

Interoperability and Open Standards for eGovernment Services

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Abstract

This paper presents the key industry issues concerning interoperability and open standards with a view to developing sustainable solutions beneficial to all stakeholders. The focal point in the discussions amongst the different stakeholders – EU, Member State governments and industry – is the definition of open standards as the implications of this definition affect government services and business practices across Europe. Open Standards should refer to a technical interoperability framework which is agreed upon by companies and governmental decision-makers in order to ensure greater overall interoperability. This paper outlines how the balance between standardisation and intellectual property is struck by respecting the principles of transparency and non-discrimination. In this regard, the need to preserve consistency with EU policy and legal positions taken is of crucial importance, in particular as it relates to European and international intellectual property rights and public procurement law.

1. Introduction

Recent EU policy initiatives, including **eEurope**, have brought **‘Interoperability’** to centre-stage of the European Union’s ICT governance framework.

Today, in one way or another, all stakeholders - governments, industry, consumers, and other social partners - have recognised the need for interoperability and recognise the benefits interoperability could bring. However, while everybody may agree on the need for interoperability, the scope and implementation of interoperability, as well as the incentives that encourage it or the technical or political barriers that hinder it, remain controversial.

One of the main controversies of concern relates to the implementation of interoperability and the definition of open standards.

The ICT Industry has recognized the ever-increasing importance of systems and software interoperability to enable business process/government service development and the integration of systems and business processes. Simply defined, interoperability is the ability of two or more ICT assets (hardware devices, communications devices, or software

¹ Initiative for Software Choice (ISC, www.softwarechoice.org) is a global coalition of more than 300 large and small companies and associations committed to advancing the concept that multiple competing software development and licensing models should be free to develop flourish unimpeded by government preference or mandate. The Initiative is managed by the Computing Technology Industry Association (CompTIA www.comptia.org) the worlds largest technology trade association.

components) to easily or automatically work together and, in the business sense, expands to include the ability of two or more business processes, or services, to easily or automatically work together. It is clear that the ability to **interoperate is key to reducing ICT integration costs and inefficiencies**, increasing business agility, and enabling the adoption of new and emerging technologies.

Standards, and their widespread adoption, enable interoperability. Leading ICT industry players are very actively working together through industry associations and standards organisations to **advance the development and adoption of open standards**². In addition to investing large sums of money on developing open standards and making their hardware and software compliant with such open standards, major ICT Industry players are cooperating at unprecedented levels to align their technologies so they interoperate, and significant progress is being made.

For quite some time, major ICT Industry players have been routinely sitting down together and addressing interoperability issues through standards development in technical committees of standards organisations such as the W3C (World Wide Web Consortium), OASIS (Organisation for the Advancement of Structured Information Standards), and others. Organisations such as the **WS-I (Web Services-Interoperability Organisation)** have sprung up to specifically address interoperability of standards and the adoption of standards. The ICT Industry is convinced that best-of-breed, interoperable solutions can best be achieved through these competitive marketplace activities.

ISC encourages government, as a major end-user of ICT technologies, to be both a supporter of the ICT standards setting process and an active participant in that process. However, the ICT industry does not believe governmental mandates regarding the types of ICT solutions that governments may acquire and/or regulation of the types of ICT solutions eligible to receive public funding, are in either the best interests of government or private industry as a whole. Industry further believes that such mandates would slow progress towards interoperability and inhibit government's ability to select the most cost effective, best-of-breed hardware/software solutions. In particular, **mandated standards** run the risk of imposing a "technology penalty" on users, as the legislative process fails to keep up with technological development, depriving users of the benefits of innovation. In the end, the development, adoption and evolution of open standards must be voluntary, driven by the benefits from the standards and technologies, with both suppliers and users able to articulate real business benefits.

2. Alternative definitions of interoperability

From a purely technological perspective, interoperability concerns the ability of two or more ICT assets (hardware devices, communications devices or software components) to easily or automatically work together. However, business and government also require interoperability of processes, so that business processes or administrative services can link up easily through computing/ communications processes. This paper will consider interoperability in this broader sense, covering both the process and the technology perspective.

² A multitude of various alternative definitions for 'Open Standards' exist. For a selection of Open Standards definitions see Annex II of the CompTIA Interoperability White Paper of 18 February 2004: http://www.softwarechoice.org/download_files/Interop.pdf . Further comments by industry regarding the definition of Open Standards in the European Interoperability Framework can be found in a European Industry Association (EICTA) position letter of 12 January 2005: <http://www.eicta.org/Content/Default.asp?PageID=244> .

In this broader context, interoperability can be defined or viewed from several different perspectives. A few of them are outlined below:

- **The EU Software Copyright Directive** defines interoperability between computing components generally to mean “the ability to exchange information and mutually to use the information which has been exchanged”.³ This does not mean that each component must perform in the same way, or contain all of the same functionality, as every other one – interoperability is not a synonym for cloning. Rather, interoperability means that the components, which may differ in functionality, can share information and use that information to function in the manner in which they were designed to.
- **The European Interoperability Framework (EIF)** definition identifies three separate aspects:
 - **Technical** – linking up computer systems by agreeing on standards for presenting, collecting, exchanging, processing, transporting data.
 - **Semantic** – ensuring that transported data shares the same meaning for link-up systems
 - **Organisational** – organising business processes and internal organisation structures for better exchange of data.
- **The UK e-GIF (e-Government Interoperability Framework)** model focuses on 4 aspects: interconnectivity, data Integration, access, and content management.

From the perspective of the ICT industry, interoperability can be conceptualised as a means of connecting two or more “end-points” with a “wire”, where a “wire” means an exchange of data using data and communications standards. Under this definition the aim of interoperability is to define “wires” so that software/ computers can interconnect and interoperate on demand. A common set of standardized, widely-adopted “wires” enable connections and interoperability quickly at minimum cost.

Just as the edges of a jigsaw puzzle define how a puzzle piece connects with other puzzle pieces, the goal of interoperability to define the “wires” or the puzzle edges so that software/hardware/business processes can interconnect and interoperate on demand. In designing hardware and software, and implementing business processes, the ICT industry attempts to make the edges (“wires” or “interfaces”) as common as possible while maintaining the functional features of the ICT components and accomplishing their combined business requirements. This practice of "defining the edges" rather than the implementation of the component itself also promotes innovation and differentiation, which is highly desirable as it promotes beneficial competition in a multi-vendor environment. One must recognize that, in designing and using these component pieces, interoperability is not an end-state but rather is a continuum, i.e., a given component can't interoperate with every other component but rather with only those components designed to interoperate through the same standard(s) (“wires” or “edges”).

In designing ICT components and utilizing the “wires” that connect the components, the designers attempt to keep components from being too dependent on one another so they can be used to interconnect with other hardware/software components. The concept of

³ Council Directive of 14 May 1991 on the legal protection of computer programmes (91/250/EEC)

dependence/independence of two components is called coupling by the ICT industry, and the most “loose” coupling possible, while meeting business requirements for the hardware/software, is a highly sought-after characteristic in design. “Tight” coupling of hardware or software results in more “brittle” processes that break when either of the components is changed. Unfortunately, as the features/functions of the hardware/ software components change and are enhanced, frequently the “wires” that connect it to other components must also change to take advantage of the new technology. This means that **interoperability is not static, rather it is a continually evolving situation** driven by rapid changes in technology and customer requirements.

3. Scope

Interoperability extends from industry to industry, including the ICT Industry (as an end-user of technology); other industries such as the financial, automotive, chemical, etc. industries; as well as government. It includes private sector technology use by the largest, as well as the smallest, of companies. In the public sector it includes technology use by the smallest governmental agencies and entities as well as the largest.

It follows that interoperability is not just a country-specific or national issue, but is **global in scope**. This international perspective, which the ICT industry has done much to emphasise, has led key policy and decision-makers in Europe to realise that there is a need for interoperability in Europe both within and between public administrations and with enterprises.⁴

The UK’s e-GIF Service Delivery Infrastructure, for example, identifies the various components of an interoperable e-Government system: Citizens and Business (“users”); the Multiple Access Channels; the portals (Local Authority, Government, Private Sector); the infrastructure (Government Gateway); Government Systems (Local Authorities, Departmental Systems, Other Public Sector Systems). All of this requires **different kinds of interoperability for different groups** (citizens, enterprises, and other government entities).

- **Interoperability with individuals/citizens** is typically accomplished primarily through Internet/Web Browser interfaces. It also includes direct data exchanges (e.g., file transfers of tax form submissions), mobile communications, etc., which are likely to grow in importance over the next five to ten years.
- **Interoperability with private enterprises** must take into account that enterprises have a wide range of systems. It may be accomplished through the same ICT vehicles as are used with individuals/citizens but may also involve more sophisticated business-to-Government data exchanges and the like.
- **Government and public authorities seeking interoperability** both within their own administration and with others face the same interoperability challenges that private enterprises face in accomplishing enterprise application integration (EAI) and business-to-business (B2B) integration, such as business process alignment and data semantics resolution. Interoperability with other governmental entities must take into account the diverse application software systems and ICT hardware that governmental entities already

⁴ See Commission Staff Working Paper: “Linking up Europe: the importance of interoperability for e-Government services” <http://europa.eu.int/idabc/en/document/2036/5583>

have in place as well as local governmental business processes predicated on local and national laws.

4. Benefits of interoperability

Connectivity and interoperation among computers, among entities (governments, businesses, citizens, and individuals), and among software components can increase the flexibility and agility of ICT systems, thus reducing administrative and software costs for government. They may also reduce the time needed to implement software and e-Government services.

- **At a EU Member State level**, E-Government flexibility and agility may be increased as interoperability increases. Interoperability can, for instance, assist in the delivery of e-government services based on life events, and help the business sector interact electronically with administrations, reducing administrative costs burden and encouraging SME's to "go digital".
- **At the European level**, interoperability supports the Single Market and its associated "four freedoms of movement of people, capital, goods and services". As people move and enterprises trade across Europe they need to interact electronically with public administrations in Member States other than their own. For e-Government services to be usable across border, national administrations will need to obtain information from other Member States (e.g. relating to taxation status, social welfare contributions, registration information on enterprises, etc.). Since the Single Market and other key European policy objectives require interoperability between European administrations, the needs of trans-border users of e-Government services must be taken into account when developing e-Government services.

5. Business sector experiences and synergies

Technical standards are being developed through open processes, and their adoption is being driven by the pressure software companies are under to meet their customers' requirements for standards adherence. Standards and interoperability work best when processes are loosely coupled.

The problems of interoperability are not unique to government. The interoperability problems of integrating disparate databases, distributed networks, e-procurement solutions, B2B data exchanges, enterprise application integration, portal integration, B2C (consumer/citizen) solutions, mobile communications, and others all exist in private industry as well as the public sector. In general, there is a common need across all industries for research, new technologies, and improved standards to address interoperability.

5.1 Specific requirements for eGovernment services

At another level, work must be done to define and agree upon Government sector-specific semantics and on the alignment of business processes. Many e-Government services exist, such as taxation functions and social services, that require government agreement on their own semantics and processes. Likewise there are frequently additional public sector requirements in general business processes such as procurement that are not found in the private sector, e.g., specific competitive bidding requirements and/or specific approval approaches. For e-Government, business process alignment in many cases requires an alignment of laws, regulations, etc. – something that the European Union, with its Single Market approach, can leverage.

Private industry experience makes it clear that business process re-engineering and improvement is a **continual process, not a one-time event**. The overall goal must be the most cost-effective business process solutions, both intra-entity (within government) and inter-entity (between governments). From a software perspective, competition drives the ICT software vendors to develop applications that embody the most efficient business processes and that provide open environments for the exchange of data between software.

5.2 Open standards – the industry view

ICT industry experience is that “best of breed” solutions, regardless of the business or development model but evaluated on the basis of the best value for the money, provide the best functionality mix, support interoperability between components through their compatibility with open standards, and ensure continual upgrades, software support and expertise. Open standards compatibility should be a major selection criterion for software to ensure its interoperability, though it should be recognised that open standards may evolve quickly and **preferences for any open standard or versions of open standards, including OSS-style open standards, should be avoided** to preserve the utmost flexibility in a best value assessment of technology and solutions for administration interaction and business problems.

A major contributor to interoperability is voluntary open standards development plus voluntary open standards adoption. Open standards development, without significant adoption of the resultant standards, does nothing in the effort to achieve interoperability. Standards, like software, must evolve to take advantage of technology advances. Best-of-breed solutions, evaluated on a best value for money basis, that are continually updated and have software support to meet customer standards-compatibility expectations are the best approach to achieve and ensure ongoing interoperability.

5.3 Industry interoperability as a benchmark

ISC would put forth mainly two thoughts regarding the EIF and other existing e-Government interoperability frameworks:

- The national frameworks and EIF generally limit their scope to what IDA would refer to as technical interoperability and do not try to address semantic and business process interoperability to the same degree. The next step would therefore be to address semantic and organisational interoperability. This means that eGovernment interoperability has reached roughly the same evolutionary point as the question of interoperability for much of private industry.
- E-Government should fully leverage the work of the ICT industry and the competitive marketplace to achieve and maintain interoperability. Governments, through their procurement, research, and policies, should support and encourage the efforts of the ICT industry to voluntarily develop, adopt and promote open standards. Government should also leverage and be protective of the intellectual property the ICT industry develops.

Taking interoperability to the next level requires resolving the much more difficult issues of semantic interoperability and business process interoperability. The ICT industry has provided technology stacks, such as ebXML and Web services, and cross-industry semantic/business process standards, but at a detailed level, semantic and business process interoperability are

more “user-specific” in nature and require the involvement and leadership of the users in question (in this case, governments). To date, there have been some efforts in private industry to align semantics and business processes, but these efforts are not commonplace.

Achieving semantic/business process interoperability for eGovernment raises its own challenges, including aligning laws and regulations, etc. Government involvement and leadership in defining the needed semantics and business processes and/or adopting private industry semantics/business processes is critical. At an infrastructure framework level, the ICT industry will develop and provide open standards addressing content exchange and business process execution (e.g., ebXML, BPEL4WS).

E-Government should fully leverage the competitive marketplace to reach interoperability. The ICT industry has devoted considerable resources towards voluntarily defining, and changing hardware and software to adhere to open technology standards. Government, through its procurement, research, and ICT policies should support these efforts and fully utilize them to reach interoperability. Cost effective, open-standards compatible hardware and software, where the underlying standards have been widely adopted, is an enabler of interoperability. **Open-standards compatible software can be developed using any software development model, and can be licensed under a variety of business models.**

Open source does not mean or imply “open standard” or compatibility with open standards, and vice-versa, as open standards may be implemented by software developed under any business or development model. Open source is not a standard or set of standards, but instead simply software whose code is publicly available. Nothing in and of itself ensures that OSS is interoperable, even with other OSS programmes. For instance, the freedom to modify OSS code necessarily provides the ability to change the code in ways that may undermine a programme’s ability to interoperate with other programmes and devices. Beyond open-standards compatibility, general business requirements, functionality requirements, total cost of ownership, and other elements of a **“best value for money” evaluation** should drive the selection of software, not how the software was developed or is licensed.

6. Private/public multi-stakeholder partnerships

The best approach to achieve and ensure e-Government interoperability is by the public sector partnering with the private sector, in particular the ICT industry. Without partnering with the private sector, e-Government runs several risks:

- The risk of adopting technologies and standards that become outdated and unsupported over time.
- The risk of not being able to rapidly take advantage of technology advances and business process improvements that private industry develops.
- The risk of adopting standards that do not interoperate between the private and public sectors (e.g., privacy standards, security certification standards).

ISC applauds the efforts of, for example, the UK Office of the E-Envoy and their work with major international standards bodies such as OASIS and W3C. Standardisation and frameworks within governments, such as the EIF, e-GIF, etc., plus direct involvement in international standardisation efforts, such as those of the W3C, OASIS, and others, and

working with regional intermediaries such as CEN/ISSS, are essential to e-Government interoperability.

Many of the interoperability hurdles the public sector faces are the same as, or very similar to, the hurdles private sector companies face, but some distinct differences do exist. In particular, many governmental business processes are closely tied to legislation, regulations, and court findings. Process improvement and data semantics resolution frequently requires revision to the underlying legislation or regulations. The European Union's coordinated approach facilitates such legislative and regulatory changes.

Nevertheless, governmental services/business process "owners" must aggressively pursue change to affect it even within the context of the EU. ISC agrees with the European Commission that there is a need for commitment at all levels for interoperability to happen (i.e. global and international, European, national, regional and local) and there is a need to ensure that consequential adjustment of European or national policies occur.

ISC recognises that, through greater interoperability, large improvements in EU intra-Government and inter-Government services are possible. Additionally, from the private industry perspective, improved interoperability with the private sector and citizens/consumers could, and should, be a major source of e-Government business process/services improvement. Many of the business process improvements made in the private sector over the last decade or so have been accomplished by companies working with their customers and suppliers (the "extended enterprise") to streamline their "supply chains". Information flow, as well as the flow of physical goods/services, from supplier to government and, in many cases, from government to citizen/consumer, could be streamlined through similar extended enterprise efforts. There is a plethora of commercial software available to support such business-to-business (or, in this case, business-to-Government or government-to-business) exchange of data. Similar to private industry, these extended enterprise efforts would result in more customer-centric, citizen-friendly, governmental enterprises.

Public sector software must meet governmental business requirements. The public sector faces many of the same decisions that private industry does in deciding whether to acquire or build software. Governmental entities, like private companies, vary in size and business requirements, both of which affect ICT software and hardware selection. Like private industry, in some cases governments should allow software to drive process, while in other cases, governments should have process drive software. Also like private industry, **software applications may be developed in a variety of ways, and offered under many different types of licenses**. In almost all cases, software and hardware acquisition costs are merely a part of the overall total costs of ownership (TCO) – interoperability and cost elements such as training have become major parts of the cost equation. In the competitive environment, ICT companies offering open standards compatible proprietary software solutions have strong incentives to deliver robust functionality and open standards based interoperability to meet customer requirements and sell their products.

7. Conclusions: Open Source and Open Standards

In acquiring software, compatibility with open standards should be a major selection criterion. Ubiquitous access and interoperability frequently suggests the use of open, widely adopted standards. It is therefore important to distinguish between Open Source and Open Standards:

- An **Open Standard** can be seen as a set of rules and specifications that collectively describe the design or operating characteristics of a programme or device and is published and made freely available to the technical community. Open standards are vetted through an open process.
- Generically, **Open Source** refers to software in which the source code is available to the general public for use and/or modification from its original design form of charge. Open Source is also used to refer to a method of licensing software. Open Source software is therefore not an open standard, per se (for example, open source software changes are generally not vetted through an open process). It may interoperate with other open source software if the two “end point” open source software applications adhere to the same open standard. However, the fact that software is open source does not mean that it necessarily implements the same open standards as other open source software applications.

Hardware/software utilising proprietary standards can generally interoperate only with other hardware/software utilising the same proprietary standard. Similarly, open standards-based hardware/software can generally also only interoperate with other hardware/software that utilizes the same open standard, and open standard version. Even with the adoption of standards, either open or proprietary, the **standards will need to continually evolve** and be updated to take advantage of technology advances, and everyone will need to address software updates and version control to stay current with standards.

While the EIF (IDABC) definition of open standards is an approved policy definition for the IDABC Programme, it is – according to IDABC statements - not intended to be binding outside the specified area of validity: *"the recommendations and guidelines of the [European Interoperability] Framework and related documents, such as the IDABC Architecture Guidelines, are mandatory for pan-European projects carried out in the context of IDABC programme."* Despite this confirmation of the restricted validity, questions are raised concerning the discriminatory spill-over effect of the EIF OSS-styled open standard definition on transactions between administrations, citizens and business, including legal implications under in particular EU public procurement law. To **preserve consistency with EU policy and legal positions taken, in particular with regard to European and international IPR and public procurement law**, it is important that EU Member States governments and European institutions, including the IDABC unit of the European Commission which does not speak for the European Commission as a whole, defend, amongst others, strong principles of technological neutrality, non-discrimination and equal treatment⁵.

Defining ‘open standard’ through categorical preferences for or references to particular business or licensing models would favour or eliminate certain suppliers or products and thus violate the fundamental principles of non-discrimination and equal treatment. It would moreover prevent contracting Government authorities from utilising the full panoply of possible technical solutions.

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⁵ for a legal analysis of EU public procurement law in relation to preference definitions of OSS-style open standards see: ISC Legal Note of 16 September 2004, http://www.softwarechoice.org/download_files/ISC_LegalNote_final.pdf