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# Communications of the Association for Information Systems

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## Open Standards and Government Policy: Results of a Delphi Survey

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### Abstract:

In an increasing number of countries governments consider to stimulate the role of open standards in public Information and Communication Technology (ICT) infrastructure development. The aim of this work is to identify important issues related to government policy with regard to open standards and the development of public ICT infrastructure. This multi-method research presents results from an exploratory literature review and multi-round Delphi survey of key experts in the field of standardization.

**KEYWORDS:** open standards, government policy, ICT infrastructure, multi-method, literature review, Delphi survey

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## I. INTRODUCTION

In service-oriented, highly industrialized countries, information itself is both a raw material and a product [Castells 1996]. This doubly important role of information in economic development means that institutions related to knowledge exchange may influence economic outcomes as much, or more than, they may influence productive efficiency or innovation [Steinmueller 2005]. Informational processes effectively become so critical that governments need to take an active role. They do this by fostering an information infrastructure that creates equal access to and an even distribution of knowledge among citizens and businesses, and by ensuring the security of this critical infrastructure [Castells 1996; GAO 2004].

The magnitude of benefits of an information society is as profound as the challenges it creates for policymakers [Fomin et al. 2003; 2005]. Governance of the informatization process requires from nation-states' administrations understanding of driving forces [Axelrod and Cohen 1999; Gao 2007], that operate in the formation of an information society. Due to the novelty of trend, the expertise on open standards policymaking is not readily available. In situations like this, governments have a long-exercised tradition of appealing to the intellectual vision of academia for decision-supporting predictive expertise [Helmer and Rescher 1959]. While scholars cannot and do not act as fortune tellers, for policy advice it suffices that an expert be able to sketch out adequately the general directions of future developments, to identify some critical issues on which the course of these developments will hinge, and assess alternatives [Helmer and Rescher 1959, p.42; Mitchell 1992, p.8].

In the tradition of government-academy collaboration, we were approached by the Danish government agency in autumn of 2005. The government was the first in the world to request access to Microsoft's XML schemas in 2003, and the first to get it two years ahead of the now famous Massachusetts decision that set the open document format ball rolling.<sup>1</sup> At that time, the responsible government agency was looking for answers on how to change a viewpoint on open standards as a technical issue (as seen by many in public and private ICT organizations) to one of policy instrument.

A government-sponsored project was launched with the aim to identify important issues related to open standards in the development of public Information and Communication Technology (ICT) infrastructure and to aid government policymakers develop appropriate governance frameworks for the further informatization of the state. The research question set for the project and addressed in this paper is twofold. First, we aimed to explore whether standards matter in developing and governing public ICT infrastructures, and if they do, 2) what can or should be the governments' role in developing standards-related policy.

The nine standards-related issues reported in this research were identified through a hermeneutic cycle of iterations between a literature review and sense-making sessions and further validated through a multi-round Delphi survey of key experts in the field of standardization of ICT. Unlike many Delphi studies, this work is less focused on consensus building and more geared toward achieving a degree of explained disagreement that draws up the dilemmas of standards and standardization in government policy.

This paper is structured as follows. In Section II, the research motivation and design are introduced. In Section III, research design and important issues pertaining to governance of open standards in public ICT infrastructure development are presented. In Sections IV, V, and VI the identified issues are validated in the Delphi survey and experts' opinions presented to the reader. The article ends with conclusions and overview of contributions and limitations of this work.

## II. RESEARCH MOTIVATION AND DESIGN

### The Challenge of Technology Interoperability and the Role of Standards

Official rhetoric portrays development of an Information Society as global expansion of ICT infrastructure to all spheres of people's lives [Castells 1996]. In the reality, this level of informatization is achieved through merging of previously disparate ICT systems to an interconnected global infrastructure [Edwards 1998]. Often, each of the

<sup>1</sup> <http://www.consortiuminfo.org/standardsblog/article.php?story=20080328080930159>

previously autonomous or semi-autonomous systems evolves in a piecemeal fashion, bit-by-bit, resulting in Leviathan-sized systems [Callon and Latour 1981] featuring hundreds of specific, special purpose modules and related user practices [Beard et al. 2005; Chung et al. 2003; Gordon et al. 2004; Sarkar and El Sawy 2003]. As a result, interoperability challenge came to stay as a hot topic in national and international policy rhetoric [Commission of the European Communities 2004; Council of the European Union 2004].

At the heart of the interoperability issue is the role of standards in providing compatibility and information. It is through sharing a common standard that anonymous partners in a market can communicate, can have common expectations on the performance of each other's product, and can trust the compatibility of their joint production. Thus, standards are necessary for the smooth functioning of anonymous exchanges, and therefore, for the efficient functioning of the market [WTO 2005].

Interoperability and the associated gains of information access and coordination capabilities can be achieved by accepting one monopolistic operator and its (often) proprietary standard. An alternative to monopoly option are so-called *open standards*.

*Open standards* are understood as "technologies whose specifications are public and without any restriction in their access and implementation" [Reding 2008]. In the academic community, there is an ongoing debate on how to exactly define an open standard [West 2003; 2006]. Given the context of this work, we chose to use the definition accepted by European standardization organizations<sup>2</sup>: Open standards are (1) developed and/or affirmed in a transparent process open to all relevant players, including industry, consumers and regulatory authorities; (2) either free of Intellectual Property Rights (IPR) concerns, or licensable on a fair/ reasonable and non-discriminatory (F/RAND) basis; (3) driven by stakeholders, whereas user requirements must be fully reflected; (4) publicly available; and (5) maintained [ICT Standards Board 2005, p.10].

Open standard-based interoperability differs from the monopolistic operator scenario by respecting and assuring conditions required to avoid pitfalls of direct or indirect bias to particular industrial interests and national interests serving the same particularistic purpose of information access and exchange. In other words, open standards allow establishing interoperability while avoiding the monopolization of the markets. Therefore, it is expected that open standards centered policy for national ICT infrastructure development will help governments administrations avoid many negative issues commonly associated with adoption of proprietary standards, such as the lock-in and lock-out effects [Liebowitz and Margolis 2000], the cost of maintenance of proprietary solutions [West and Dedrick 2006], the "angry orphan"<sup>3</sup> issue [King and West 2002], among others. However, the intended effects of open standards are contingent upon the implementation of governance instruments which can ascertain compliance to the standard, ensure interoperability, platform independence, and cultural and linguistic diversity.

### The State Governance and the Role of Scholarly Expertise

From the perspective of a national policy, adoption of a standard for national ICT infrastructure is seen as rule-setting for market exchange [Abbott and Snidal 2001, p.345]. Standards are instruments of governance, where the latter is defined as the formal and informal bundles of rules, roles, and relationships that define and regulate the social and economic practices of state and nonstate actors in their affairs [Abbott and Snidal 2001, p.346].

An increasing interest in open standards in national informatization policies may be traced to the understanding of the huge economic impact a *lack* of open standards can have upon national economies, and government budgets in particular [Castells and Himanen 2002], which is in turn related to interoperability problems in building national ICT infrastructures [Council of the European Union 2004].

While the importance of policy formulation with respect to standards in general is well recognized [Hawkins 1995a; 1995b], the level of involvement of government in standardization activities is a subject of ongoing discussion. Should the government take an active role in formulating informatization policies, or a *laissez-faire* position? Another issue is that of timing for standards policy formulation [Blind 2004]. Early policy on open standards may prove a barrier to national ICT infrastructure development if ICT market is dominated by proprietary vendors' solutions. A late response to market-driven informatization processes, on the other hand, may result in switching costs being too high [Blind 2004, p.188].

<sup>2</sup> The Information Communications Technologies Standards Board (ICTSB) is an initiative from the three European Standardization Organizations (ESOs) with the participation of forums that are specification providers active in Europe in the field of Information and Communications Technologies (ICT), in order to coordinate their activities for the development of ICT technical specifications. <http://www.icts.org>

<sup>3</sup> The abandonment of and support for technology by proprietary vendors.

In order to avoid undesirable consequences in the development of national ICT infrastructures, government administrations are called upon to make decisions, which are directly related to the question of future developments. Therefore, effective policy-making is strongly dependent on predictive ability of staff of expert advisers [Axelrod and Cohen 1999; Helmer and Rescher 1959]. However, the issue of open standards in governmental rhetoric so far has been addressed almost exclusively on a technical level—as an issue pertaining to interoperability in national ICT infrastructure. Answering the questions of “if and how” the open standards can become a governance instrument would require a special expert knowledge not readily available even for forerunners of the information society revolution. To take a step from seeing open standards as “universally good thing” [Cargill 1994, p.3; West 2006] to a policy of promoting, (co-)developing, selecting and adopting open standards as a government ICT policy would require a versatile apprehension of what can be an activist government role in standardization and standards policy. This in turn calls for expert opinions from different professional domains.

### III. RESEARCH DESIGN

Due the novelty of the topic of open standards in government policy, scarcity of available scholarly literature,<sup>4</sup> and practitioners’ expertise, and the general complexity of the relationship between standardization and governance of ICT, the Delphi method was chosen to survey the leading experts in the field.

Our use of the Delphi methodology was preceded by an exploratory sense-making study and a literature review. The exploratory sense-making was needed to identify general issues related to the subject of governance of ICT infrastructure vis-à-vis the role of open standards and potential economic benefits stemming from their adoption. The literature review aimed at identifying specific issues for open standards and policymaking. The Delphi survey was conducted to validate and enhance the findings of the other two studies (see Figure 1).

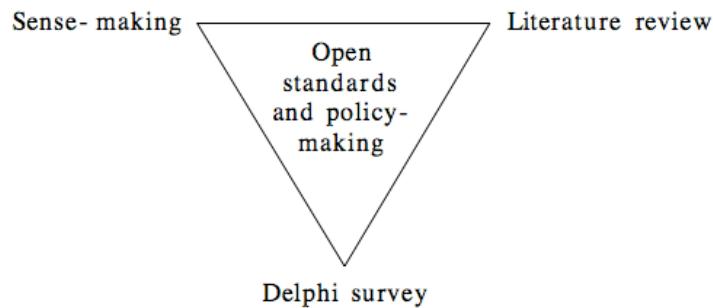


Figure 1. Triangulation Approach Used in the Study

#### Literature Review and Sense-Making

The literature review we undertook was of exploratory character—it was *not* aimed at proposing novel theoretical foundations or conceptual models for the topic, but at *developing a concept-centric review* of (a part of) existing literature [Webster and Watson 2002, p.xvii].

The temporal and contextual scope of the inquiry was imposed by the novelty of the topic, and a scarce availability of literature on open standards and government policy. Contextual limitations contributed to the choice of research design, where findings from a literature review were combined with sense-making sessions and Delphi survey method. Project meetings were used to engage in sense-making focused on identification of most important and relevant issues to be presented for the experts review. During the two months from the initiation of the project—prior to the launch of Delphi survey, a total of seven meetings of the project team were held.

Three principle domains of knowledge guided our inquiry:

1. Interoperability of ICT infrastructure (through the use of open standards);
2. Economic benefits of nation-state’s informatization (exchange based on adoption of open standards);
3. Governance of public ICT infrastructure (policy making for 1. and 2. above).

<sup>4</sup> In their introduction to the MISQ Special Issue on Standard Making, Lyytinen and King report that despite the importance of standardization to the IS field, by 2002 “only roughly 2 percent of published journal papers in the field have dealt with ICT standards during the last decade” Lyytinen, K. and J. L. King (2006) “Standard making: A critical research frontier for information systems research,” *MIS Quarterly* (30) pp. 405-411. Narrowing the scope from the general topic of standards to the more specific of the role of open standards in government policy results in almost non-existent state of literature. A search on ISI Web of Science in March 2008 for publications on topics related to open standards, infrastructure, and government policy (TS=(open SAME standard\*) AND (TS=(government policy) OR TS=governance) AND TS=infrastructure\*) returned 3 results, only one of which was publication in the field of IS, dated 1998.



Selection of literature sources was not limited to solely academic domain. Given the scope of the inquiry, IDABC database<sup>5</sup> publications for the period of 2003-2005<sup>6</sup> were searched using a search key “open standard,” producing a list of 75 publications, which were subsequently analyzed. IDABC issues recommendations, develops solutions, and provides services that enable national and European administrations to communicate electronically while offering modern public services to businesses and citizens in Europe. IDABC is concerned with such issues as interoperability, e-government services, and communications, which makes it a viable source for determining the scope of research problems.

Further, an inquiry was made into the SIIT<sup>7</sup> standardization-related mailing list about existence of related projects. As of March 2006,<sup>8</sup> the list hosted 272<sup>9</sup> participants from academia, industry, government organizations, and SDOs.<sup>10</sup>

Finally, both academic publications and governments’ and industry white papers were sought using keywords “open standards.” For scarce publications that were found, upward and downward citation analysis was performed.

Through a hermeneutic iteration between the literature review, a number of sense-making discussions, and mailing list moderated interaction with colleagues, some 30 issues pertaining to the research question of this study were identified (Table 1, left column), which were subsequently grouped into nine to be included into the Delphi questionnaire (Table 1, right column).

<b>Table 1. Issues Pertaining to Standardization and Policy-Making</b>	
<b>Issues/Literature sources</b>	<b>Issues/Description</b>
The role of user groups in network economics and risk management [Zhao et al., 2005] Inadequacy of extant economic theories [Reimers and Li, 2005] Tension between perceptions of open standards [West, 2006] Contradictions between openness, cost, and performance [West, 2006] Competition between national and international policy interests [Henriksen and Mahnke, 2005] Consolidation of larger user base [Sliman, 2002] Adoption of open standards by major global vendors [Simon, 2005]	<b>Economics of standards</b> A broad category including, but not limited to network economics, switching costs, R&D investments, and investment risk management through standardization
Public good problem: large firms develop standards, small firms adopt them [Wigand et al., 2005] Defining the target groups for policy [IDABC, 2004] Mandatory vs. voluntary compliance to interoperability frameworks [IDABC, 2004]	<b>Public good and compliance</b> Governance of ICT infrastructure and services through specifying the degree of compliance (recommendation, mandate) to government supported standards by different stakeholders (vendors, government organizations as end-users)
Standards as means of communication between an administration and an enterprise or citizen [IDABC, 2004, National Science Foundation, 2005] Lack of standards for syntax and semantics [Zhao et al., 2005] Competition between national and international policy interests [Henriksen and Mahnke, 2005] Defining the target groups for policy [IDABC, 2004]	<b>Syntax and semantics</b> Semantic and syntax interoperability problems in establishing data and process exchange on the national level, and between the nation states

5 IDABC stands for Interoperable Delivery of European eGovernment Services to public Administrations, Businesses and Citizens. <http://europa.eu.int/idabc/>

<sup>6</sup> The project run from January through June 2006.

<sup>7</sup> Standardization and Innovation in Information Technology.

<sup>8</sup> At the time when the inquiry was made.

<sup>9</sup> From email communication with the moderator of the SIIT list.

<sup>10</sup> Standard Development Organizations.

<p>Access to tools and services [IDABC, 2004, National Science Foundation, 2005]</p> <p>Horizontal and vertical real-time integration of service layers [Zhao et al., 2005]</p>	<p><b>One-stop service experience</b> Establishing real-time integration of information across vertical and horizontal layers of public sector's agencies to satisfy the growing demands of end-users for one-stop information access</p>
<p>Technical maturity of underlying technology [Zhao et al., 2005]</p>	<p><b>Assessment of technical maturity of standards</b> Whether the interoperability, conflicting interests of stakeholders, and ICT architecture- related issues should be decided upon only when mature international (open) standards are available</p>
<p>Communication between administration and an enterprise or citizens [IDABC, 2004, National Science Foundation, 2005]</p> <p>Public good problem [Wigand et al., 2005]</p> <p>Competition between national and international policy interests [Henriksen and Mahnke, 2005]</p> <p>Higher durability of open standards [Sliman, 2002]</p> <p>Adoption of open standards by major global vendors [Simon, 2005]</p>	<p><b>Future-proof</b> Control over standards specifications vis-à-vis government agencies' and citizens' power to force vendors assure data accessibility and version control of the software/data formats.</p>
<p>Regulators must collaborate with SDOs [Chang and Jarvenpaa, 2005]</p>	<p><b>Goals of participation</b> Should the government be active in monitoring emerging standardization in early state in order to ensure coherence and compliance with existing ICT policies and open standards.</p>
<p>Contradictions between democratic, administrative, and professional rationales in policy-making [Lines, 2005]</p> <p>Competition between national and international policy interests [Henriksen and Mahnke, 2005]</p> <p>Defining the target groups for policy [IDABC, 2004] A need for long-term perspective</p> <p>Lack of focus on citizens [Ilshammar et al., 2005]</p> <p>Lack of tools to measure performance of public sector's services [Flak et al., 2005]</p> <p>Discrepancy between rhetoric and reality [Andersen et al., 2005]</p>	<p><b>Accessibility</b> The perceived need for developing e-services based on concepts of simplicity, transparency, user-friendliness, and security to promote trust in public administration</p>
<p>Adoption of open standards by major global vendors [Simon, 2005]</p> <p>A need for a standard for IP requirements; openness in SDOs collaboration [Schoechle, 2005]</p>	<p><b>Intellectual Property Rights (IPRs)</b> Should there be an explicit policy on IPRs in ICT infrastructure development?</p>

The last step in the triangulation research approach adopted in this work was to validate the findings of the literature review and sense-making, and to obtain expert opinions on each of the nine issues through the series of linked surveys using the Delphi method [Mulligan 1999].

### The Delphi Method

Delphi should be looked upon as primarily a tool of enrichment to be used in conjunction with other methods and techniques [Mitchell 1992, p.6]. In this research we used Delphi in combination with literature review and sense-making as a validation and exploratory tool [Mulligan 1999].

Delphi methods employ panels of experts to systematically address complex phenomena [Mulligan 1999, p.198]. This research utilized the ranking capabilities of the Delphi method, as participants were asked to rank importance and timing of issues. The research invokes standard Delphi principles— anonymity and feedback [Gordon 1994]— it employs a series of linked questionnaires [Delbecq et al. 1975], where successive rounds of questionnaires summarize experts' responses to the preceding questionnaire and ask respondents to reevaluate their opinions based upon the summarized results [Brancheau et al. 1996, p.266].

While the original impetus behind the Delphi method is to seek experts' consensus, in the diverse and complex contemporary environment of technology policy-making, consensus is less important than crystallization of reasons for dissensus [Gordon 1994]. In this research, Delphi should therefore be seen more as a systematic means of synthesizing the judgments of experts [Gordon 1994] to validate and enrich the findings of prior research [Mitchell 1992; Mulligan 1999].

The use of Delphi to forecast the future of technology and business domain is not new. [Mitchell 1992, p.4] argued for suitability of Delphi for predictive analysis of new technology-based market developments for at least the following reasons:

1. In the early stages of technology market development, there is a tendency for unrealistic expectations and media hype. This holds for the role attributed to open standards in modern ICT industries—open standards are often seen as a universal good and a panacea for incompatibility and interoperability problems at different levels. Besides, quite on the contrary, there can be much doubt over the viability of technology and its claimed benefits, leading to decrease of consumer confidence.
2. Rapid growth of technological variety and trajectories increase the risks involved in organizational decision making. These risks can be reduced by gaining better information regarding the future development in the subject domain.
3. High rates of innovation and variety of alternatives increase the risk of betting on a wrong technology/standard.
4. There is a need to have a long-term focus.

The success of Delphi research is critically dependent on the right kind of experts, who understand the issues, have a vision, and represent a substantial variety of viewpoints. In our study, we invited experts with different backgrounds related to the topic of standards and government policy: representatives of SDOs, industry professionals, academic staff with publication record on the issues of standardization, and government decision makers affiliated with ICT development policy-making in general or standardization policy-making in particular.

We tried to obtain a balanced mix of expertise by soliciting a commensurable number of participation from academia, industry, government, and SDOs. The obtained representation is somewhat less balanced, as three experts from industry, and two from government have not responded to the invitation to participate in the study. This does not undermine the validity of the Delphi survey, however. First, almost all experts have expertise from different professional domains (e.g., consulting and academia, or industry and academia), due to their current or past affiliations. Second, unlike statistically based studies where participants must be representative of a larger population, in Delphi *nonrepresentative*, knowledgeable persons are needed [Gordon 1992].

Identification of knowledgeable people was mainly done through their membership in research and practice communities (frequent participants and committee members of standardization-related conferences and workshops, people who published on the topic, etc.). One of the selection criteria used was full-time job related to standardization practice and/or theory. Recommendations and referrals from those identified were also used to solicit participation of additional experts.

A total of more than 20 experts were contacted, and 18 have participated in the first round of the survey (the list of experts is given in Appendix 1). The opinions of 13 experts who participated in at least two rounds of the survey were taken for data analysis. This represents a sufficiently high number for the obtained results to be considered valid. [Delbecq et al. 1975] suggested that the number of experts should be five to thirty. [Martino 1985] argued that with a panel of 15 experts in a given field, it is highly unlikely that another equally expert group will produce radically different results.

Three rounds of survey were planned, as most changes in Delphi response occur in the first two rounds, with some researchers reporting that not much is gained by iterating more than twice [Mitchell 1992, p.7]. To facilitate and speed up data collection from and feedback to the experts, we used a Web-based survey tool.

## IV. CONDUCT OF THE SURVEY.

### Structure of the Initial Survey Items

The initial survey questionnaire was structured around the nine issues identified through the literature review (see Table 1 earlier). Introduction to the survey and invitation to the Web-based questionnaire were sent to the participating experts. Participants were asked to provide their assessment of the 1) importance and relevance of the issues, and 2) the likelihood of having those issues to be incorporated in government policy within the next five



years. The experts were also asked to provide reasons for their judgments. The exact formulation of the questions was as follows:

“Please review these important standardization issues, and rate their relevance and importance in the context of an open standard government policy on the scale from 1 (completely irrelevant and unimportant) to 5 (highly important and relevant),” and

“Please review these important standardization issues, and rate the likelihood of each of the identified issues becoming directly addressed in government’s open standards policy within the next 5 years.”

Two feedback rounds were used to present the results of the previous rounds of survey, i.e. the variance in judgments and the reasons for the extreme judgments were communicated to each participant calling for reassessment. Experts were asked to reconsider their former judgments in view of the reasons for the extreme opinions [Gordon 1994].

The group judgments’ consensus calculations were based on the median. Standard deviation defined the “consistency range.” If no opinions outside the consistency range were found, the issue was dropped from the further round of the survey.

### First Round

Experts received invitation to log in to a Web-based survey. For each of the nine issues, experts were instructed to rate each issue on a 1-to-5 scale, as well as to provide reasons for their opinion. Finally, experts were asked to provide open-ended comments, if they felt that some important issues were not listed or some of the listed issues were irrelevant.

Eighteen experts completed the first round of the survey. For the consistency reasons, the answers of one expert, who has not fully completed the survey were excluded, leaving the total of 17 collected responses. A median was calculated for all answers. The calculated “consistency range” divided the opinions between “within the accepted consensus range” and “outsiders.”

### Second and Third Rounds

“Outsider” opinions and their extreme opposition<sup>11</sup> were sent out to each expert prior to the second and third rounds. Each expert, additionally, as a reminder received his/her answers for the previous round of the survey. Statistical feedback on the opinion range was also supplied: the median, standard deviation, “consistency range,” and the number of outsiders for each of the questions. After the completion, the statements were analyzed according to the first-round procedure. 12 and nine experts have completed the second and the third rounds of the survey, accordingly. For the consistency reasons, the answers of experts, who have not fully completed the survey were excluded, leaving the total of 11 and 8 collected responses, accordingly.

## V. DATA ANALYSIS

“As in this survey outsiders’ opinions are introduced for all, so very often real scientific discoveries we find in extremity domain.”  
(Delphi participant, edited)

Analysis of Delphi data is relatively straightforward. Our data show several general trends. First, by juxtaposing the experts assessments on the issues’ importance and time perspective, we can clearly see that all the issues had a median importance rating of at least 3 (on the 1 to 5 scale), i.e., all the identified issues are perceived important. At the same time, the likelihood of implementing policies addressing those issues within the next 5 years is rated as low (the median for time perspective is 2 for six out of nine issues after the third round) (see Table 2).

Further analysis allows to identify issues perceived to be the most and the least important. We can also identify the issues with the largest and the smallest number of outsiders, which indicates the most and the least of disagreement among experts on the importance of each specific issue.

<sup>11</sup> For example, if an expert with rating “5” or “4” was an “outsider,” this expert’s opinion and opinions of experts who provided rating of “1” or “2” were sent out in the feedback. Or the other way around.

**Table 2. Importance and Timing Of Issues – A Summary from the Three Rounds\***

Issue			Round		
			1	2	3
Economics of standards	Median	Importance	4	4	4
		Likelihood	2	2	2
	Outsiders	Importance	13%	18%	0%
		Likelihood	19%	27%	25%
Public good and compliance	Median	Importance	3.5	4	4
		Likelihood	3	3	3.5
	Outsiders	Importance	25%	27%	29%
		Likelihood	19%	36%	25%
Syntax and Semantics	Median	Importance	4	4	4
		Likelihood	2.5	3	2.5
	Outsiders	Importance	19%	9%	14%
		Likelihood	6%	18%	13%
One stop service	Median	Importance	3	3	3
		Likelihood	2	3	2
	Outsiders	Importance	25%	17%	14%
		Likelihood	25%	9%	13%
Technical maturity	Median	Importance	3	4	3.5
		Likelihood	2	2	2
	Outsiders	Importance	38%	18%	14%
		Likelihood	19%	18%	13%
Future proof	Median	Importance	3	4	3.5
		Likelihood	2	3	2
	Outsiders	Importance	38%	18%	14%
		Likelihood	19%	18%	13%
Goals of participation	Median	Importance	3	3	3
		Likelihood	2	2	2
	Outsiders	Importance	25%	27%	14%
		Likelihood	13%	18%	0%
Accessibility	Median	Importance	3.5	4	3.5
		Likelihood	2.5	4	2.5
	Outsiders	Importance	19%	9%	29%
		Likelihood	13%	27%	0%
IPRs	Median	Importance	4	4	**
		Likelihood	2	4	2
	Outsiders	Importance	19%	0%	**
		Likelihood	19%	27%	25%

\* This table presents the calculated median for expert ratings for each issue and round. Standard deviation defined the “consistency range”. Ratings outside the consistency range were considered “outsiders.”

\*\* The issue of IPRs was dropped from the 3<sup>rd</sup> round, as the consensus of ratings on this issue was achieved after the 2<sup>nd</sup> round.

From the nine issues offered to experts for rating the perceived importance, *economics of standards*, *public good and compliance*, *syntax and semantics*, and *IPRs* were rated “4” on the 1 (least important) to 5 (most important) scale after the second round of the survey. Apparently, those four issues are perceived to be the most important and relevant ones (Table 2).

The median rating for issues of *one-stop service experience* and *goals of participation* was “3” after the second round, and remained unchanged. Those two issues are perceived as the least important and relevant ones (Table 2).

We can identify issues, which are believed to have the least (those with median 2) and the most (those with time perspective median of 3 and above) chances being incorporated into government policies with the next five years. From the nine issues offered to experts for rating the time of policy enactment, *economics of standards*, *technical maturity*, and *goals of participation* were rated “2” after the second round of the survey. Taking those three issues under the direct policy control within the next five years is perceived to be least likely (Table 2). While issues of *accessibility* and *IPRs* had a median 4 after the 2<sup>nd</sup> round, the only issue with a median above 3 after the third round was *public good and compliance* (Table 2).

Finally, we can also see where the consensus and dissensus on timing issues resides. For the importance of the issues, after the second and the third rounds, there were more than ¼ of outsiders for the issues of *public good and*

*compliance, one-stop service experience, future proof, goals of participation, and accessibility.* These were the issues of the biggest dissent of opinions. For the time perspective of issues, after the second and the third rounds there were more than ¼ of outsiders for the issues of *economics, public good and compliance, future-proof, accessibility, and IPRs.* We can also see that there was more dissent for the time perspective than for the importance of issues.

Before we proceed to further analysis of the survey data, we should make a note on what logic was used in the analysis. The objective of this work was to establish a reasoned connection between the issue of “open standards as a media hype and ‘universal good’” and one of “open standards as a government policy instrument.” The nine issues offered for expert ratings were representative of available (though scarce) literature on standards and standardization in general. Survey of expert opinions was expected to provide explanations for *if* and *how* standards can become instruments of governance. Reaching consensus on the importance of each or all issues *per se* was not as important as obtaining diversity of expert opinions, which were to be considered by the policy makers in deciding on appropriate policy for public ICT infrastructure development. Given that mindset of obtaining a diversity of views, the following section presents an exploratory analysis of the survey data.

## VI. EXPLORATION OF REASONS FOR CON- AND DISSENSUS

For the further analysis, we used responses of those experts, who answered at least two rounds of the survey. This gave us access to the answers of 13 respondents (see Table 3). This step was taken to increase the likelihood that only opinions and ratings of those experts who used the survey feedback mechanism were used.

**Table 3. Ratings of Expert Opinions**

Issue		Experts rating					Score	
		5	4	3	2	1	Total	Total
Economics of standards	Importance	5	5	1	1	1	51	82
	Likelihood	2	2	-	4	5	31	
Public good and compliance	Importance	5	4	1	2	1	49	87
	Likelihood	1	5	2	2	3	38	
Syntax and Semantics	Importance	3	7	2	-	1	50	86
	Likelihood	1	4	1	5	2	36	
One stop service	Importance	3	3	4	2	1	44	77
	Likelihood	1	-	5	6	1	33	
Technical maturity	Importance	1	6	3	1	2	42	69
	Likelihood	-	2	1	6	4	27	
Future proof	Importance	3	5	2	2	1	46	79
	Likelihood	1	3	2	3	4	33	
Goals of participation	Importance	1	4	3	3	2	38	67
	Likelihood	1	1	2	5	4	29	
Accessibility	Importance	4	4	4	1	-	50	92
	Likelihood	1	6	2	3	1	42	
IPRs	Importance	5	6	1	1	-	54	94
	Likelihood	3	3	1	4	2	40	

We believe that reducing the number of experts in this way increased the overall consistency of the experts' argumentation, while it did not change the composition of the most and least important issues. *Economics of standards, public good and compliance, syntax and semantics, and IPRs* remained among the most important issues, while *one-stop service experience* and *goals of participation* remained among the least important ones (Table 3, see total scores for the importance of issues). The overall ratings for the timing of possible policy enactment remained unchanged, too, with *economics of standards, goals of participation, and technical maturity* having the lowest score, and the issues of *accessibility* and *IPRs* having the highest.

We grouped experts' opinions rated on a 1 to 5 scale in the Delphi survey for each issue into four segments in a classical 2-by-2 matrix with four binary high-low combinations (see Table 4 through Table 12). The top row of each table shows how many experts assigned high importance (rated “4” or “5”) to a particular issue. The bottom row of each table, accordingly, shows the number of experts who gave low importance (rated “1” or “2”) to a particular issue.

The right column in each table shows the number of experts who believe a particular issue will be taken under direct policy control within the next five years (rated “4” or “5”). The left column gathers expert opinions on unlikely policy control (rated “1” or “2”).

In the following, we present digests of experts' opinions<sup>12</sup> (given in italics) falling into different segments for each of the nine issues surveyed in Delphi study (Table 4 to Table 12).

## Economics of Standards

### Economics of Standards: High Importance

Ten out of the total 13 experts' responses share the view that economics of standards is an important issue in the government policy (see Table 4, top row). Main reasons for assigning high importance to the issue of economics of standards in public policy is that the government policy makers must have understanding of the market mechanisms.

**Table 4. Economics of Standards. Grouping of Expert Ratings**

Importance	High (4-5)	
	High-Low 6	High-High 4
	2 Low-Low	- Low-High
	Low (1-2)	High (4-5)
Likelihood of implementation		

Economics are important when establishing a balance between the public development and private supply. Both public administrations and private parties have to invest in ICT systems, therefore theories of economics of standards can be of help to make underpinned decisions. This is specifically true in the light of divergent views on standards and ICT investments held by public vs. private entities. For private technology vendors standards are strategic coordination mechanisms of technology and market development. Public sector, on the contrary, approaches the issue of standards and its policy by the use of macro-indicators of economic development (e.g., GDP, trade balance, R&D, etc.).

Questions like "How to create a viable market for private vendors? How to foster user demand for products and services? How to protect users from lock-ins into proprietary solutions?" and alike must be answered by the policy makers attempting to control for economics of standards.

Government can have a unique role in promoting adoption of open standards due to its ability to mandate procurement policies, and its possibility to protect end-users from solutions which can have negative economic effect on the end-user (firms, citizens, public administrations) in the long run.

*Finally, governments are in a position to decide on the public good status of a particular technology or service, and evaluate standards and/or technologies against them being a barrier to innovation.*

The reasons why experts believe the many issues of economics of standards will come under direct policy control within the next five years are primarily related to innovation and overall development. *Avoiding switching costs in a rapidly developing ICT domain, where versioning and new generations of technologies became a commonplace are definitely a driver.* Despite the overall confidence in that economics of standards will become a policy issue fairly soon, experts acknowledge that achieving a policy control on a large scale is difficult.

Six out of 10 experts who assign high importance to the economic aspect of standard policy, believe that *governments cannot control the economic models via policy; hence implementation of such policies is unlikely.*

Among the reasons for little likelihood of policy implementation, is an opinion that governments have no resources or expertise to get involved, and that standards issue is outside the scope of government's interests. Government is believed not to be interested in open standards, save in a very short term pragmatic and superficial way. Government is not a risk-taker, not pro-active, and not business-oriented to assign high priorities for economic policies implementation on standards. Taking into account the problematic of public sector's economics as whole, it seems an unrealistic task for administrations to tackle with economics of standards. Besides, economic issues lie outside the scope of EU policy interests, left to the private industry and market regulation.

<sup>12</sup> It is important to note that the following sections contain only digests of experts opinions, and not the authors' opinions.



**Economics of Standards: Low Importance**

Two experts rate low both the importance and the likelihood of economic policy's implementation. One of the experts asserts that the issue of economics must be considered differently. It should not be focused on the costs of standards or standardization. Instead the cost-control policy should be "the same or less than before for the ever increasing number of services." In support of this argument, the expert notes that it is possible for the government to avoid the issue of open standards all together by outsourcing ICT service developments and provision.

Experts familiar with the EU-level initiatives on standardization, note that, *apart from some isolated initiatives (such as e.g., eGovernment Economics Project—eGEP), there is little evidence that economics of standards will become a major issue.*

**Public Good and Compliance**

**Public Good and Compliance: High Importance**

Eight experts share the view that public good and compliance issue is important for government policy (see Table 5, top row). Different opinions for the support of the issue are voiced.

**Table 5. Public Good and Compliance. Grouping of Expert Ratings**

Importance	High (4-5)	
	High-Low 2	High-High 6
	2 Low-Low	- Low-High
	Low (1-2)	High (4-5)
Likelihood of implementation		

Basic ICT infrastructure is an essential public good. Governments must collaborate in developing a coherent and long-term strategy that provides this facility as a foundation for commerce, innovation and competition. Increasing importance of the public good issue can be taken by government as a measure to counter the proprietary developments by large corporations.

Common infrastructure and services are believed to be a prerequisite for wide user acceptance. Compliance across the public service must be uniform or else the exercise will create nothing but confusion. Where it is a benefit to government, it makes sense to have procurement mandates that provide direction (and have these span many governments so vendors have a common target). Where a standard has significant public impact, it makes sense to consider regulatory requirements. However, demanding or recommending compliance is not simple. You do not just say "comply with this..." It is necessary to be specific on precisely how suppliers should comply. Therefore, while legislation and regulations can be mandatory, standards' implementation should be voluntary. Compliance to standards is essential. Without specification of compliance requirements, standards are useless.

One expert notes, "while taking this issue under government policy control is certainly desirable, achieving it on a large scale is a difficult task." This last comment leads to less optimistic estimate on the temporal proximity of policy implementation, which groups ratings of two experts. As an obstacle to near-future implementation of policy, experts note that "governments will continue to work with those issues on a spotty basis, but no comprehensive initiative is likely to emerge."

**Public Good and Compliance: Low Importance**

Two experts give less-than-optimistic opinions on importance and time perspective for this issue (bottom row of Table 5). One expert notes that "governments have neither power nor means to enforce compliance, save cases where anti-trust legislation can apply." Another expert repeatedly notes that "governments have no will, interest, nor budget for significant action in this domain."

The reasons for a diminished role of the public good and compliance issue in government policy are several, as noted by the experts. *A government organization would have difficulty arguing or recognizing what standard represents a public good. In other words, the issue becomes "what standards to support" and who would require them? Thus, the issue of public good and compliance becomes important only when the government is competent and has no other interests than the total welfare and general good. Instead of looking for public goods and enforcing*



compliance, the government will at best ensure that a service or capability they specify is sourced, provisioned, and works to end user needs.

## Syntax and Semantics

The majority of experts agree on the importance of this issue (Table 6). Five experts believe the likelihood of implementing targeted policies on the issue within the next five years is high (segment “High-High”), while the same number of experts doubt this time frame is feasible (segment “High-Low”).

**Table 6. Syntax and Semantics. Grouping of Expert Ratings**

Importance	High (4-5)	
	High-Low 5	High-High 5
	1 Low-Low	- Low-High
	Low (1-2)	High (4-5)
	Likelihood of implementation	

### Syntax and Semantics: High Importance

The importance of the syntax and semantics issue is prompted by the general trend of globalization, multicultural and multilingual environment for ICT services, and the requirements of interoperability. Without a shared syntax one can't even make an effort to communicate. Once the syntax is there, one can talk about sharing semantics.

At the same time, the global multi-cultural and multi-lingual environment creates barriers to service development and interoperability. Overcoming this barrier can be done by developing solutions for common syntax and semantics on a community level. Worldwide unification can be achieved through mapping between communities.

Several experts note that *syntax and semantics should not be seen as a joint issue—semantics depends on ontology; syntax is less important and depends on protocols. Technically, syntax and semantics is noted not to be a complex issue – XML can be used as a solution. However, implementation of control mechanisms requires coordination and negotiation. E.g., when XML is used, diligence is needed by government to assure that a viable core of XML and other standards are established to avoid inadvertent or deliberate deviations.*

One expert notes that *due to the divergence of views, this issue absolutely has to be taken into account, but that it cannot be allowed to act as a shield for anticompetitive behavior the way it has been in past standards initiatives.*

Among opinions touting near-future estimates for policy implementation are those seeing *cultural and regional cooperation as driving forces for information society development.* The role of EU is noted to play a special role here. Besides, *semantic interoperability becomes a major factor in improving services interoperability without having to realign underlying technical infrastructure.* Another driver for policy implementation is the nature of the issue itself —*it is a service-driven issue, therefore akin to control by the government.*

Opinions assigning high importance and low likelihood (“High-Low”), suggest that there is insufficient competence of the government to grasp the complexity of the issue, and that this is a technical issue best left to the engineers. Therefore, no consistent or directed action should be expected. One expert notes that government, nonetheless, will engage on a technical level, but just to avoid political issues. Supporting those views, one expert points at the narrow business oriented approach of the government in open standards issues.

### Syntax and Semantics: Low Importance

The bottom row of Table 6 shows there is one expert providing counter-arguments to the importance of the syntax and semantics issue in government policy. Specifically, an expert notes that *syntactic and semantic interoperability problem is an intractable problem that can not be solved using voluntary standards as they are currently created. Regulation might be the answer, but the regulators would be suspect. Until there is an absolutely dominant supplier—and Microsoft comes close—or an overwhelming competitive (economic or other) advantage, you aren't going to solve the issue.*

## One Stop Service Experience

Table 7 illustrates that there is no dominant expert opinion on the issue of one-stop service experience.



**Table 7. One Stop Service Experience. Grouping of Expert Ratings**

Importance	High (4-5)	
	High-Low 2	High-High 1
	3 Low-Low	- Low-High
	Low (1-2)	High (4-5)
Likelihood of implementation		

**One Stop Service Experience: High Importance**

The only opinion in segment “High-High” postulates, as has been repeatedly told for prior issues, *that this is certainly desirable feature, but implementing control policy is hard to achieve on a large scale*. An expert opinion found in segment “High-Low” points at the U.S. federal government policy of “No wrong door” as a useful guide: *Systems should be designed in such a way that a user can access a particular service, whatever the point of entry into a system*. Besides, as the expert notes, *there are already tools available for implementing lightweight “semantic navigation” systems—for example the ISO 13250 standard (Topic Maps)*.

As barriers to policy implementation are considered *administrations’ favor of the “central portal” model of one-stop service delivery*. *These solutions are likely to be proprietary, cosmetic “shells” for which there will be no driver towards standardization*.

**One Stop Service Experience: Low Importance**

Less optimistic estimates of the importance of the issue and the time frame for policy implementation (segment “Low-Low”) give one of the highest opinion weights with its three entries. Experts note that *the issue is important, but the ability to make changes is minimal*. *The problem is how to implement it, given human nature, the nature of organizations, and the nature of government*.

Opinions found here range from rather mundane and straightforward, such as “will not happen in practice,” and already heard “no will, interest, or budget for significant action,” to well-elaborated ones. Among the latter, an expert opinion that government organization goes against one-service approach. As a possible reason for such an attitude, an expert notes that *protecting user privacy makes such approaches unlawful under the EU privacy directive*. Finally, the expert points at “disaster projects” in the U.K.: *following this model is doomed never to become anything else than monstrous projects which fail*.

Finally, one expert notes *that interoperability does not imply centralization: One-stop service is even possible with incompatible systems, and therefore should not be discussed as a standardization issue*.

**Technical Maturity**

The majority of experts agree on the importance of this issue (Table 8). Despite the consensus, the issue has not generated a wealth of diverse opinions.

**Table 8. Technical Maturity. Grouping of Expert Ratings**

Importance	High (4-5)	
	High-Low 5	High-High 2
	3 Low-Low	- Low-High
	Low (1-2)	High (4-5)
Likelihood of implementation		

**Technical Maturity: High Importance**

Opinions voiced in support of the issue argue *that governments should monitor standards and implement them in conjunction with the private sector*. This requires mature standards. A better understanding of this issue would allow to minimize the risk of betting on a wrong solution, i.e., avoid wasting money by standardizing at the wrong time.

Fast policy implementation, however, will be hampered, as *implementing such policy would put government into a position of being dependent on the availability of “mature” international standards*. Further on, this is too complex a problem to make it a political issue, and that governments lack the needed expertise and resources for policy implementation.

**Technical Maturity: Low Importance**

Opponents of the importance of the issue elaborate on the problem of government’s lack of expertise: “Who judges maturity?” Is it when a standard is old or is it when the technology is no longer interesting, or is it after the market has settled? Technical maturity is “easy to state, hard to define.” The issue of technical maturity is said to be a secondary problem in formulating standardization policies: standards will only be relevant as long as the technology they relate to is relevant.

Yet another opinion expert warns that technical maturity is a red herring, often used by vendors to discourage or block standardization that is not to their advantage. Users, and in particular governments should take a long-term (5+ year) strategic view of their interests and become pro-active in facilitating the standards needed. This would require early involvement, and long-term commitment.

**Future-Proof**

The issue of future-proof in standardization yielded quite even distribution of opinions between three segments (see Table 9).

Table 9. Future Proof. Grouping of Expert Ratings		
Importance	High (4-5)	
	High-Low 3	High-High 4
	3 Low-Low	- Low-High
	Low (1-2) High (4-5)	
Likelihood of implementation		

**Future proof: high importance**

The issue of future-proof is important, because it is related to (backward) compatibility of data and media. Backward compatibility or transition paths are always an appropriate requirement as technology evolves. In the private vendor dominating ICT realm, much if not most of the “evolution” of technology is not to increase user benefits, but force them to pay for the next generation product. Vendors have a significant incentive to force upgrades and transitions on a regular basis. Governments must allow vendors to provide extensions, but require them to both have modes of operation that are strictly conforming and that they support prior version(s). Awareness by the government of lock-in means that administrations are likely to look for standards-based policies and solutions in the very near future. There are already policies being developed, as e.g., eDocument policy area in the European Commission’s eGovernment Action Plan.

Opinions advocating the importance of the issue range in their assessment of the role of government. One expert believes that governments have neither influence nor leverage here, except to ensure that the standardization processes and the market driven tuning are fair and transparent. Agencies cannot force anything at all. At best they can force backward compatibility but not future proof. Version control and consistence of an open standard is best achieved when it becomes in effect managed by one single entity with full liabilities vis-à-vis end users.

Another expert states that “sophisticated procurement and contractual procedures can determine formats and shapes, and hence are appropriate tools for future-proof control intervention.” While disagreeing on the capabilities of the government with regard to implementing constructive policies on future-proof of ICT, both experts agree that version control is needed. This can be achieved by letting government entities trial out future services in consortia modes with developers and users.

One expert suggests that the issue of future-proof should be diverted from data formats. The real big danger and challenge is in ensuring that data carriers and media are future-proof. There will always be a rich and varied market for converters of data formats, but this is not so obvious for conversion between media.

There are voices of doubt with regard to the timeframe for the future-proof policy implementation. One expert notes that future-proof is not a central task of IT-architects in the central public administration. Another expert points at the diminishing technological quality of standards, which inadvertently reduces the longevity of the standards that the professional community *can develop*. Yet another reason for skepticism stems from the question “How do governments ‘force’?” The expert believes that as long as it is in the economic interest of a vendor to use unique formats, they’ll find a way to sell incompatible solutions to the government. An extreme opinion suggests that one “can’t future proof during a period of rapid technological change.” Finally, a reconciling voice suggest that future-proof control can be achieved if one allows the vendors some latitude to experiment.

As for almost every issue taken in the survey, experts doubt that government has the needed expertise to take an appropriate action on future-proof issues: “Government will play a role here as a large consumer, but beyond that they are likely to do more damage than good.”

**Future Proof: Low Importance**

Among most skeptical opinions is expert’s prediction that the government can’t and won’ stay focused long enough to fight the fight.

As for the reasons for unimportance of the issue, those are rather related to incapability or inappropriateness of the issue, not to its importance. The question asked here, again, *is* “What compelling force does the government have?” Does a government have a choice of not buying products “that the governmental users want”? The expert points at the importance of the installed base, not only that of hardware, but most importantly “nearly a 100 years of installed base of data.”

**Goals of Participation**

Table 10 shows that expert opinions side on little importance of the issue of governmental participation in standardization.

Table 10. Goals of Participation. Grouping of Expert Ratings		
Importance	High (4-5)	
	High-Low 2	High-High 2
	5	-
	Low-Low	Low-High
	Low (1-2)	High (4-5)
Likelihood of implementation		

**Goals of Participation: High Importance**

Experts suggest that government should not leave everything to the market, otherwise this will lead to wrong advice and wrong investment decisions. Government’s participation can be seen as a valuable “insurance policy,” enabling governments to keep abreast of standards development and avoid investing in technology that looks to be going down a blind alley. Government must intervene to minimize the industry cartels that seek to exclude users, government and competing vendors.

A door for government involvement can be the increasing awareness that the main “standards” bodies and consortia are still too heavily industry-driven, and require a broader user and public sector base. The expert notes that this observation is often made by industry representatives themselves, who see public sector involvement in a “referee” role.

Governments must be proactive, long-term participants, forcing consortia transparency of all agreements, terms, conditions, fees, IPR agreements, etc. This would create a much more “open” standards process. However, currently low levels of government involvement will continue out of inertia or lack of knowledge, an expert predicts.

**Goals of Participation: Low Importance**

Administrations should monitor and define grey areas, common interests where market fails to get agreement. So it is not a problem of type of standards or lack of them, but that of defining sectors of implementation, setting priorities and scopes. While in rapidly changing IT environment continuous improvements and change management are crucial, a more important role is played by interfaces and principles, not technical solutions.





transparency and trust will increase. Already, in the EU there are eAccessibility and eInclusion programs, which are predicted to become foundation for major public policy issue in eGovernment investment.

Finally, bottom-up push is predicted to materialize, as user frustration over services in-accessibility may reach a sufficiently high volume if government does not take action within the next five years. Another expert notes that such user frustration may be avoided, as the issue of accessibility is probably the area in which governments are most active and even successful, mostly through outsourcing.

In the heart of counter-arguments for speedy policy/ service adoption is, again, complexity of the problem—offering universal accessibility “isn’t easy,” as one expert notes.

#### Accessibility: Low Importance

Opposition to the importance of the issue argues *that accessibility is a secondary issue, and not a standards issue.*

#### IPR

Eleven out of 13 expert opinions are assign high importance to the issue (Table 12). Despite the nearly unanimous support of the importance of the issue, we find a peculiar divergence of reasons for this importance among the opinions voiced. The level of elaboration on reasoning varies greatly, too.

**Table 12. IPRs. Grouping of Expert Ratings**

Importance	High (4-5)	
	High-Low 5	High-High 6
	1 Low-Low	- Low-High
	Low (1-2)	High (4-5)
Likelihood of implementation		

#### IPR: High Importance

Most general explanations to support high ranking of the issue are *that* “IPRs are important for policy reasons” and “IPRs are very important to make sure progress and competition can happen.” In other comments we find more sophisticated presentation of reasoning.

While not neglecting the importance of IPRs, some experts would like to see the IPR-free standardization, for the reason that IP-related issues are “splintering the ICT business market place.” This is a critical and important issue, that has surfaced because the standardization process has been allowed to run out of control with new and amateur players. While reversing the trend is not possible, taking the issue under government control will help counter-balance the predatory nature of some of the players in ICT development.

Another expert notes that standardization policy-making must build upon the existing laws—there are explicit IPR laws in place already, and there won’t be special laws made for standards. However, governments must be aware of the pitfalls IP can bring to the national ICT development. First, there is no single test for RAND or FRAND that is culturally and nationally neutral. Patents are routinely abused (when people buy and sell them as a commodity), and standard setters are in significant denial. Second, existing IPRs make it difficult to enter the market for new players. Some countries are positioned better than others to either keep or remove those barriers. In China, according to one example, they’ve filed over 600,000 national patents in the last three years—to catch up with U.S. patents and European patents.

Another expert elaborates on why (F)RAND issues, mentioned above, are important. He notes that IPR is the secret (in many senses of the word) tool of vendors to manipulate the standards process. The patent process can be easily manipulated to exclude competition, and flagrant abuses of it can be used to preclude challenge by smaller companies who cannot afford the fight even when they are right. Without meaningful policies on IPR, operating on a global basis, standardization will be manipulated using this “business opportunity.” The expert continues, “*There are probably public interest standards where IPR should be either excluded or bought-out by governments to avoid this.* There are definitely things being patented today that should not be allowed.” Yet another comment sheds a light on what those “forbidden” areas may be: “Just get rid of sui generis copyright and disallow the patenting of algorithms.” According to this expert, “IPR is a good example of where governments have gotten all of the issues exactly wrong.” This expert predicts that the whole ICT industry will soon grind to a halt in the litigation courts if current

interpretations of IPR are sustained. In the realm of short life-cycles of technology in the ICT domain, IPRs are unsustainable and mean nothing more than nasty little monopolies. Open source could be a way to get around them, but if the legal principles don't change "open" won't mean anything.

Other experts note that there is too much reluctance to change the principles operating in the IPR domain, as mentioned earlier. Specifically, there is a reluctance to reduce the power of IPR (running time of patents and copyrights), and way too much reluctance in threatening with expropriation of proprietary standards. Thus, the dilemma is presented by, on the one hand, IPRs being related to much of the available technology, and, on the other hand, that any public money used in developing ICT solutions for the public sector, should mean that any IPR is owned by the public sector and not by the private companies that undertake the work. One solution for solving the dilemma is offered: IPR policies must be implemented mostly as an internal tool (for consistency), and not as a means to encourage industry "to deal FRANDly with IP."

With regard to the timing for policy implementation, experts disagree. Some call for prompt policy implementation, predicting that it will be established at the EU level (but may diverge from WTO views). The reason for near-future implementation of the policy is grounded in the problematic of the issue—the problem requires some kind of governmental intervention if it is to be solved. One opinion is that *it will happen only when the non-G7 countries force the issue*. Others predict that *this will happen sooner rather than later to aid interchangeability*. Finally, another reason for prompt implementation of IPR policies is that governments should minimize the abuse (IPR is a key issue often used by industry to block or control standardization) that is rapidly expanding in the ICT domain and strongly diminishing the open-ness of open standards.

Other experts are skeptic with regard to the very capability of government to attempt the change—IPRs are the holy grail of standards manipulation, industry will fight for a long time before they yield to any IPR policies, much less one that is in the public interest. While governments will continue to get involved, predicts an expert, they will "screw things up even worse than they are now—total capture by the ICT vendors on this front." One expert is suggesting that a remedy for such a pitiful situation can be in delegating these issues largely to the SSOs. Another expert concurs to the latter opinion, suggesting that coordination at an international level between administrations may improve the situation. Without cooperation, many administrations will continue to "give away" their IPRs on public-funded ICT development, either through poor contracts or lack of attention to the management of ICT assets.

#### IPR: Low Importance

The only opinion voiced in opposition to the importance of the issue is, once again, a repetition of the concern that establishing IPR policy is certainly desirable but hard to achieve on a large scale.

## VII. SUMMARY

This work was aimed at exploring the role of standards in developing and governing public ICT infrastructures, and the role of government in developing standards-related policy. Analysis of opinions obtained through the Delphi survey shows the overall complexity of the research question, and provides no definite answers with regard to the government's role. However, this research has some important findings, namely that:

1. There is a great diversity of views on each of the nine surveyed issues.
2. The importance and relevance of the nine issues offered for the survey is perceived in general higher than the likelihood of taking those issues under direct policy control within the next five years. Given the diversity of (often conflicting) views, the less-than optimistic predictions of the policy implementation time frame do not come as surprise.
3. Issues perceived to be the most important are economics of standards, public good and compliance, syntax and semantics, and IPR.
4. Issues perceived to be the least important are one-stop service experience, technical maturity, and goals of participation.
5. The diversity of views expressed by the experts is:
  - to some extent reflecting the diversity of professional affiliations of the experts,
  - representing different perspectives (technical, economic, and social) on standardization and infrastructure development, as suggested by the literature, and
  - providing an aid to policy decision-making through versatile illumination of the most important issues.

In the following, we summarize experts' opinions for each of the nine surveyed issues. The overall picture is that all nine issues are seen to be important and therefore governments might formulate and implement a policy on each of these. However, it is not self-evident that governments have the ability to do so and therefore the chances that governments really take up these issues are rated lower.

## Managerial Implications for the Nine Issues

The impact of standards for ICT systems has been studied by *economists* who paid attention to, for instance, network effects, switching costs, R&D investments and risk management. Government can have a unique role because it can prescribe certain standards, stimulate its use by its procurement policy, and/or decide about the public good status of a particular technology. The latter may lead to a preference for “open standards.” However, experts disagree on the willingness as well as the ability of governments to deal with such issues.

Governments can take the *public goods* issue to counter the proprietary developments by large corporations in order to avoid vendor lock-in by promoting or even enforcing conformity to general standards. However, demanding or recommending compliance is not easy, it is necessary to specify precisely how suppliers should comply.

Standards for information exchange may concern *syntax* as well as *semantics*. Semantics depends on ontology; syntax depends on protocols. Some experts question government’s competence to deal with this issue, they suggest that this is a technical issue best left to the engineers.

Increasingly, end-users ask for *one-stop information access*. In that sense the issue is important, but the problem is how to implement it. Though, interoperability does not imply centralization: one-stop service is even possible with incompatible systems, and, vice versa, standardization does not imply one-stop information access.

In ICT, product life cycles tend to be short and this raises the issue of *technical maturity of standards* which also relates to revisions, if any, of standards. Experts argue that this is too complex a problem to make it a political issue, and governments lack the needed expertise and resources for policy implementation. However, the consequence may then be that governments leave the choice of standards to industry with the risk of lock-in and no guarantee at all that industry will come up with “mature” standards. Therefore, users, and in particular governments might take a long-term (5+ year) strategic view of their interests and become pro-active in facilitating the standards needed. This would require early involvement, and long-term commitment.

Then a major requirement should be that standards are *future-proof* in the sense of (backward) compatibility of data and media. In the private vendor dominating ICT realm, much if not most of the “evolution” of technology is not to increase user benefits, but force them to pay for the next generation product. Vendors have a significant incentive to push upgrades and transitions on a regular basis. Governments may require vendors that extensions support prior version(s). However, a requirement of backwards compatibility may in the longer run hinder break-through innovations. So again the question is how to find the right balance and to which extent Government is capable to make the appropriate choices.

In case government intends not to leave everything to the market, in order to avoid wrong investment decisions, it could keep abreast of standards development by *participating in the processes of developing standards*. In general, standardization organizations and consortia are industry-driven, and may profit from a broader user and public sector base. Government representatives could act as observers, but a more active role could be to monitor and define grey areas and common interests where market fails to get agreement. However, several experts question the government’s competence which is needed for effective participation. Moreover, in case of participation, the question is in which of the more than 1000 committees and consortia to participate.

Experts see a need for e-services to be *accessible* in terms of simplicity, transparency, user-friendliness and security, which may promote trust in public administration. However, this is not per se a standardization issue.

*Intellectual Property Rights* apply in particular to proprietary standards and consortia standards and for governments it is the question whether or not they should have an IPR policy. IPRs may splinter the ICT business market place and for that reason a form of counterbalance from the side of government reaching beyond the general IPR legislation may be good for the sake of interoperability of ICT systems.

## VIII. CONCLUSIONS

In this work we attempted to answer the questions of whether standards matter in developing and governing public ICT infrastructures, and if they do, than what can be the appropriate governance instruments, and when such instruments are likely to be implemented by nation-states’ governments.

Using hermeneutic method of iteration between literature review, sense-making, and peer-inquiries, we identified several issues pertaining to the subject matter of this study. These issues were further validated in the Delphi survey by leading experts from academia, industry, and government organizations.

While it is natural that some issues were rated more important than others, the expert comments show that all of the nine issues are relevant for government policy making for public ICT infrastructure.

With regard to identification of appropriate governance instruments, the presented views of experts speak of complexity of the subject matter. The diversity of views, sometime to the extent of extreme opposition, suggests that no universal rules or ideal roles for the governments in developing open standards based policy are likely to emerge.

## IX. CONTRIBUTIONS, LIMITATIONS AND FURTHER RESEARCH

This work has several important contributions:

1. Given the scarcity of available scholarly literature on the topic of open standards and government policy, the literature review and identification of nine pertinent sets of issues reported in this work contributes to delineation of the emerging topic [Webster and Watson, 2002].
2. Given the under-explored practice in the IS research domain of using multi-method research in general, and the Delphi method in particular, this work contributes to the development of the field [Sawyer 2001, p.180].
3. Given the ongoing debate on how to define and measure the openness of standards [Krechmer 2006; West 2003; West 2006], the presented nine issues can be used as a framework for assessing government practices in developing public ICT infrastructures.
4. Given the novelty of the open standards government rhetoric, this work contributes to the government practice by providing a versatile view on what challenges governments are likely to face in making a step forward from seeing open standards as solely a panacea for interoperability problems [Commission of the European Communities 2003; Commission of the European Communities 2004; Simon 2005] toward an active ICT infrastructure development policy, which promotes, (co-)develops, selects, and adopts open standards as governance instruments.

This work has several limitations and calls for further research. While the Delphi study demonstrated that governments may have a role to play in some issues, it failed to identify a well-defined stakeholder role available for the government to fill. Therefore, further research is needed to address how standards may become a new government field of interest, complementing industry and competition policy—all as political instruments required to cope with challenges and consequences of global ICT revolution.

## X. EPILOGUE

“Excellent.  
One of the rare pieces of academic work that is useful.  
Thank you.”  
(Delphi participant)

Governments have long exercised tradition of appealing to the intellectual vision of academia for decision-supporting expertise. While this research has fallen short of defining concrete open standards governance instruments for ICT infrastructure development, we have reasons to believe that the general directions of future developments of open standards policy and the critical issues on which the course of these developments will hinge were identified in this research and subsequently helped the Danish government assess alternatives in charting policy actions. On June 2 2006, as we were preparing the final report to the agency...

“...the Danish parliament (the Folketing) unanimously adopted Parliamentary Resolution B103 on the use of open standards for software in the public sector. The Resolution instructs the Government to ensure that the public sector's use of information technology, including the use of software, should be based on open standards. A majority of the political parties have made it a condition that the use of open mandatory standards must not involve increased costs to the public sector.

In February 2007, the National IT and Telecom Agency held a consultation on the report 'Use of Open Standards for Software in the Public Sector.' This report recommends that seven software standards should be made mandatory with effect as of 1 January 2008... These are the following sets of standards:

- Standards for data exchange between public authorities (OIOXML)
- Standards for electronic record management (FESD)
- Standards for electronic procurement in the public sector (OIOUBL)
- Standards for digital signatures (OCES)
- Standards for public websites / homepages and accessibility
- Standards for IT security (DS484 - only for the government sector)





- Standards for document exchange (ODF/OOXML)<sup>13</sup>

Now that Denmark has shown the way for an early move in government open standards policy, other governments may follow and this is what has already happened. The Dutch government recently published an action plan for the use of open standards in the public sector. The Dutch took Denmark as a benchmark but made some choices which deviate from the Danish ones: "The Netherlands remains in step with international developments... [following] Denmark and Belgium [as] international leaders..."<sup>14</sup>

## ACKNOWLEDGEMENTS

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*Editor's Note:* The following reference list contains the address of World Wide Web pages. Readers who have the ability to access the Web directly from their computer or are reading the paper on the Web, can gain direct access to these references. Readers are warned, however, that:

1. These links existed as of the date of publication but are not guaranteed to be working thereafter.
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<sup>14</sup> From "The Netherlands in Open Connection – An action plan for the use of open Standards and open Source Software in the public and semi-public sector," <http://appz.ez.nl/publicaties/pdfs/07ET15.pdf>



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## LIST OF ACRONYMS

CEN	European Committee for Standardization (see also SSO, SDO, ESO)
CENLEC	European Committee for Electrotechnical Standardization (see also SSO, SDO, ESO)
EDI	Electronic Data Interchange
ESO	European Standardization Organization (see also SSO, SDO)
EU	European Union
FRAND	Free, Reasonable, And Non-Discriminatory
HW	Hardware
GDP	Gross Domestic Product
GSM	Global System for Mobile communications
ICT	Information and Communication Technologies
II	Information Infrastructure, ICT Infrastructure
IP	Intellectual Property
IPR	Intellectual Property Right
IOS	Inter Organizational System
ISO	International Standardization Organization (see also SSO, SDO)
IT	Information Technology (see also ICT, II)
ITU	International Telecommunications Union (see also SSO, SDO)
OSI	Open System Interconnection (model)
OSTEA	Open Standards and their Early Adoption
R&D	Research and Development
RAND	Reasonable And Non-Discriminatory
SDO	Standards Development Organization (see also SSO, ESO)
SIIT	Standardization and Innovation in Information Technology
SQL	Structured Query Language
SSO	Standards Setting Organization (see also ESO, SDO)
SW	Software
VIS	Vertical Information Systems (standardization)
W3C	World Wide Web Consortium
WTO	World Trade Organization
XBRL	Extensible Businesses Reporting Language
XML	Extensible Markup Language

## APPENDIX 1. LIST OF EXPERTS<sup>15</sup>

Name	Position	Professional experience (past or present)				
		Academia	Industry	Government	SDO	Consultancy
Egyedi, Tineke	Senior Researcher	o				o
Hawkins, Richard	Professor	o				o
Jakobs, Kai	Head of Technical Staff, Chair of Informatik	o				
Krechmer, Ken	Lecturer;	o	o		o	o

<sup>15</sup> Our knowledge of the professional past experiences of the experts is to large extent limited to that advertised in their CVs.

Lyytinen, Kalle	Professor	o	o			o
Simcoe, Timothy S.	Professor	o				o
Spring, Michael	Professor	o				
Øst, Alexander G.	IT Architect	o		o		
Valdo, Taavi	Senior Officer			o		
Cargill, Carl	Director of Standards, SUN Microsystems		o		o	
Pau, Louis-Francois	CTO, Ericsson Networks Division; Professor	o	o	o	o	
Kosanke, Kurt	Member of the IFAC/IFIP Task Force on Architectures for Enterprise Integration		o		o	o
Brown, Peter	Chair, CEN/ISSS eGovernment Focus Group	o	o	o	o	o
de Vries, Henk	Professor	o			o	
Ketchell, John	Director, CEN Pre-standards			o	o	
Isaak, James	IEEE Board of Directors				o	
Chauvel, Yves	Director for European Co-ordination, ETSI				o	
Walsh, Peter	General Manager	o	o		o	o

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**Mogens Kühn Pedersen** is professor at the department of Informatics at the Copenhagen Business School (CBS). His current and past research topics include theory of distributed knowledge management systems and their use in services, including healthcare and construction, and in other industries. They also include studies in digital government (for business), governance of IT, and open source software and standards. Prior to joining CBS as professor and director of the Ph.D. school in Informatics, he was at Roskilde University. He serves as chairman of the Danish Standards' committee S-142/u 34 on document description and processing language, a mirror committee to ISO/JTC1/SC34 (2007-) processing OOXML draft international standard (DIS 29500). He has been an adviser to the Danish Ministry on open standards (2005-6), open source projects (2003-4), advanced eGovernment applications (2003-4), and Open Source Software in eGovernment (2002).

**Henk J. de Vries** is associate professor Standardization at Rotterdam School of Management, Erasmus University in Rotterdam, The Netherlands, Department of Management of Technology and Innovation. His education and research concern standardization from a business point of view. From 1994 until 2003, Henk worked with NEN, Netherlands Standardization Institute, in several jobs, being responsible for R&D during the last period. Since 1994, he has an appointment at the Erasmus University's School of Management and since 2004, he has been working full-time at this university. Henk is author of more than 200 publications, including several books on standardization.

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