across industries in the reward afforded by patent protection and in the needs for compatibility and standardisation, no disclosure rule would be optimal for all situations.
- Increase the transparency of IPR relevant for standards by building up publicly available databases with IPR that are potentially ‘essential’ for their standards.

5.2.4 Licensing Policy

Having learned through disclosure which elements of the standardised technology may be proprietary and subject to royalties, SSBs are still left with the problem of drafting guidelines for setting licensing fees the IPR-owner should charge after the standard is determined. The typical policy mandating that a royalty be ‘fair, reasonable and non-discriminatory’ gives little guidance for royalty determination because ‘reasonable’ can mean different things to a technology-owner and a technology-buyer.

- Make databases available which contain details of exemplary licensing cases, which provide guidelines for the negotiations between the IPR-holders and potential licensees.
- Take into account the IPR-holders´ pre-selection negotiation and conclusion of licenses with individual licensees in the standard selection process.
- Encourage SDOs to set up some means of dispute resolution within the organisation to help resolve royalty disagreements, since this will be quicker and cheaper than resorting to the courts.

5.2.5 Patent Pools

Since usually not only a single patent has to be considered for integration into a standard, patent pools may represent an organisational model to save transaction cost regarding both disclosure and licensing of IPR, compared to multilateral negotiations. They are also able to resolve conflicts both among IPR-holders themselves and between IPR-holders and standards users. Nevertheless, to establish and run patent pools efficiently, and to promote their general welfare advantages, some conflict potentials and potential disadvantages, like their misuse as a price-fixing mechanism, have to be taken into account and the following recommendations should be considered.

- Pool patents early, in order to avoid constellations with two or more pools driven by different interests.
- Use public non-profit research institutions as key gravitational force for creating patent pools, since they can more easily balance the often controversial interest of the companies.
- Involve companies in patent pools which are successful in distributing new products and technologies, since this may guarantee the successful acceptance of a new standard in the market.

5.2.6 Competition Policy

Both the outcome of the IPR regime, like granting a temporary monopoly via patents, and the results of standardisation processes, like the specifications of a standard causing heterogeneous implementation costs at the user side, may have negative impacts on competition. However, standardisation may also foster competition by levelling the playing field.

In general, competition policy makers have to develop a better understanding of the scope of conflict between IPR and standardisation and its impact on competition policy issues. In general, a more intensive dialogue between all parties involved can be a first step to this better understanding.

Besides this general suggestion, the following proposals focus less on different consequences of the IPR regime for standardisation and competition, but more on the consequences of the interaction of IPR and standards on competition.

- If IPR-protected technologies are integrated in a standard, be very careful about possible negative impacts on competition, since this constellation may increase the monopoly power of the IPR-holder. A remedy could be the prescription of compulsory licenses, although this instrument should be used very restrictively, because of its negative incentive signal to innovative companies interested in standardisation.
- In the case that standards become mandatory via reference in other regulations, solutions have to be found to deal with IPR-holders who refuse to give licenses away for no or very small fees.
- Consider also standardisation as an instrument to solve antitrust problems, since it allows that all interested parties influence both the specifications of a standard and implement it, leading to a common level in the playing field of competition.

Therefore, standardisation may also substitute the regulation of competition by governmental institutions.

- Standards are able to devalue the brand loyalty, which is built up during the terms of patents, after the patent protection comes to an end, since standards may speed up the substitution process after the termination of the patent protection period.
- Increase the pro-competitive aspects of patent pools by the involvement of competition policy authorities in laying out allowable licensing arrangements of patent pools. Furthermore, a patent pool notification scheme increases the transparency for these institutions and alleviates and improves their decision-making process.

6 Links With Other Workpackages

This deliverable covers rather broad ground. Therefore, its links to other workpackages (notably WPs 3 and 4) are equally extensive. Figure 20a shows the originally envisaged links; the work done within WPs 1 and 2 is considered to contribute only to WP 3, which looks at the dynamics of standards and their implementations. Figure 20b depicts the links as they finally emerged.

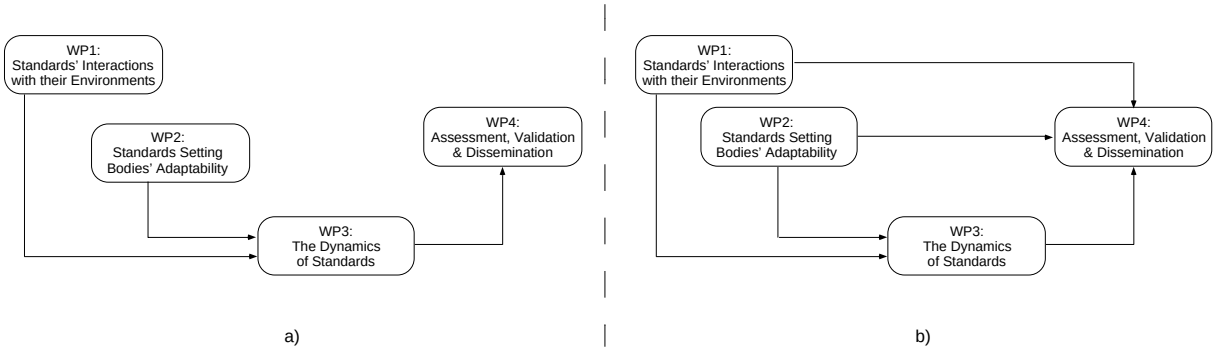

Figure 20: Links between WPs 1-4
a) Originally envisaged b) Actual

ICT and e-business standards are hardly ever stand-alone artefacts, or part of one. Rather, they are part of a typically complex system of interacting artefacts. Thus, demand for new / modified standards will in almost all cases be expressed in terms of the demand for changes in the functionality of this system, articulated by either producers, appliers, or consumers. This, in turn, may trigger activities relating in one (or several) SSBs (depending on the 'weight' associated with those entities actually issuing this request, and on the level of activities they develop).

Also, standards are incorporated into larger systems, which are then implemented and deployed on a consumer premises. These processes of incorporation and implementation, and also during subsequent use, may have an impact on the standards over time.

The above establishes the relation that exists between the work done on the link between standardisation and business models and WP3, which – among other aspects – looks at the interaction between standards and the environment within which they are developed.

Yet, this work also provides direct link to WP 4, which is in charge of developing tools for an impact assessments of standards. The standards setting environment is not a static entity. New SSBs are established over time, old ones are dissolved, memberships of the individual bodies change, etc. This broader environment from which standards emerge may also be expected to have an impact on the content of a standard (and indeed on its very existence). These dynamics are also expressions of (changing) stakeholders' interests. The business model approach may help capture these effects, and thus also provide input for an impact assessment.

Likewise, strategic and commercial interests of the intermediaries, i.e., the SSBs, which provide the platforms for standards negotiations, may change over time. Such changes are also likely to contribute to the dynamics of the broader standardisation environment, and to be of relevance for an impact assessment.

The taxonomy of standards setting bodies and of the different categories of standards users also links into both WP 3 & 4., complementing the work described in chapter 2. The specific characteristics of a standard's origin will have to be integrated into tools to measure the impact a standard may be expected to have not on a per-company level, but on a wider scale (e.g., per industry sector or per regional / global economy). Knowledge about who initiated a standard setting activity, and / or is supporting it, will be of particular importance. Likewise, an ex-ante analysis of the match (or lack thereof) between an SSB's characteristics and the applicable business models of the stakeholders of an emerging standard will yield relevant information for an impact assessment exercise.

The insights that can be gained through an analysis of the dependencies between standards will further complement the work on the link between standardisation and business models (see above). By also including information on standards of adjacent layers a broader and more realistic picture can be obtained than can be from the analysis of one isolated standard. This will be of relevance to both an impact assessment and for an analysis of a standard's interactions with the environment within which it is developed.

Finally, the study on the perceived relation between a standard's source and its success in the market verifies some of the more theoretical deliberations presented in chapters 2 and 3. It will thus also directly validated within the impact assessment based on the survey among ETSI-members.

7 References

Amor, D. (2000): The E-business (R)Evolution. Living and Working in an Interconnected World. USA: Prentice Hall.

Arthur, B. (1989): Competing Technologies, Increasing Returns, and Lock-In by Historical Events. Economic Journal, Vol. 99, pp. 116-131.

Baskin, E.; Krechmer, K.; Sherif, M. (1998): The six dimensions of standards: Contribution towards a theory of standardization. Management of Technology. In: Lefebvre, L.A. et al. (eds). Sustainable Development and Eco-Efficiency, Elsevier.

Bellissard, L., et al (1999): An Agent Platform for Reliable Asynchronous Distributed Programming. Proc. 18th IEEE Symposium on Reliable Distributed Systems table of contents. IEEE Computer Society

Besen, S.M., and Farrell, J. Choosing (1994):How to Compete: Strategies and Tactics in Standardisation, The Journal of Economic Perspectives (8:2), Spring, pp 117-131.

Blind, K. (2004): The Economics Of Standards - Theory, Evidence, Policy, Edward Elgar, ISBN 1 84376 793 7

Blind, K; Thumm, N. (2004): Intellectual Property Protection and Standardisation. Internationl Journal of IT Standards & Standardization Research 2(2), pp. 61-76

Blind, K.; Thumm, N. (2004a): Interdependencies between Intellectual Property Protection and Standardisation Strategies. Research Policy 33, 2004, pp. 1583-1598.

Blind, K.; Thumm, N.; Bierhals, R.; Hossein, K.; Iversen, E.; van Reekum, R.; Rixius, B. (2002): Study on the Interaction between Standardisation and Intellectual Property Rights; Final Report to the DG Research of the European Commission (EC Contract No G6MA-CT-2000-02001), Karlsruhe.

Borras, J. (2004): International Technical Standards for e-Government. Electronic Journal of e-Government Volume 2 Issue 2, (75-80)

Britt, F.F. (2002): Multiplying business value: The fusion of business and technology. IBM Institute for Business Value, http://managementconsult.profpages.nl/man_bib/rap/ibm06.pdf

Broadbent , M.; Weill, P.; St. Clair, D. (1999): The implications of information technology infrastructure for business process redesign. MIS Quarterly. Vol. 23 , Issue 2

Bunduchi, R., Graham, I, Smart, A. & Williams, R. (2005): The Tensions Shaping the Emergence of Standards Bodies: the Case of a National Health Informatics Standards Body. Prometheus, Vol 23, Number 2.

Cargill, C. (2002): Uncommon Commonality – A Qust for Unitiy in Standardization. In: Bolin, S. (ed): The Standards Edge.

Castells, M. (2000): The Information Age: Economy, Society, and Culture. Volume 1: The Rise of the Network Economy. Oxford: Blackwell Publishers.

CEN (2005): Analysis of standardization requirements and standardization gaps for eProcurement in Europe, CEN Workshop Agreement, Brussels

CPT (eds.) (2005): The Consumer Project on Technology: Treaty On Access To Knowledge. www.cptech.org/a2k/consolidatedtext-may9.pdf.

David, P.A. (1985): Clio and the Economics of QWERTY, The American Economic Review (75:2) pp 332-337.

David, P.A. (1987): Some new standards for the economics of standardisation. In: Economic policy and technological performance, P. Dasgupta and P. Stoneman (eds.), Cambridge University Press, Cambridge, pp. 206-239.

David, P.A.; Steinmueller, W.E. (1990): The ISDN Bandwagon is Coming, But Who Will Be There To Climb Aboard?: Quandaries in the Economics of Data Communication Networks. Economics of Innovation and New Technology, Vol. 1, pp. 43-62.

Davydov, M. M. (2000): e-Commerce Solutions for Business and IT Managers. corporate Portals and e-business Integration. New York, USA: McGrow Hill.

de Vries, H.J. (1999): Standardization. A Business Approach to the Role of National Standardization Organizations, Boston / Dordrecht / London: Kluwer Academic Publishers.

de Vries, H.J. (2001): Systematic services standardization from consumer´s point of view, contribution to the ISO Workshop in Oslo May 2001, Oslo.

DIN (ed.) (2002): Standardisierung in der deutschen Dienstleistungswirtschaft - Potenziale und Handlungsbedarf - Beuth, DIN-Fachbericht 116, Berlin: Beuth.

Eertink, H.; Demchenko, Y. (eds) (2000): Notes from the European Middleware Workshop (EMW2000). http: / / www.terena.nl / tech / projects / middleware / emw2000notes01.html

Egyedi, T.M. (2001): Why JavaTM was -not- standardized twice', Computer Standards & Interfaces. vol. 23, no.4.

European Commission (eds) (2001): On Actions Taken Following the Resolutions on European Standardisation Adopted by the Council and the European Parliament in 1999. COM(2001) 527 final.

European Commission (eds) (2004a): Commission Staff Working Document: The challenges for European standardisation. http: / / europa.eu.int / comm / enterprise / standards_policy / role_of_standardisation / doc / staff_working_document_en.pdf.

European Commission (eds) (2004b): The role of European standardisation in the framework of European policies and legislation. Communication from the Commission to the European Parliament and the Council, COM(2004) 674. http: / / europa.eu.int / comm / enterprise / standards_policy / role_of_standardisation / doc / communication_en.pdf.

European Commission (eds) (2005): i2010 – A European Information Society for growth and employment – Extended Impact Assessment. http: / / europa.eu.int / information_society / eeurope / i2010 / docs / extended_impact_assessment.doc

European E-Business Report (2004). www.ebusiness-watch.org / resources / documents / eBusiness-Report-2004.pdf

Fabisch, G. (2003): Consumers and Standards: Consumer Representation in Standards Setting. Presented at the Stanhope Centre's Cotswolds Conference. http: / / www.stanhopecentre.org / cotswolds / Fabisch%20Paper%202003.pdf.

Gallaher, M.P.; O'Connor, A.C.; Phelps, Th. (2002): Economic Impact Assessment of the International Standard for the Exchange of Product Model Data (STEP) in Transportation Equipment Industries, Planning Report 02-5, Gaithersburg, MD: National Institute of Standards and Technology.

Garud, R.; Jain, S.; Kumarasawamy, A. (2002): Institutional entrepreneurship in the sponsorship of common technological standards: The case of Sun Microsystems and Java. Academy of Management Journal, 45 (1).

Glinstedt, H. (2003): Competition Policy in Network Markets: Innovation and Mobile Telecom Standards Markets in the Information Age. Swedish Competition Authority Report.
http://www.konkurrensverket.se/bestall/pdf/Information_age.pdf&e=10431

Graham, Ian , Graham Spinardi, Robin Williams & Juliet Webster (1995): The Dynamics of EDI Standards Development. Technology Analysis and Strategic Management, Vol. 7, No. 1, pp. 3 - 20.

Gray, E.M.; Bodson, D. (1995): Preserving Due Process in Standards Work. ACM StandardView, vol 3, no 4.

Hawkins, R. (1999): The Rise of Consortia in the Information and Communication Technology Industries: Emerging Implications for Policy. Telecommunications Policy, 23, pp. 159-173.

Hong, J. I.; Landay, J. A. (2001): An Infrastructure Approach to Context-Aware Computing. Human-Computer Interaction, Vol. 16, No. 2, 3 & 4, Pages 287-303

IDABC eGovernment Observatory (2005): eGovernment in the Member States of the European Union, European Communities (ed.), Brussels

IDABC programme (eds) (2004): European Interoperability Framework for Pan-European e-government Services.
http://europa.eu.int/idabc/servlets/Doc?id=19528

IEC, ISO, ITU, UN/ECE (eds) (2000): Memorandum of Understanding Concerning Standardization in the Field of Electronic Business. http://www.itu.int/ITU-T/e-business/files/mou.pdf

IETF (eds) (1996): The Internet Standards Process -- Revision 3. Internet RFC 2026.

ISSS (eds) (2004): ICT Standards Consortia survey, 9th edition.
http://www.cenorm.be/cenorm/businessdomains/businessdomains/isss/consortia/survey+table+of+content.asp

Iversen, E. J. (1999): Standardization and Intellectual Property Rights: ETSI's controversial search for new IPR procedures. Proc. 1st Int. Conf. on Standadisation & Innovation in IT.

Jakobs, K.; Procter, R.; Williams, R. (1998): Telecommunication Standardisation – Do We Really Need the User? Proc. 6th Int. Conf. on Telecommunications, ICT '98, IEE Press.

Jakobs, K. (2004): (E-Business & ICT) Standardisation and SME Users – Mutually Exclusive? Proc. Multi-Conference on Business Information Systems, Track 'E-Business – Standardisierung und Integration, Cuviller Verlag, Göttingen.

Jakobs, K. (2005): Descriptions of Sample SSBs – Process, Membership, and Output. RWTH CoSc Working Document.

Kahneman, D. (1994):New challenges to the rationality assumption. Journal of Institutional and Theoretical Economics 150 pp. 18-36.

Katz, M. L., and Shapiro, C. (1986): Technology Adoption in the Presence of Network Externalities. Journal of Political Economy, Vol. 94, pp. 882-841.

Kraemer, K. & Dedrick, J. (2002): Strategic use of the Internet and e-commerce: Cisco Systems. Journal of Strategic Information Systems, 11(1): 5-29.

Lane, R. E. (1991): The Market Experience. Cambridge: Cambridge University Press.

Leiss, W. (1988):The Limits to Satisfaction. Kingston and Montreal: McGill-Queen's University Press.

Marincu, C.; McMullin, B. (2004): A comparative assessment of Web accessibility and technical standards conformance in four EU states. In: First Monday, 9 (7).

Morath, P. (2000): Success@E-Business. Profitable Internet Business&Commerce. London: McGraw Hill.

OSSOS (eds) (2002): Programme for Open Standards and Open Source Software in Government. www.ictu.nl/download/OSOSS_English.pdf.

Oudshoorn, M. (2003): Scheduling and Latency—Addressing the Bottleneck. In: Shi, N.S.; Murthy, V.K. (eds): Architectural Issues of Web-Enabled Electronic Business, Idea Group Publishing

Paolucci, M.; Sycara, K. (2003): Autonomous Semantic Web Services. IEEE Internet Computing. Volume 7 , Issue 5

Papazoglou, M. P. (2003): Web Services and Business Transactions. World Wide Web: Internet and Web Information Systems, 6, 49–91. Kluwer Academic Publishers.

Peteraf, M. A. (1993): The cornerstone of competitive advantage: A resource-based view. Strategic Management Journal, pp. 179-191.

Rada, R. (2000): Consensus Versus Speed. In: Jakobs, K. (ed): IT Standards and Standardisation: A Global Perspective. Idea Group Publishing, ISBN 1-878289-70-5, 2000.

Riggins, F. J. & Rhee, H. (1998): Toward a Unified View of Electronic Commerce. Communications of the ACM, 41(10): 88-95.

Roberts, S. (2004): Presentation at e-Business W@tch Workshop, OECD work in the area of e-business and its impacts, Paris.

SAGA (2003): Standards and Architectures for e-Government Applications. http://www.kbst.bund.de/Anlage304417/Saga_2_0_en_final.pdf

Salter, L.(1988): Mandated Science: Science and Scientists in the Making of Standards. Dordrecht: Kluwer.

Schmidt, S.K.; Werle, R. (1998): Coordinating Technology. Studies in the International Standardization of Telecommunications. Cambridge, MA: MIT Press.

Scitovsky, T. (1976): The joyless economy: an inquiry into human satisfaction and consumer dissatisfaction. Oxford: Oxford University Press.

Seddon, P. (1997): Defining Electronic Commerce, Department of Information Systems, University of Melborne, http://www.dis.unimelb.edu.au/staff/peter/research/InternetEra.htmlTapscott, (2001)

Silva, F.; Senger, H. (2004): Digital Communities in a Networked Society: e-Commerce, e-Business and e-Government. Proc. Third IFIP Conference on e-Commerce, e-Business and e-Government, Kluwer

Spinardi, G.; Graham, I.; Williams, R. (1997): EDI in the Scottish health service: inter-organisational systems and inter-organisational change. Journal of Strategic Information Systems, Vol. 6, No. 3, November, pp. 251-263.

Su, S. Y. W., Lam, H., Lee, M., Bai, S. and Shen, Z. J. (2001): An Information Infrastructure and E-Services for Supporting Internet-Based Scalable E-Business Enterprises, In Proceedings of the Fifth IEEE International Enterprise Distributed Object Computing Conference, http://csdl.computer.org/comp/proceedings/edoc/2001/1345/00/13450002abs.htm

Tapscott, D. (2001): Rethinking Strategy in a Networked World. Strategy and Business, Third Quarter(24): 1-8.

van der Mandele, M. (2000): E-Business and Strategy: Arthur D. Little E-Business Center. http://www.netskill.de/ebusiness.nsf/7875A002F42DE041C125697E00562D54/$File/e-business_and_strategy.pdf. Acess date: April, 2005.

van Hooft, F. P. C. & Stegwee, R. A. (2001): E-business strategy: How to benefit from a hype. Logistics Information Management, 14(1/2): 44-53.

Venkatraman, N. (1991): IT-Induced Business Reconfiguration. In Scott Morton, M.S. (ed): The Corporation of the 1990s: Information Technology and Organizational Transformation. Oxford University Press, 1991.

Venkatraman, N. (2000): Five Steps to a Dot-Com Strategy: How to Find Your Footing on the Web. Sloan Management Review, 41(3): 15-28.

Verhoosel, J.P.C.; Akkersdijk, V. (2004): eGovernment for Businesses: Lessons learned from a trajectory of Standardization of Business Information - eAdoption and the Knowledge Economy: Issues, Applications, Case Studies, Cunningham, P.; Cunningham, M. (eds.), Amsterdam: IOS Press, pp. 604-610.

Wieringa, R.; van Eck, P.; Blanken, H. (2004): Architecture Alignment in a Large Government Organization: A Case Study. CTIT Technical Report, http://wwwhome.cs.utwente.nl/~patveck/papers/wieringa_etal_caise04forum.pdf

Williams, R., Graham, I., & Spinardi, G. (1993): The Social Shaping of EDI. Paper presented at the Proceedings of the PICT/COST A4 International Research Workshop, Edinburgh.