eGovernment, Interoperability and Innovation

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Abstract : eGovernment is faced with a number of complex issues, such as Internet security, data protection, and a multilingual user environment. There are two essential interdependent ingredients to surmounting these challenges: interoperability and innovation. Innovative solutions developed by the ICT industry promote interoperability. Meeting consumers' expectations for interoperability must remain a constant effort on the part of industry, and policy makers have a role in encouraging industry efforts in this area. This paper analyses three key policy elements to creating an environment in which innovation and interoperability can thrive.

1 Introduction

The new millennium marked a significant turning point in eGovernment. According to the Commission Background Paper for the eEurope Mid-term Review, the proportion of basic services fully available online in the EU grew from 17% to 43% between October 2001 and October 2003. The eEurope+ Progress Report reveals that notable advances were also made in the then 13 candidate countries: in 2001 over 80% of online government services identified in the eEurope+ Action Plan were either unavailable or still in the planning stages; by June 2003, this figure had been reduced to 34%. Benchmark surveys have demonstrated similarly that between 2002 and 2004 the percentage of European governments providing online services increased from 12% to 35%.[1]

During this highly dynamic period, we have learned first-hand that eGovernment implicates many different and complex issues. These include issues of trust (e.g. data privacy and security), of training/expertise, of archiving and migration, and of surmounting language differences, to name only a few. At the forefront of these issues is interoperability, however. Effective communication between and among consumers and providers, whether governments or businesses, requires that the products they use be able to share and exchange data. As the European Commission has explained,

[1] Darrell M. West, Center for Public Policy, Brown University, "Global e-Government 2004", September 2004, p. 5; www.InsidePolitics.org/egovtdata.html.

> *"[f]ailure to put in place interoperable eGovernment systems will have both economic and social costs. These include: unresponsive public administrations that are expensive to run and incapable of implementing policy promptly; inability to develop value added eGovernment services; higher costs, greater administrative burden and competitive disadvantage relative to local firms (e.g. inability to participate in public e-procurement activities), and hampering the proper functioning of the Internal Market."*[2]

In rapidly evolving, highly competitive IT markets such as the European market, companies have strong commercial incentives to make their products interoperate with each other. These commercial incentives must be reinforced by appropriate public policies, however. While industry can and should be allowed to lead, its ability to do so depends largely on the right technology policies being in place to support these efforts.

This paper is intended to explore the policy framework that is most favourable to interoperability—a framework that should respect the following principles: (1) technology neutrality; (2) intellectual property protection; and (3) neutral R&D funding policies. We explore each of these principles in greater detail below.

2 Discussion

2.1 Interoperability Explored

EU policymakers have long recognised the importance of interoperability. Indeed, this principle was enshrined in EU law well over a decade ago, in the EU's 1991 Software Directive (Directive 91/250). The Directive's Article 6 establishes fair and balanced rules that permit reverse engineering of software in certain narrow circumstances and when indispensable to achieve interoperability. Article 6 has worked well in practice and has served as the foundation for many interoperable technologies.

Since 1991, interoperability has remained an important EU goal—especially in the eGovernment context. To take one particularly pertinent example, in June 2002 the eEurope 2005 Action Plan made the development of a European Interoperability Framework (EIF) a priority component of pan-European eGovernment strategy.

At its most basic, interoperability is the ability of IT systems to work together. The EU Software Directive provides perhaps the best definition of interoperability, which it describes as "the ability to exchange information and mutually to use the information which has been exchanged." While many have sought to build on this definition, this simple language captures well the objective underlying interoperability efforts. More recently, in the EIF, the EU has parsed this definition. The EIF identifies three distinct elements of interoperability: (1) "technical" interoperability, involving the linking up of computer systems via agreed standards for the exchange of data; (2) "semantic" interoperability, focused on ensuring that exchanged data shares the same meaning between linked systems; and (3) "organisational" interoperability, involving the organisation of business processes and infrastructures, to enhance data exchange.

[2] COM (2003) 567, Commission Communication on eGovernment, 26 September 2003 (p. 19).

Broad-based IT interoperability is vital to the fulfilment of the Information Society's enormous potential to enrich the lives of citizens in Europe and beyond. Interoperability plays this role by ensuring that consumers have the ability to access and use a diverse range of technology products and services. Interoperable products provide consumers with meaningful choice among vendors, as well as with increased functionality, enabling consumers to construct systems that meet their specific needs from a variety of vendors, incorporating hardware (microprocessors, memory and storage media, printers, screens, etc), software elements (operating systems, middleware, data management tools, applications etc) and related services. In this way, interoperability reduces ICT integration costs, improves efficiencies, enhances business productivity and facilitates the adoption of new and emerging technologies.

Perhaps nowhere are the benefits offered by interoperability more important than in the eGovernment context. Among the primary aims of any eGovernment system is the simplification of the way in which citizens interact with government. To achieve this, technology must be employed in a manner that makes it easier for citizens to deal with multiple government agencies, at local, national and regional level. When ICT systems and the processes that they support interoperate, this objective can be achieved more readily. To quote the Commission on this point, "personalised [eGovernment] services require integration and sharing of processes and knowledge across departments and institutions. This requires IT systems of the various participating administrative bodies to be interconnected and information and administrative processes to be 'joined up', i.e., they must 'interoperate'".

Interoperability is especially important in the pan-European eGovernment context. European eGovernment services are at high risk of fragmentation by diverse languages, geographic borders and differing national priorities. Only by deploying products and services that interoperate can governments ensure that the benefits of eGovernment services will extend across national, administrative and organisational boundaries. To again quote the Commission, "the development of the single market and its associated freedoms will require that national eGovernment systems are interoperable."

Just as it is essential, interoperability in the eGovernment context is also complex. An eGovernment system must address communication needs at many levels, including government's ability to communicate with citizens (individuals), with the private sector, and within the public sector itself. There are a range of diverse software and hardware systems and various types of data implicated in these transactions. The UK's e-GIF Service Delivery Infrastructure exemplifies the complexity here, listing the many components of an interoperable eGovernment system, including users (citizens and businesses); portals (Government, local authorities, the private sector); infrastructure (the Government gateway), multiple access channels and competing government systems.

2.2 Innovation and Interoperability: the Essential Ingredients

Attaining interoperability in the complex set of circumstances that characterise eGovernment is a challenge. As policymakers have long recognised, industry is best equipped to address the technological aspects of this challenge and thus bears primary responsibility for ensuring technical interoperability. Consistent with this expectation, the ICT industry has made substantial progress in promoting interoperability over the past decade. Technology companies have done this through several mechanisms, including the development and implementation of technology standards, and the voluntary disclosure of technical information

that facilitates the development of interoperable products.[3] These efforts have been collaborative; currently, most major ICT companies are working in partnership with other industry players and/or governments in at least one, and often many, fora to ensure that their technologies interoperate. It is clear that consumers' expectations for software and hardware interoperability are not always met. Continuing efforts on the part of industry remain necessary.

Industry experience in this area has demonstrated several fundamental principles regarding ICT interoperability:

- First, while industry must play the leading role in promoting technical interoperability, industry efforts will be more successful if accompanied by appropriate public policies. Public and private sector infrastructures now routinely rely on heterogeneous IT solutions, comprised of hardware and software from multiple vendors. The extent to which one product can interoperate with another has a significant impact on market demand and consumer satisfaction. In this way, the modern IT marketplace creates strong commercial incentives to ensure interoperability.

- Second, interoperability and innovation are closely linked. Indeed, interoperability depends largely upon policies that promote focused innovation and broad competition in the IT sector. A healthy IT marketplace with a wide range of products and services means greater competition—and greater incentives (in the form of market share) for a particular firm to make its technologies interoperate with those of its competitors. A healthy IT ecosystem also ensures a broad variety of innovative product choice—directly benefiting creators and consumers of eGovernment services and eGovernment-related technologies.

- Third, in addition to promoting interoperability, ICT innovation has many other important benefits—as the EU has recognised. Perhaps most significantly, ICT innovation is central to the EU's ability to achieve its Lisbon Agenda goal of becoming the world's leading knowledge economy by 2010, and the parallel objectives of creating jobs and fostering economic growth. Already ICT innovation contributes greatly to global economies. Technology companies today employ more than nine million people, raise more than €500 billion a year in tax revenue and contribute nearly €1 trillion a year to global economic prosperity. Between 1996 and 2002, technology companies added more than a half million high-skill jobs to the Western European economy alone. Jobs in the packaged software sector generally earn about twice the European average wage (and thus generate proportionally greater tax revenues); in 1999, each job in the packaged software sector contributed four times as much to the Western European economy as a job in financial services and six times as much as one in consumer goods. The software industry contribution is compounded as the use of software raises general levels of productivity, efficiency and competitiveness for European industry overall. Increased innovation means an increased contribution.

- Fourth, there is no single "best" way to achieve interoperability. The principles outlined below touch on several distinct areas, each of which promote interoperability in their own right. That said, there is no single path to attain this objective. Instead, any

[3] Technology standards are a cornerstone of software and hardware development; with growing demand for interoperability, the role of standards has only increased in importance. BSA has recently adopted a "Statement on Technology Standards", which is attached to this paper as Annex 1.

approach to promoting interoperability should be multifaceted and should recognise that the complex technical, commercial and other issues involved require above all a shared vision among key players in order to develop solutions that can and will be widely supported and implemented.

- Fifth, the development and deployment of effective government technology strategies—including strategies to promote eGovernment and to advance interoperability—depend on public/private partnerships. As discussed further below, top-down mandates and heavy-handed regulation often work against the goal of interoperability. In contrast, government/industry partnerships permit the public sector to benefit from the significant technological expertise of industry. At the same time, such partnerships assist public administrations in making their needs known to industry for use in the development of standards and software solutions and thereby help industry create interoperable products better suited to government needs.

With these fundamental principles in mind, we turn to an analysis of the three key policy elements that, in our experience, promote ICT innovation and interoperability.

2.2.1 Technology Neutrality

Innovation happens best when technologies are allowed to compete on their merits. Indeed, competition is the driving force for innovation. To foster competition, public policies should treat all technologies equally and permit the "best" technology to prevail.

Policies that mandate or prefer technologies have the opposite effect. Such policies tend to give rise to product uniformity. In addition to reducing the number of products available in a given market, technology mandates and preferences also chill innovation.

The principle of technology neutrality is especially important when procuring technologies—including eGovernment technologies. Governments that attempt to mandate technologies (or technology standards), or to pick technology winners and losers risk making incorrect choices among the full range of products available in the market place. All e-technologies, including software technologies, have benefits and costs relevant to the context in which they are to be deployed. Public entities should procure the technology that best meets their needs based on a broad range of variables, including interoperability, functionality, performance, security, value and cost of ownership.

Generally in Europe, such technology-neutral approaches to IT policies have been favoured. That said, in some isolated instances governments or parliaments have opted for or are considering software preference policies. Typically, such policies arbitrarily limit public procurement to "open source" software products—that is products that are developed and licensed under an open source model. As a general rule, under this model, the source code of the software is made available royalty-free to the users of the software, under terms allowing redistribution, modification and addition, though often with certain restrictions. In contrast, under a "proprietary" software model, software developed by a commercial entity is sold or licensed to the end-user; the source code of the software may be made available to certain users of the software through a licensing agreement, but is usually not broadly distributed and generally may not be copied or modified except as provided for in such agreements.

Neither method of software development is inherently better or worse. Nor are these models mutually exclusive. Software firms (including BSA members) are increasingly embracing

both models and developing business strategies in which proprietary and open source software coexist. Indeed, the co-existence of these different models serves as the foundation of a healthy and diverse software ecosystem, driving competition and thereby encouraging innovation and interoperability—to the benefit of users and of society overall.

The ongoing vitality of this ecosystem depends on freedom of innovation. Regardless of the model under which they create—be it open source or proprietary—BSA members are unanimous in the belief that innovation happens best when all software solutions are permitted to compete on their merits. BSA members also know from long experience that the most exciting innovation occurs in response to marketplace demands—not government mandates.

2.2.2 Intellectual Property Protection

The link between intellectual property (IP) and innovation is well-established. At the most fundamental level, by ensuring that authors and inventors can realise a financial return on their investments, IP yields incentives and resources to invest in creating new products and new technologies. Entrepreneurs depend on IP to attract investment and commercialise their ideas; consumers rely on IP to support the innovation that enables them to live their lives more productively and more enjoyably; and governments and societies gain from IP through economic growth and social progress.

These benefits are more than theoretical. Economic analysis has demonstrated over and again that effective intellectual property protection leads to greater creativity, competition and economic success—and that IP-based industries fuel economic growth. A 2000 Study by Datamonitor indicated that the European software industry alone is responsible for well over a million jobs through direct employment in the EU-15, and that every job in the sector generates four jobs in the wider economy. A 2001 OECD report noted that software accounted for up to a third of the overall contribution of ICT investment to GDP growth in OECD countries.

Significantly, virtually all existing technology development models—including proprietary and open source software licensing models—are fundamentally based on IP (especially copyright). By enabling developers of both models to control the downstream distribution and use of their works, IP rights enable these developers to disseminate their creations in new and exciting ways. In this way, IP serves as the foundation of a diverse and healthy software ecosystem.

While there is general consensus surrounding the close link between IP and innovation, the link between IP and interoperability is less understood. It does exist, however. Patents, for example, can play a key role in promoting interoperability. By their nature, patents facilitate the sharing of information, while at the same time ensuring that innovators can protect their inventions. Indeed, patents are uniquely suited to this role. In contrast to copyrights and trade secrets, patents require that inventors publicly disclose their inventions. In return, patents grant certain exclusive rights in these inventions to their inventors. This gives the inventor control, and enables the inventor to realize the economic benefits of his or her efforts, providing an economic stimulus for new inventions while at the same time promoting the goal of technological disclosure. Of course, as with any intellectual property regime, the patent system must balance the interests of many stakeholders and must be carefully calibrated to ensure that the protections it offers promote rather than impede innovation and interoperability.

To promote maximum innovation and interoperability, government policies should provide effective protection for IPRs. At European level, a series of Directives establish this protection in the copyright space—including the 1991 EU Software Directive, which provides a balanced and workable set of rights and exceptions for copyright in computer programs. The Software Directive has more recently been complemented by the 2001 "Copyright Directive." Patents for computer-implemented inventions have long been made available under European Patent Office practice, and the EU is now considering codification of this practice in a Directive. The EU has also recently adopted an "Enforcement Directive," providing important tools that facilitate effective enforcement of IPRs.

Technology innovation has been both the objective and the consequence of affording software developers the benefits of IP protection. To ensure developers remain encouraged to innovate, and to develop solutions to interoperability challenges more particularly, they must remain free to benefit from the IP protections available to them. Likewise, they should retain the freedom to determine the business and licensing models they wish to employ. Unfortunately, in some instances policymakers have sought to make specific intellectual property licensing choices a precondition for eligibility for procurement. The decision as to whether and how to exercise and enjoy one's intellectual property rights should remain, as it has been traditionally, a matter for the right holder's informed choice.

2.2.3 Neutral R&D Funding Policies

The EU in recent years has come to lay increasing emphasis on R&D spending. As the Commission explained in its recent Communication on Challenges for the European Information Society beyond 2005, "a strong presence in research and development is essential for the general strength of the ICT sector and for their uptake in the economy at large". The OECD has reached a similar conclusion, noting that "business R&D and early-stage financing of innovative ideas and new businesses are two major drivers of growth and structural transformation of the ICT sector." Indeed, studies demonstrate that up to 40% of labour productivity growth is generated by R&D spending and that there are powerful carry-over effects in other areas of the economy.

Investment in R&D is especially important in the software sector, and government plays an important role in financing basic software research. When public funds are used to support software R&D, such funding should be made equally available to all software developers, regardless of the development model chosen to do the research. The innovation that results from this work should be licensed in a way that allows for shared knowledge and ensures that the outcome of such research can be applied to commercialised products. Such an approach has already proven to be a successful means for encouraging innovation in commercial products across many sectors, which in turn generate growth and tax revenue necessary to fund future public research initiatives.

3 Conclusion

A new wave of innovation has created tremendous opportunities for eGovernment services. While eGovernment systems have grown exponentially over the past few years, however, much remains to be done. Indeed, according to Eurostat data, in 2003 only 45% of government services in the EU-15 were fully available online.

Overcoming existing challenges to eGovernment roll-out, including enhanced interoperability within and among eGovernment services, and reaping the full benefits of eGovernment

opportunities is possible only in the context of a rich and diverse technology marketplace. BSA believes that by applying the above principles and by working closely together in public-private partnership, we will be able to create the environment necessary to spur creativity, innovation, and technological advance—including interoperability. BSA stands ready to assist in this effort.

Annex 1

BSA STATEMENT ON TECHNOLOGY STANDARDS

1 Preface

Technology standards are a cornerstone of software and hardware development that play a key role in fostering a healthy and competitive IT ecosystem. With growing demand for interconnectivity, interoperability and sharing among hardware, software and IT services, the role of standards has only increased in importance. This is particularly true in the public sector, due to the need for better communication with citizens as well as among government agencies (intra and inter-governmental). BSA[1], whose member companies both use and develop a wide range of technology standards, has created this statement to help improve the understanding of, and policy decisions about, standards.

2 Standards Promote Interoperability and Benefit Consumers

The purpose of technology standards is to promote interoperability, efficiency, increased functionality, productivity and economic growth. Interoperable software, hardware and services spur innovation and competition, which lead to increased consumer choice, the creation of new markets, enhanced communication and technological progress. In order to reap these benefits, however, it is important to properly understand the nature and use of standards.

Technology standards are typically documented in written specifications that enable developers of software, hardware and services to make and distribute products or components that work with one another within a given context. This interoperability can take the form of information exchange (e.g., protocols or file formats), task performance (e.g., APIs) and other functions that allow systems and people to collaborate effectively. In addition to facilitating broader communication across platforms and devices, this interoperability also enables suppliers to develop their own implementations of a standard, which consumers can then choose among. All entities are not required to implement the standard in exactly the same way; technology standards make possible flexible implementations that best fit the task at hand while retaining interoperability[2]. Standards thus create predictability, interoperability and competition between implementations without imposing homogeneity.

3 Voluntary Standards Fuel Innovation

Voluntary processes have proven to be the most effective means of fueling innovation through standards. Indeed, most of the widely adopted technology standards in existence today have

[1] The Business Software Alliance (www.bsa.org) is the voice of the world's commercial software industry and its hardware partners before governments and in the international marketplace. Its members represent one of the fastest growing industries in the world. BSA programs foster technology innovation through education and policy initiatives that promote copyright protection, cyber security, trade and e-commerce.

[2] This flexibility is not unique to the software industry. For example, the ISO open standard on metric screw threads dictates the dimension of a 2mm thread size (i.e., the "specification"), not *how* the screw is constructed or with what materials (i.e., the "implementation").

been developed through voluntary, supplier-led efforts[3]. The marketplace—responding to consumer demands—is best situated to determine the appropriate timing for the development and promotion of a standard. Over the years, suppliers have been able to respond quickly to industry and consumer needs by developing standards that most effectively address interoperability issues and embrace the direction of the marketplace.

On the other hand, government-mandated standards in the technology industry can often result in a number of unintended consequences. These consequences may include: (i) unnecessarily freezing the development of new technologies and failing to reap fully the benefits of such quickly evolving technologies; (ii) inadvertently disadvantaging certain market competitors; (iii) hindering market acceptance and penetration; and (iv) precluding a multi-faceted competitive environment.

The method of development of a standard is not ultimately the critical factor that determines its acceptance. A successful standard is one that solves the problem for which it is intended. Typically, the development of such standards is achieved through a natural and dynamic process that is voluntary and responsive to market demands.

4 Characteristics of "Open" Standards

Among technology standards, there is particular interest in "open standards" as a potential means of achieving widespread interoperability. While there is no universally accepted definition of that term, all open standards have the following common characteristics:

(1) Open standards are 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;

(2) Open standards are publicly available without cost or for a reasonable fee for adoption and implementation by any interested party;

(3) Any patent rights necessary to implement open 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

(4) Open standards are regularly developed, maintained, approved or ratified by consensus, in a market-driven standards-setting organization that is open to all interested and qualified participants. Standards can also develop by consensus in the marketplace.

Within this context, governments can play an important role in advancing open standards. Government policies that support the implementation or adoption of open standards, where open standards exist and are broadly supported by industry, will improve interoperability and benefit governments and consumers on the whole. On the other hand, governments should avoid policies that inadvertently discourage the development and adoption of broad-based standards, either by mandating standards themselves (e.g., freezes innovation) or mandating

[3] UPnP, FireWire, PDF, QFX, Flash, Java and ZeroConf are just a few examples of widely-adopted technology standards originally developed by a single company or group of companies.

those that have not achieved broad industry support[4], or by reducing the economic incentives to participate[5].

5 Distinguishing Open Standards and Open Source Software

While an open standard is a technical ***specification***, open source software (OSS)[6] is software that may be used to ***implement*** an open standard in a particular product or service. Whether a standard qualifies as "open" has nothing to do with the development and licensing model of the software used to implement that standard. In fact, open standards are neutral with regard to software development and licensing models—welcoming all models and favoring none—so it is equally feasible for an open standard to be implemented in proprietary software as in OSS.

Some open source projects are closely associated with particular open standards (e.g., Apache with HTTP, or MySQL with SQL), and some standards even choose to release their reference implementations under open source licenses. However, the mere availability of source code is neither necessary nor sufficient to make something a standard, much less an open standard. The real question is whether the standard has the characteristics of an open standard as described above.

6 Conclusion

While standards in general play a key role in enabling interoperability, which type of standard is appropriate and successful ultimately depends on many unique factors (e.g., the specific technology, market and timing involved). Voluntary, supplier-led standards efforts are typically the most effective at addressing interoperability issues and securing widespread adoption. It is important to clearly distinguish open source software, which may be used to ***implement*** an open standard, from the open standard itself. Government agencies also have a role to play, but are most effective when facilitating voluntary processes rather than imposing rigid mandates.

In closing, BSA believes that a mature, balanced understanding of the purpose and practice of standards—including the important role of open standards—is essential for a healthy marketplace and technology industry. In turn, a healthy IT ecosystem based on voluntary standards has proven best able to help customers achieve their desired goals of interoperability, flexibility and accessibility. The BSA looks forward to working with all interested parties to help bring that about.

February, 2005

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[4] This, for example, may be appropriate for technology standards as they relate to public health and safety issues (e.g., aviation, medical equipment and cellular emission).

[5] Such undesirable policies may involve mandating the absence of royalties or other reasonable fees; government-mandated standards-setting processes; compulsory ratification by a formal standards body; and other policies that interfere with choice, flexibility and responsiveness.

[6] "Open Source" is a software-licensing model where the source code of the software is typically made available royalty-free to the users of the software, under terms allowing redistribution, modification and addition, though often with certain restrictions. The support, training, updates and other services for the software may be provided by a range of entities. Open source programs are often, though not exclusively, developed through a collaborative effort in which a number of persons, usually with no formal association with each other, contribute elements of the final software. Increasingly, software companies are also contributing programs developed in-house to the open source community.