

INTELLECTUAL PROPERTY MANAGEMENT IN STANDARD SETTING:
E-GOVERNMENT ACQUISITION PROCESSES IN THE US, EU, JAPAN, AND INDIA

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Technical standards play a crucial role in the ability of governments to efficiently and cost-effectively operate e-Governance systems. These internal infrastructures enable governments to digitally exchange information among agencies and to perform critical social functions related to national security, public health and safety, and the direct delivery of public services to citizens. Standards are the blueprints providing common specifications and technical characteristics that enable interoperability among devices adhering to these standards.

It would be difficult for society to function without standards, whether for the basic standardization of time and units of measurement and weight, or the homogenization of standardized parts in manufacturing and transportation. Governments rely on standards for areas as diverse as national defense and environmental protection. In the area of e-Governance, technical standards are a basic force of interoperability enabling the electronic exchange of information within and among government agencies, between governments and private industry, or between governments and constituents. There are many layers of interoperability – technical, legal, organizational, and semantic. Because of the linkages between interoperability standards and effective e-Governance, many nations have taken a heightened interest in the characteristics of the technical standards that underpin their technology investments and infrastructure.

The efficacious selection of interoperability standards can contribute to technical efficiency, the public interest, and broader economic conditions. Technically, they are designed to provide the necessary connectivity and consistency to exchange government data among devices and platforms. Socially, they help enable citizens to access government services and provide the foundation for public interest areas like law enforcement, emergency services, national security, and emerging areas such as e-Health and smart grid infrastructures. Economically, governmental use of standards can facilitate cost efficiencies, avoid government dependency upon a single vendor, facilitate global trade, and encourage private industry development of standards and the accompanying national competitiveness these private efforts afford. Legal scholars, economists and social scientists have extensively studied these societal effects of interoperability and standardization.¹

Governments can assume a number of roles related to information and communication technology standards. Depending on national context, some governments provide funding for private industry standards development, research and development, or standards education. Most governments send individuals to standards development processes to, along with other technology users, help articulate technology usage requirements or participate as official representatives in more formal international standards institutions. The list of standards organizations in which governments participate is far too lengthy to itemize here but includes countless standards fora and consortia (e.g. IEEE, IETF, W3C); regional organizations (e.g. ETSI); national standards bodies (e.g. British Standards Institution, South African Bureau of Standards); and international standards bodies (ISO,

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ITU, IEC). Governments also sometimes regulate certain characteristics and usages of standards-embedded technologies in areas such as: national security (e.g. placing restrictions on the export of strong encryption standards); accessibility for the hearing impaired (e.g. requiring closed captioning capability in televisions);² digital broadcasting (e.g. requiring technologies to adhere to digital broadcasting standards); spectrum management (e.g. allocating electromagnetic spectrum); and competition policy (e.g. laws addressing antitrust).³

This paper focuses specifically on government acquisition of products and services that implement standards. Governments are enormous customers of information and communication technologies (ICTs) and related services via their e-Government procurement processes. The United States federal government alone spends \$74 billion annually on information technology expenditures.⁴ In the developing world, government acquisition comprises a relatively considerable percentage of national ICT expenditures. Commensurate to procurement in other areas of commerce, governments have a fiduciary responsibility to cost effectively and judiciously acquire the products and services necessary to operate. Consider that public procurement in all product areas in the European economy is 16.3% of GDP.⁵

While there are a number of characteristics of standards pertinent to e-Government acquisition processes, this paper focuses primarily on aspects of standards-based intellectual property rights (IPR). The evolution of ICTs has created more complicated IPR conditions for governments seeking to establish policies. A single device (e.g. a smart phone or laptop) necessary for e-Governance implementations can embed hundreds of standards, each with different intellectual property circumstances, foreshadowing the complexity involved in government policies toward IPR in e-Government acquisitions.⁶ An additional complexity is the range of intellectual property restrictions embedded in the countless standards necessary for e-Governance infrastructures. Some core Internet standards have minimal intellectual property rights restrictions; other standards, including those for audio, video, and image communications have embedded standards-based patents, as do popular wireless networking standards such as Wi-Fi and GSM.

Intellectual property rights are a concern in developed and developing countries alike, with both associating standards-based IPR with national innovation prospects. Once globally entrenched, standards have a certain conservative momentum because of their network effects. Manufacturers in developing countries face unique circumstances as later entrants which may not have been historically involved in a standard they plan to implement in their products. Newer entrants wanting to implement a standard might have to seek permissions to use the standard, might have to pay a royalty payment, and might not have the legal expertise necessary to navigate these circumstances.

The scope of this paper is also narrowed to focus on standards within government infrastructures (including information exchange with citizens) rather than the use of standards in broader society; the paper also focuses on federal agency procurement rather than state and local procurement.

To examine e-Governance acquisition processes related to standards-based intellectual property rights, this paper has selected four regional cases: the United States, the European Union, India, and Japan. This paper, intended to be descriptive rather than normative, addresses several questions. In what ways do governments connect governmental functions/responsibility/choice and intellectual property rights qualities in standards? What are the governments' acquisition policies/regulations

related to standards in e-Governance infrastructures and what are the rationales for these policies? Do government policies list general IPR characteristics of standards that agencies must use as criteria in connection with procurement or do they specify a list of actual standards or even products that adhere to these specifications, or both? How do governments address enforcement and ensure operational compliance, conformity, and auditing of acquisition policies?

This paper examines these questions and presents a comparative survey of the standards-based intellectual property rights aspects of e-Government acquisition policies. The country case studies were selected to normalize the study to democratic forms of governance while accounting for geographical and economic diversity as well as diversity of policy approaches to standards-based intellectual property rights.

The Private Sector-Based Approach of the United States

The United States government is a significant user of standards and also makes reference to thousands of standards in U.S. government regulations and procurement policies. Historically, the United States has emphasized the foundational role standardization plays in society, commerce, and national security. The American National Standards Institute's (ANSI) publication entitled "United States Standards Strategy" aptly begins with an 1821 John Quincy Adams quote on the public importance of standardization: "Weights and measures may be ranked among the necessities of life to every individual of human society. They enter into the economical arrangements and daily concerns of every family. They are necessary to every occupation of human industry; to the distribution and security of every species of property; to every transaction of trade and commerce...and all the operations of war."⁷

Since the 1980s, a U.S. federal government policy priority has been to adopt industry standards developed by the private sector rather than embarking on government-unique standards-development efforts. The adoption of technical standards by United States Federal agencies is guided statutorily by the National Technology Transfer and Advancement Act (NTTAA) and administratively by the Office of Management and Budget (OMB) Circular A-119.

The NTTAA is a significant United States statute addressing technical standards in that the Act requires federal agencies to use technical standards developed by voluntary consensus standards bodies.⁸ Passed by the United States Congress and signed into law by President Clinton in 1996, the objective of the law is for federal agencies to adopt available private sector standards rather than developing standards that are government-specific. It also assigns to the National Institute of Standards and Technology (NIST) the role of coordinating "Federal State, and local technical standards activities and conformity assessment activities, with private sector standards activities and conformity assessment activities, with the goal of eliminating unnecessary duplication and complexity in the development and promulgation of conformity assessment requirements and measures."⁹

OMB Circular A-119 (Office of Management and Budget Circular A-119) is entitled "Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities." The Office of Management and Budget has authority to set internal policies

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related to improving the administrative management of the Executive Branch of the United States government and “Circulars” are guidelines the OMB provides to Executive Branch federal agencies. As stated in OMB Circular A-119:

“This Circular directs agencies to use voluntary consensus standards in lieu of government-unique standards except where inconsistent with law or otherwise impractical. It also provides guidance for agencies participating in voluntary consensus standards bodies and describes procedures for satisfying the reporting requirements in the Act”¹⁰

OMB Circular A-119 defines a voluntary standard as “standards developed or adopted by voluntary consensus standards bodies, both domestic and international” in contrast to other types of standards such as what the Circular describes as “(1) ‘Non-consensus standards,’ ‘Industry standards,’ ‘Company standards,’ or ‘de facto standards,’ which are developed in the private sector but not in the full consensus process; (2) ‘Government-unique standards,’ which are developed by the government for its own uses; or (3) Standards mandated by law...”¹¹

The United States’ rationale for giving preference to the adoption of voluntary industry standards is rooted in economic efficiency and economic incentives and an associated operating philosophy of relying on private industry to supply the products necessary for the government to function. As such, OMB Circular A-119 explains additional goals of governmental adoption of voluntary consensus standards as obviating the costs of duplicative government efforts to develop standards that already exist in industry, incentivizing industry to produce the standards that “serve national needs,” and promoting economic competition and growth through standards harmonization. As a stakeholder, federal agencies send employees to participate in these standards-setting institutions but avoid government-specific standards development. To illustrate the scope of this activity, in 2009, federal agencies participated in 528 private sector standards bodies.¹²

Circular A-119 makes specific reference to the intellectual property conditions of voluntary consensus standards, stating that: “these standards include provisions requiring that owners of relevant intellectual property have agreed to make that intellectual property available on a non-discriminatory, royalty-free or reasonable royalty basis to all interested parties.”¹³ The objective of the U.S. approach to standards-based intellectual property is to both respect the rights of owners of intellectual property rights while promoting the availability of reasonable and non-discriminatory licensing of these intellectual property rights to those interested in using the standards.

In March of 2012, the Office of Management and Budget submitted a request for information (RFI) inviting comments on whether OMB Circular A-119 should be revised. The RFI, published in the Federal Register, referenced questions requesting clarification about intellectual property rights in standards. For example, the RFI indicates that: “Some parties have raised transparency concerns with respect to the availability of copyrighted materials in instances where standards are referenced or incorporated in regulation and compliance with such standards is mandatory.”¹⁴ The OMB received numerous submissions in response to the RFI. As of the publication of this document, no revisions to OMB Circular A-119 have been made.

The Evolution of European Union Standardization Policies and Regulations

The standardization context in the European Union is unique because it necessitates coordination across 27 member states, each with its own history and political and economic approach to standardization. Many of the standards harmonization efforts in the EU related to government usage of standards have focused on information and communication technologies. The evolution of how these E.U. policies have evolved provides some indication of the complexity of this area as well as how politically and economically charged government procurement policies involving standards-based IPR are for those with a stake in the outcome.

The European Union joined a number of other governments which have introduced interoperability frameworks providing guidance on government procurement policies related to the adoption of standards within government information system usage.¹⁵ The overarching purpose of developing a “European Interoperability Framework” (EIF) was to define “a set of recommendations and guidelines for eGovernment services so that public administrations, enterprises, and citizens can interact across borders, in a pan-European context.”¹⁶ The initial pan-European effort to increase interoperability through information and communication technology standardization was seen as a critical precursor to providing seamless electronic services to citizens across the E.U. and to achieve cost efficiencies within government communication infrastructures.

The European Commission issued an initial version (later revised) of its European Interoperability Framework in 2004. The issue of intellectual property rights in standards emerged in this initial version. The Framework did not recommend particular standards that would be used but recommended underlying principles to which procurement of ICT products should adhere. The initial version of the EIF defined eight principles including: accessibility; multilingualism at the presentation level; security; privacy and personal data protection; subsidiary, meaning that the framework should not interfere with the internal workings of E.U. member states; the use of open standards; consideration of open source software alongside proprietary alternatives; and multilateral solutions.

In regard to intellectual property rights issues, the principle specifying the use of open standards was most pertinent, as well as the principle met with the most controversy by stakeholders. According to the Interoperability Framework, to meet minimal requirements the standard would have to be adopted in a not-for-profit, open participation organization; published freely or for a nominal fee and the “intellectual property – i.e. patents possibly present – of (parts of) the standard” would have to be “made irrevocably available on a royalty free basis.”¹⁷ This requirement for the adoption of standards made available on a royalty free basis was followed by widespread debate, a lengthy period of public consultation and revisions that led to the issuance of a revised version of the policy in 2011.

The most recent, revised version of the EIF, entitled the “European Interoperability Framework (EIF) for European Public Services,” modified requirements for intellectual property rights licensing to FRAND terms, an acronym for fair, reasonable, and non-discriminatory. Specifically, the European Interoperability version 2.0 defined the openness principle in standards to mean:

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- “All stakeholders have the same possibilities of contributing to the development of the specification and public review is part of the decision-making process;
- The specification is available for everybody to study;
- Intellectual property rights related to the specification are licensed on FRAND terms or on a royalty-free basis in a way that allows implementation in both proprietary and open source software.”¹⁸

While the European Interoperability Framework is a policy document that is not binding on Member States, the European Commission also initiated an effort to harmonize and codify its standardization-related policies in a proposed and more formal regulation on European-wide standardization. As standards scholars Kai Jacobs and Knut Blind explained the history, “there is no such thing as a concise document describing a European standardization strategy. Rather, there are a number of ‘Directives’, ‘Communications’, ‘Council Conclusions’, and other official documents.”¹⁹

The European Commission commissioned a 2007 study on the policy needs for ICT standardization in the European Union.²⁰ Among other topics, the final report directly addressed government procurement issues related to standards. It addressed Council Decision 87/95, which states that Member States must reference European standards in their ‘public tendering procedure.’ The formally recognized European standards bodies are CEN, CENELEC and ETSI (European Standards Organizations or ESOs).

The report raised a concern about the overemphasis on formal standardization bodies, whether European or international (e.g. ISO/IEC/ITU), when the majority of ICT standardization work, in reality, takes place in consortia and fora. For example, DVB, ECMA, IEEE, IETF, OASIS, and W3C exist outside of the framework of the standards bodies that have traditionally been recognized in Europe and presumably would only be referenced under limited circumstances.

The study’s findings led to the publication of a European Commission 2009 White Paper about modernizing the European standards context and a subsequent period of public consultation.²¹ The 2009 White Paper suggested several attributes of standards that would be suitable for government use including intellectual property rights considerations:

“IP essential to the implementation of standards is licensed to applicants on a (fair) reasonable and non-discriminatory basis (FRAND), which includes, at the discretion of the IPR holder, licensing essential IP without compensation.”²²

It also recommended the ability to reference as mandatory or to recommend consortia standards meeting these attributes in public procurement policies. One unusual aspect of this initial White Paper’s IPR recommendations was the suggestion about *ex-ante* declarations of maximum royalty fees. Specifically, the White Paper suggested that standards development organizations “consider a declaration of the most restrictive licensing terms, possibly including the (maximum) royalty rates before adoption of a standard as a potential route to providing more predictability and transparency.”²³ This suggestion was removed in the latest set of European Commission documents following from the White Paper and the proposed Standardization Regulation.

The European Commission's "Proposal for a Regulation on European Standardisation" directly adopted many of the recommendation of these policy papers. One of the major proposed actions related to public procurement stated: "The use of standards developed by other organizations in the field of information and communication technologies will be possible in public procurement, provided that these standards comply with a set of criteria based on the WTO principles for international standardization processes, in domains where there are no European standards, where European standards have not gained market uptake or where these standards have become obsolete."²⁴

It also codifies the FRAND intellectual property licensing framework for necessary IPR in Annex II, rejecting some proposed amendments to require that necessary IPR be available royalty-free. These are significant developments in the history of the E.U.'s approach toward procurement and standards. The European Parliament approved the Regulation on September 11, 2012 and the Regulation will be binding on European Union Member States on January 1, 2013.²⁵

India's Open Standards Preference in e-Government Procurement

India's policy on government procurement of standards for e-Governance differs from the United States and European Union approach to intellectual property rights in specifically giving preference to the selection of royalty-free standards. India's Ministry of Communications and Information Technology formally established a "Policy on Open Standards for e-Governance" on November 12, 2010.²⁶ The policy was intended to serve as a framework for selecting standards for the hardware and software underlying e-Governance systems within India.

The Government of India's Policy on Open Standards for e-Governance cites several rationales for its standards approach. Part of the impetus is the historical circumstance of government ICT infrastructures across the country "characterized by islands of legacy systems using heterogeneous platforms and technologies and spread across diverse geographical locations in varying states of automation."²⁷ India's framework for the selection of ICT standards in e-Governance infrastructure cites this need to improve interoperability among agencies as a primary objective. In addition to this concern with interoperability, the Policy cites additional objectives including: the promotion of technology choice and a level playing field for competition; concerns with information preservation and ensuring that public information is available into the future; and avoiding vendor lock-in and dependence on a single vendor for products or services.

Indian advocates for the open standards policy from outside of the government also claimed that proprietary standards placed a greater burden on developing countries, which were later entrants into information and communication technology markets and had a relative diminished economic capacity to pay royalty fees relative to developed countries.²⁸ Other Indian organizations, such as the trade association NASSCOM (National Association of Software and Services Companies) disagreed with the open standards policy, and particularly its call for the selection of a single standard in any particular area, instead emphasizing that e-Governance implementations should allow for multiple standards.

The intellectual property requirement India places on standards used in e-Governance systems states that the Government of India shall adopt royalty-free standards and specifically that:

“4.1.2. The Patent claims necessary to implement the Identified Standard shall be made available on a Royalty-Free basis for the life time of the Standard.”²⁹

When royalty-free standards (whose licenses are not conditioned upon royalty payments and contain few permitted restrictions) are not available for a domain, the Policy allows for the exception of adopting information and communication systems based on FRAND or RAND terms with no royalty payments or FRAND/RAND terms with royalty payments. Another distinguishing feature of the Policy is the requirement for a “Single” standard for each technology domain, which also provides for exceptions allowing for multiple standards in a technology area if technically justified or in the public interest. The Government of India asserts that, despite the request for a single standard, this approach actually produces choice because it “implies freedom to select the appropriate implementation of the single elected open standard from the available multiple implementations of the standard.”³⁰

In addition to the intellectual property rights requirement, the Policy identifies other mandatory characteristics for a standard adopted in e-Governance infrastructures. The documentation of the standard should be available for free or for a nominal fee. The standard should be maintained by a non-profit organization with an open and participatory development process. The Policy also specifies that the standard should be a technology-neutral specification. The term “technology neutral” is explained as platform independence, with platform defined as an operating system, type of hardware, or transmission device.³¹ The final mandatory characteristic for a standard to be considered open is that it should enable local support, including being accessible in all Indian official languages.

A salient question is how such a policy is implemented, particularly in a large country with somewhat autonomous regions with different information technology agencies. Although India’s policy is too new to reasonably answer this question, its “Manual on the Implementation of Policy on Open Standards” indicates a procedure in which the Government of India will centrally identify technology domains to be standardized, a variety of expert committees determining which standards meet mandatory characteristics of openness, and an ‘Apex Body on e-Governance Standards’ determining the selection of a single open standard for that technology area.

Japan’s Interoperability Framework for Information Systems

Japan’s approach to intellectual property rights for standards used in government information systems is more similar to the European Union’s approach than India’s. The Japanese Ministry of Economy, Trade and Industry established guidelines via its “Interoperability Framework for Information Systems” published in 2007. These guidelines for federal and local government procurement of information systems specify that, if there are underlying intellectual property restrictions on the implementation of the standard, they should be able to be licensed by implementers either on a royalty-free basis or on reasonable and non-discriminatory terms.³²

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Similar to other procurement policies related to standards in e-Governance, the problem to which the Japan Interoperability Framework was responding was the historic context of incompatibility among information systems used by various government ministries and agencies because of dependencies on proprietary standards. Other goals related to improvements in interoperability include enhanced convenience to users (including citizens), application and data portability, cost efficiencies from reductions in system development and operation costs and from promoting vendor competition, and the avoidance of vendor lock-in.

The Japanese policy, like the India policy, states a preference for open standards, although Japan's definition of the intellectual property rights requirements of open standard is different than India's policy. Japan procurement preferences based on open standards generally cite international de jure standards such as those from ISO, IEC, and ITU and Japanese industrial standards. Other requirements preferred for standards used in government information systems cite the following criteria:

- The standard should be established and maintained by a non-profit organization with open participation processes and democratic procedures.
- Anyone can adopt the standard, which is published; if there are any intellectual property restrictions on implementing the standard, the IPR should be licensed on a royalty-free or RAND basis.
- More than one market implementation should conform to the standard.³³

Japan's Ministry of Economy, Trade and Industry has developed a detailed Technical Reference Model (TRM) for the Government Procurement of Information Systems to provide more specific information about the procurement of information systems.³⁴ The intended audience of the document consists of the CIOs, information technology personnel, and procurement agents responsible for government e-Governance acquisition, as well as the vendors competing for government business. The TRM provides information necessary for "supporting the preparation of procurement specifications in accordance with the government policies" presented in the framework for interoperability.³⁵

The Technical Reference Model describes the various technical domains in which procurement efforts are directed (e.g. servers, storage, network services) as well as specifics about the procurement of services (e.g. help desk, cloud servers, security). The TRM does not list standards that meet the requirements of each technical area but it does provide guidelines for evaluating standards in procurement processes. Some of these criteria apply to intellectual property rights in standards, such as IPR conditions being clearly delineated and criteria related to what the TRM refers to as 'equity'. As the document summarizes, "The IPR policy, which has an impact on the utilization of standard specification, must be equitable and rational to all the users and allow implementation without the possibility of undue charging."³⁶

Summary of Comparative Findings and Open Questions

The four standards procurement cases addressed in this paper, while differing in definitions, scope, and specific requirements, allude to some common principles about how democratic governments view both their e-Governance obligations and the role of standards IPR in e-Governance acquisition processes. The cases, and the supporting documentation cited in these cases, generally demonstrate five shared principles: interoperability; cost-efficiency; concern with supporting the private sector; transparency; and information diversity.

The overarching principle, whether overtly expressed or not, is the objective of technical *interoperability* within governments and between governments and citizens. For example, the European Union policies and regulations were defined to enable the interoperable exchange of information within governments and between governments and citizens and also in the broader pan-European context. India's policies are similarly rooted in legacy problems in which different agencies and regions historically used incompatible products that prevented interoperability among these different entities. While the cases differ in how to most expeditiously achieve this interoperability, the objective of technical interoperability seems consistent.

The second shared principle is *cost efficiency*. Governments have a fiduciary responsibility to contain costs and to efficiently and cost effectively implement e-Governance infrastructures. Part of this obligation involves interest in the adoption of approaches that use already available industry standards, avoiding duplicative efforts when standards and products already exist. The United States policy clearly expresses this objective of cost efficiency. The European policy also cites the objective of promoting cost efficiencies within government information infrastructures

A related shared principle, though executed in distinct ways, involves *supporting the private sector* and promoting economic competition. For example, the Japanese policy stresses that more than one market implementation should conform to the standard; one of the stated objectives for the India policy is the promotion of a level playing field for competition and the resulting promotion of technology choice. The U.S. and E.U. approaches to standards-based intellectual property seek to provide incentives for innovation to the owners of IPR while promoting reasonable and non-discriminatory access to other private entities who could produce technology innovations using the standard.

The standards-based IPR policies of each of these governments also adhere to a certain degree of information and procedural *transparency*, openly publishing policies and providing some form of public comment period so that industry and civil society has the opportunity to provide public review and comment. Another shared principle, particularly evident in supporting documentation, is *information diversity*. Although this might seem obvious, the government acquisition policies apply not only to alphanumeric text applications but also the multimedia (audio, image, video) information that has become a routine part of public records and the exchange of information between citizens and governments.

Despite these shared principles, and in specific regard to standards-based IPR aspects of e-Governance acquisition, these cases have also demonstrated some differences. For example, the Indian approach giving preference to royalty-free standards is distinct from the other three cases.

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Finally, this paper concludes by noting some open questions that apply to all of these e-Governance acquisition policies. These questions all have a pragmatic basis of inquiry regarding how to translate policies/regulations from theory into practice. The first question relates to the definitional ambiguity of what exactly constitutes terms such as “reasonable and non-discriminatory” licensing or “fair, reasonable, and non-discriminatory” licensing or, for that matter, what counts as multiple implementations of a standard in products. These are the requirements of various government acquisition policies so, to translate these requirements into practice, they must have a clear meaning. The policies do not specifically define these terms, and do not explain which standards meet these various requirements. How does a government procurement officer making a decision about what ICT products to acquire determine (a) whether the appropriate standards are embedded in the product (remember that hundreds of standards can underlie a single computing device); and (b) whether these various standards adhere to the requirement of reasonable and non-discriminatory licensing terms or whether the standard is used in multiple, competing products. A vendor could easily provide an answer to (a) but there is no clear industry benchmark for what is considered fair, reasonable, or non-discriminatory. In many cases companies requesting a license to implement standards-based IPR in a product might not wish to make these terms public, or might be contractually obligated to not disclose these terms. Similar definitional and operational questions arise for royalty-free licensing requirements. While core Internet and Web standards historically have minimal IPR restrictions, other widely implemented and popular standards do not meet the royalty-free requirement. In practice, many of the standards necessary to exchange multimedia information over the Internet would not meet the Indian royalty-free preference.

The e-Governance acquisition policies toward standards IPR are based on universal democratic principles such as interoperability and economic competition, but how to pragmatically translate these principles and policies into actual procurement practices is the open question.

LIST OF ACRONYMS

ANSI – American National Standards Institute
CEN - Comité Européen de Normalisation
CENELEC - Comité Européen de Normalisation Électrotechnique
DVB – Digital Video Broadcasting
ETSI - European Telecommunications Standards Institute
ESO - European Standards Organization
GDP – Gross Domestic Product
GSM – Global Systems for Mobile Communications
e-Government – Electronic Government
EC – European Commission
EIF – European Interoperability Framework
EU – European Union
FRAND - Fair, Reasonable, And Non-Discriminatory
IEC – International Electrotechnical Commission
IETF – Internet Engineering Task Force
ICT - Information and Communication Technology
IPR – Intellectual Property Rights
ISO- International Organization for Standardization
ITU – International Telecommunication Union
NAS – National Academies of Science
NASSCOM - National Association of Software and Services Companies
NIST - National Institute of Standards and Technology
NTTAA - National Technology Transfer and Advancement Act
OASIS - Organization for the Advancement of Structured Information Standards
OMB - Office of Management and Budget
RAND – Reasonable and Non-Discriminatory
RFI – Request for Information
TRM – Technical Reference Model
W3C – World Wide Web Consortium
Wi-Fi – Wireless Fidelity
WTO – World Trade Organization

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¹ See, for example, John Palfrey and Urs Gasser, *Interop The Promise and Perils of Highly Interconnected Systems*, Basic Books 2012; Laura DeNardis, *Protocol Politics: The Globalization of Internet Governance*, MIT Press 2009; Paul A. David and Shane Greenstein, "The Economics of Compatibility Standards: An Introduction to Recent Research," 1 *Economics of Innovation and New Technology*, Volume 1, 3–41, 1990.

² See, for example, Carmin Marincu and Barry McMullin, "A Comparative Assessment of Web Accessibility and Technical Standards Conformance in four EU States," *First Monday*, Volume 9, Number 7, 2004.

³ See, for example, FTC v. Rambus; Mark A. Lemley, "Antitrust and the Internet Standardization Problem," 28 *Connecticut Law Review* 1041, 1065 (1996); Phil Weiser, "Regulating Interoperability: Lessons from AT&T, Microsoft, and Beyond," *Antitrust Law Journal*, Vol. 49, 2009.

⁴ The figure of \$74 billion in annual U.S. information technology expenditures is taken from the 2012 IT Dashboard of the United States Office of the Chief Information Officer. URL (last accessed August 15, 2012) <http://www.itdashboard.gov/treemap>.

⁵ ec.europa.eu/enterprise/sectors/ict/files/full_report_en.pdf

⁶ See Brad Biddle, Andrew White, and Sean Woods, "How Many Standards in a Laptop? (And Other Empirical Questions)," September 10, 2010. URL (last accessed August 31, 2012) http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1619440.

⁷ American National Standards Institute, "United States Standards Strategy," Third Edition Approved December 2010. URL (last accessed August 15, 2012) http://www.ansi.org/standards_activities/nss/usss.aspx?menuid=3.

⁸ National Technology Transfer and Advancement Act (NTTAA) of 1995, Public Law 104-113 signed into law March 7, 1996. URL (last accessed August 15, 2012) <http://standards.gov/nttaa/agency/index.cfm?fuseaction=documents.PL104113>.

⁹ *Ibid*, Section 12, b (3).

¹⁰ OMB Circular No. A-119 Revised, Memorandum for Heads of Executive Departments and Agencies, "Federal Participation in the Development and Use of Voluntary Consensus Standards in Conformity Assessment Activities," February 10, 1998. URL (last accessed August 15, 2012) http://www.whitehouse.gov/omb/circulars_a119.

¹¹ *Ibid*.

¹² Mary F. Donaldson, "Standards Coordination and Conformity Group, Thirteenth Annual report on Federal Agency Use of Voluntary Consensus Standards and Conformity Assessment," NISTIR 7718, 2009.

¹³ OMB Circular No. A-119 Revised, Memorandum for Heads of Executive Departments and Agencies, "Federal Participation in the Development and Use of Voluntary Consensus Standards in Conformity Assessment Activities," February 10, 1998. URL (last accessed August 15, 2012) http://www.whitehouse.gov/omb/circulars_a119.

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