Abstract

The Internet offers a model of minimal governance to ensure interoperability. If, as Lawrence Lessig suggests, code is law, then standards bodies are legislative bodies. Pursuing this analogy further, in this paper we examine standards making processes as if these processes were legislative processes. In the end, we suggest that by studying the legislative or standard setting process, some of the characteristics that define a standard or law can be predicted.

Note: This draft represents part of a work in progress. Comments are welcome and should be directed to Charles Vincent charles_vincent@ksg.harvard.edu or Professor Jean Camp jean_camp@ksg.harvard.edu.

Setting Standards:
Looking to the Internet for Models of Governance[1]

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Technically, what the Internet achieves sounds almost oxymoronic: decentralized interoperation[2].

- Sharon Eisner Gillet and Mitchell Kapor
  The Self-Governing Internet

One of the challenges that governments and public sector agencies face as they continue to invest significant resources in the development of information technologies, is how to establish and disseminate technical standards that ensure interoperability and flexibility in a decentralized decision-making environment. Without a centralized body with the authority to dictate standards across political or functional boundaries, how can any organization ensure its systems will be compatible with other systems and open to change/upgrade as standards evolve? As the ultimate experiment in creating interoperable standards in a decentralized decision-making environment, the bodies and processes through which Internet standards are set offer several models that may inform public sector organizations in responding to this challenge.

If, as Lawrence Lessig suggests, code is law, then standards bodies are legislative bodies. Pursuing this analogy further, just as the rules and norms governing a traditional legislative process help shape the laws that are passed, so too, the rules and norms under which standards bodies operate help shape the standards that are produced. In this light, it is important that public sector organizations understand how the rules and norms of these "governing" bodies impact and shape the standards they produce.

[1] This paper is derived from a Reading and Research project undertaken in Fall, 1999.

While there are many different bodies that claim varying degrees of authority in setting standards for interoperability on the Internet, this study will focus on four organizations that serve as "models of governance" for developing standards in a decentralized decision making environment.

- International Telecommunications Union (ITU): The Government Model
- World Wide Web Consortium (W3C): The Commercial Model
- Institute of Electronic and Electrical Engineers (IEEE): The Industry/Interest Group Model
- Internet Engineering Task Force (IETF): The Open Model

By assessing the standard setting processes involved in each of these models, we can predict some of the characteristics that a hypothetical standard produced by each model would possess. We begin this work with a discussion of the democratic implications of each process. We then turn to consider how each model would shape their resultant standards in terms of openness and interoperability.

A. WILL THE STANDARD BE ADOPTED BY GOVERNMENT?

Broadly speaking, if a standard is to be adopted by government, the standard setting process needs to be compatible with the democratic requirements of public sector decision making in that society. In other words, the rules that govern the standards process must be consistent with the degree of transparency, inclusiveness, and accountability required by other decision-making processes in the public sector. Therefore, in assessing each model we need to consider the following questions: (1) Who has a voice in the process? (2) How open or transparent is the standard setting process? and (3) Where does the final authority lie for approving standards? In

[2] Sharon Eisner Gillet and Mitchell Kapor, "The Self-Governing Internet" Coordination by Design," in

considering these questions, however, it is important to keep in mind that they do not lend themselves to a single correct answer. The democratic requirements of public sector decision-making vary both across different political jurisdiction and different situations.

(a) Who has a voice in the process?

Participation in the ITU-T[3] standard setting process is limited to ITU-T membership – namely national governments (members) and select telecommunications companies (sector members).[4] Members and sector members are the only organizations with a direct voice in the standard setting process. Unless called as an expert consultant, non-ITU members do not have an avenue for participation. Since the ITU representatives of member states are also public officials, the general public can voice their opinions and thoughts indirectly through their domestic political process. However, given the distance between the general public and the ITU standards process, this link is tenuous at best.[5]

The IEEE[6] limits participation in the standard setting process to the electrical and electronic engineers that form its membership. In fact, the right to participate in setting standards is considered a benefit of membership. Valuing a diversity of opinion in the standard setting process, the IEEE does invite public sector agencies to become members of the IEEE Standards

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Coordinating the Internet ed. Brian Kahin and James H. Keller (Cambridge, MA: MIT Press, 1997), 6.

[3] The ITU-T is the Telecommunications Standardization Sector of the ITU. Factual information pertaining to the ITU-T was collected at http://www.itu.org unless otherwise noted.

[4] While sector membership is formally controlled by the home national government, there are no instances when a telecommunications company has been denied sector membership.

[5] Valerie Shuman and Richard Jay Soloman also note that the ITU standardization process is highly political. See "Global Interoperability for the NII and ITS: Standards and Policy Challenges." In ***Converging Infrastructures***. Ed. Lewis M. Branscomb and James H. Keller. Cambridge, MA: MIT Press, 1996.

[6] Factual information pertaining to the IEEE was collected at http://www.ieee.org unless otherwise noted.

Association. Nevertheless, participation is still limited to fee-paying members, whether individuals or invited organizations.[7]

Similarly, membership is a requirement for participation in the W3C[8] standard setting process. Membership is open to any organization willing to pay the $US 50, 000 annual membership fee ($US 5000 for government agencies and non-profits), but is dominated by private companies. While the W3C agenda is largely member driven, even members do not tend to participate in the development process itself. The W3C Teams that are responsible for developing standards are composed of the Consortium's technical staff (full- and part-time employees around the globe, though primarily at MIT, INRIA and Keio) along with visiting engineers from Member organizations, consultants and students. Member input is sought primarily through periodic working drafts and through the approval process. The W3C will also publish drafts to seek comments from the public, but this practice is not a required step in the standards process.

In sharp contrast, the IETF[9] standard setting process is open to any interested individual. The IETF does not have a formal membership. Anyone who wishes to participate in the standards process through working group mailing lists and tri-annual meetings is free to do so. Furthermore, since working groups are established from the bottom-up by groups of interested individuals, the direction of the IETF is almost entirely dictated by the participants.[10]

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[7] IEEE membership fees range from $US113.00/year for full members to $US19.00/year for students.
[8] Factual information pertaining to the W3C was collected at http://www.w3c.org unless otherwise noted.
[9] Factual information pertaining to the IETF was collected at http://www.ietf.org unless otherwise noted.
[10] Scott Bradner, "The Internet Engineering Task Force," in ***Opensources: Voices from the Open Source Revolution***, ed. Chris DiBona, Sam Ockman and Mark Stone (Cambridge, MA: O'Reilly and Associates, 1999), 51.

(b) How open or transparent is the standard setting process?

Just as participation in the IETF standard setting process is open to all interested individuals, so too the documents (RFCs), mailing lists, and meetings of the IETF and its working groups are open and accessible to the public.[11] Every step and document in the IETF standards process is open for consideration by participants and observers alike.[12] Since the majority of standards work is done through the mailing lists of working groups, the core of the IETF standards process is completely transparent. Moreover, mailing list archives ensure interested individuals can review the process and thoughts that led to a particular standard or decision.

In practice, the W3C's standards process incorporates some elements that foster openness. For example, the periodic publishing of drafts for public consumption and comment give non-members a window into what the W3C is working on. Besides publishing their research agenda and these periodic drafts, however, the W3C process is entirely insular. The W3C Teams responsible for developing standards do not make the substance of their meetings or debates public, leaving non-members (and many members) without any indication of the path that was taken to arrive at a standard or the reasons behind design and development decisions.

Like the W3C, the research agendas for ITU-T study groups are also published for public consideration.[13] Similarly, official decisions and recommendations to the ITU-T can be found at the ITU web site. Draft recommendations and discussion papers, however, are only available to members and are password protected on the web site. Moreover, there is no record of the

[11] All RFCs and IETF documents can be found at http://www.ietf.org/rfc.html and are available in ASCII format.
[12] The IETF does permit Design Teams to meet without taking minutes.
[13] ITU-T Study Group information can be found at http://www.itu.int/ITU-T/index.html

discussions and debates that occur via email or in the meetings that form the core of the standards development process.

The majority of the IEEE standards process also happens behind closed doors. Whereas members have access to all working documents produced by working groups, these documents are not available to the public at large. Like the ITU standards, those who want to use the standards see nothing of the process that developed them, and are privy only to the final product.

(c) Where does the final authority lie for approving standards?

On the surface, the models do not appear to differ significantly in terms of where final authority lies for approving standards. Each uses a form of working group to develop standards, which are then approved by a review committee. When we consider where these review committees – and in turn the standards – derive their authority, however, the models vary dramatically from a democratic perspective.

The review committee that approves IEEE standards is an appointed body that derives its authority from the IEEE Standards Association (IEEE-SA) Standards Board. While the Standards Board is also a non-elected body, the Board of Governors – who are elected by the IEEE membership – appoints these members. The distance between the Review Committee and any elected body already brings the democratic nature of the decision-making process into question before we consider the fact that the Board of Governors is elected by fee-paying members – a group that is not likely to be representative of the general public.

The ITU-T has a similar approval process to the IEEE-SA, where an appointed review committee derives its authority from a governing board that is elected by the membership. Since the ITU is an international geopolitical body whose members include public officials from 189 nations, the approval process would seem to have some semblance of a democratic foundation. This link, however, is weak when we consider the distance between the review committee and the public. Moreover, with only 189 of the world's 266 countries as members, the ITU cannot even claim to be completely representative of all nations.

Final authority for W3C standards (or recommendations) formally lies with the Director. That said, the Director's decisions are informed by the W3C membership through the W3C Advisory Committee, and specifications are generally accepted by the membership through a formal approval process that focuses on consensus. While the focus on consensus from the entire membership suggests an opportunity to broaden the base of authority, the W3C's membership cannot be considered representative. Dominated by large companies, the W3C only has 390 members.

The IETF motto is "rough consensus and running code." Standards are set through rough consensus and there is no formal voting procedure in working groups. Standards are officially sanctioned by the IESG whose members are appointed based on recommendations from the broader membership, but the "rough consensus" is achieved within the membership of the working group (all interested individuals) when there is running code.

As RFC 2026 (The Internet Standards Process) notes, "an Internet Standard is a specification that is stable and well-understood, is technically competent, has multiple, independent, and

interoperable implementations with substantial operational experience, enjoys significant public support, and is recognizably useful in some or all parts of the Internet."[14] As such, final authority for IETF standards lies with the Internet community and is based on the merits of the standard. If consensus cannot be reached on a proposed standard or if it does not have significant public support, it does not become an Internet Standard.

(d) Summary

As mentioned in the introduction, it is important to keep in mind that these models do not lend themselves to a single correct answer. The democratic requirements of public sector decision-making vary both across different political jurisdiction and situations. Therefore, the "adoptability" of a hypothetical standard produced by any of these models will depend on the government and society in question. However, if the democratic character of a process is measured by the degree of transparency, inclusiveness, and accountability it embodies, the IETF "open model" appears the most democratic. Each of the other models limit participation to members, release only a fraction of their working documents, and give final authority to bodies distant from anything that can be considered the public.

[14] Scott Bradner, "The Internet Standards Process: Revision 3," Updated October 1996, < ftp://ftp.isi.edu/in-notes/rfc2026.txt> (cited 10 January 2000).

B. WHAT WILL THE STANDARD LOOK LIKE?

Having considered the democratic nature of a hypothetical standard produced by each model, we turn now to a discussion of openness and interoperability as qualities or characteristics of a hypothetical standard.

(a) Openness

In the context of this paper, openness refers not to whether the standard is distributed without cost, but to the standard's technical openness. In short, once obtained do users have complete access to the standard's specifications so that they can use it in anyway they want and develop or build something compatible with the standard?

In comparing the four models in question, it is important to reiterate the point that openness does not mean free of charge. Both the ITU and the IEEE charge a fee for the documentation that details the standards they develop. Once purchased, however, the user is free to use ITU and IEEE standards in any way they wish. The user has access to the standard and its specifications, and can use this information to construct systems that are compatible with these standards.

This is not to say that restricting access to standards by charging a fee and maintaining intellectual property rights does not have implications for the standard in question. The fees that the ITU charges for documentation, for example, effectively serve as a barrier to use and adoption by developing nations. Moreover by maintaining intellectual property rights over their standards, the ITU and IEEE licenses stunt the dissemination, and arguably the evolution, of their standards within the Internet community. In fact, some have argued that the driving force

behind the adoption of Internet protocols such as TCP/IP was their open and free availability.[15] The point is, however, that a standard can be open and not free of cost.

The W3C makes the specifications of their standards freely and openly available to users. Going a step further than the IEEE or the ITU, however, W3C standards include running code before they are approved. Therefore, in addition to the raw specifications, users have access to implementations illustrating how the standard can be used in the real world.

The IETF standards process is similarly focused on the need for running code – "to fly before you buy."[16] What each of the other models lacks in terms of technical openness, however, is access to the documents and debates that lead to the final specifications. As noted above, all IETF documents are available over the Internet. This includes both Technical Specifications and Applicability Statements. Combined with mailing list archives and draft papers, these documents give users a more complete understanding of the standard and what it is designed to do. As Bradner stresses, "restricting access to work-in-progress documents makes it harder for implementors to understand what the genesis and rationale is for specific features in the standard, and this can lead to flawed implementations."[17]

(b) Interoperability

A second characteristic to consider is the degree to which a hypothetical standard produced by each of these models would be interoperable with other standards. Without a centralized body with the authority to dictate standards across political or functional boundaries, how can a

[15] Eisner Gillet and Kapor, 8.
[16] Bradner (1999), 51.
[17] ***Ibid***., 52.

government be sure that the system it is building will be compatible with other systems and subject to evolving standards?

The interaction between the IEEE and the IETF offers an interesting case study in the interoperability of standards. The IEEE publishes the 802 family of specifications that define standards for local area networks (LANs) dealing with the physical and data link layers. Since the specifications of these standards are open to those who purchase them, the IETF was able to study them and define new standards that are compatible with the old standards. For example, RFC 1042 defines new standards for how IP datagrams and ARP requests and replies can be transmitted over 802 networks.[18]

By making standards open, each of these models makes it more likely that their standards will be considered by other bodies looking to set standards. As the GSM/CDMA debate highlights, however, openness does not ensure future interoperability. While the ITU-established GSM (Global Standard for Mobiles) standard for digital mobile systems is used throughout Europe, the dominant standard in the Americas is CDMA (Code Division Multiple Access). In fact, including PDC and D-AMPS there are four dominant standards for digital phone systems, none of which are compatible with any of the others.[19] It will be interesting to see whether the ITU is more successful with its IMT-2000 standard for third generation systems (3G).

[18] J. Postel and J. Reynolds, "A Standard for the Transmission of IP Datagrams over IEEE 802 Networks," updated February 1998, ftp://ftp.isi.edu/in-notes/rfc1042.txt (cited 17 December 1999).
[19] ITU Telecom Conference, "Backgrounder:Third Generation Mobile," www.itu.int/telecom-wt-99/homepage.html (cited 24 November 1999).

Table 1: Digital Mobile Standards

Americas	Europe, Africa, Middle East	Asia-Pacific	
		Japan	Others
CDMA	GSM	PDC	GSM
D-AMPS	DCS1800	CDMA	CDMA
PCS1900	DECT	PHS	CT2
CT2, PWT, PACS	CT2		

In terms of interoperability, the W3C's ongoing experience with P3P (Platform for Privacy Preferences) is another example to watch carefully. While industry leaders (and W3C members) such as Microsoft and Netscape appear likely to integrate P3P into their browsers, there is significant criticism of the standard from the Internet community and groups such as the Computer Professionals for Social Responsibility (CPSR).[20] Whether this criticism is enough to either dissuade one/both companies to abandon the standard or give other non-P3P compliant browsers a competitive edge is yet to be seen. Regardless, the P3P experience highlights the risk to interoperability created by the W3C's decision to maintain an insular process dominated by a small number of corporate members. If a standard does not share wide spread support it may not be accepted or adopted by other standards setting organizations.

As Scott Bradner points out, "it is only the standards that meet specific real-world requirements and do well that become true standards in fact as well as in name."[21] With this in mind, the IETF's practice of inviting all interested individuals to participate, and its requirement of multiple independent implementations as well as substantial public support, suggests that IETF standards stand a better chance of becoming standards in fact. By focusing on the merits of a

standard, the IETF process produces standards that are more likely to be accepted and adopted by users. As "standards in fact," other standards organizations are likely to make future standards interoperable.

C. Conclusion

The goal of this paper is not to promote one standards process as the "right" standards process, but to paint a picture of the implications each model would have for a hypothetical standard in a public sector context. If code is law and standards bodies are governing bodies, then the rules and norms under which these bodies operate will shape the laws we live under on the Internet.

As Table 2 summarizes, while there are similarities between them, the four standards processes differ on several fronts. If we interpret these standards processes as models of governance, the differences are especially significant. A government must consider the varying degrees of participation, transparency, and accountability embodied in each model when determining which are acceptable in the context of a democratic society. In addition to democratic adoptability, the choice of standards process has consequences with respect to technical openness and interoperability.

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[20] Computer Professionals for Social Responsibility, "Some Frequently Asked Questions About Data Privacy and P3P," updated 7 November 1999 http://www.cpsr.org/program/privacy/p3p-faq.html (cited 21 December 1999).
[21] Bradner (1999), 47

	ITU	W3C	IEEE	IETF
Participation	❑ National governments and industry reps.	❑ Corporate and academic members	❑ Fee paying Electrical and Electronic Engineers	❑ All Interested Individuals
Transparency	❑ Agenda and Recommend-ations	❑ Agenda and Periodic working drafts	❑ Agenda	❑ All working documents, meetings, and email lists
Authority	❑ Review Committee (*membership)*	❑ Fee-paying members	❑ Review Committee (*membership)*	❑ Review Committee (*rough consensus of Internet community)*
Openness	❑ Open Specs	❑ Open Specs ❑ Open implement-ations	❑ Open Specs	❑ Open Specs ❑ Open Implement-ations ❑ Open Working Documents and Archives
Interoperability	❑ Openness promotes interoper-ability	❑ Openness promotes interoper-ability	❑ Openness promotes interoper-ability	❑ Openness promotes interoper-ability ❑ Based on merits ❑ Inclusive Process ❑ Implement-ations that address real problems

Selected Bibliography

Bradner, S. "The Internet Standards Process: Revision 3." Updated October 1996, ftp://ftp.isi.edu/in-notes/rfc2026.txt (cited 10 January 2000).

Branscomb, Lewis and Keller, James H. **Converging Infrastructures**. Cambridge MA: MIT Press, 1996.

Camp, Jean. **Trust and Risk in Internet Commerce**. October 1999. http://www.ksg.harvard.edu/people/jcamp/trustRisk/book.html (cited October 1999).

Compaine, Benjamin M. **Issues in New Information Technology**. Norwood, NJ: Ablex Publishing, 1988.

DiBona, Chris, Ockman, Sam and Stone, Mark. **Opensources: Voices from the Open Source Revolution**. Cambridge, MA: O'Reilly & Associates, 1999.

ITU Telecom Conference. "Backgrounder:Third Generation Mobile." www.itu.int/telecom-wt-99/homepage.html (cited 24 November 1999).

Kahin, Brian and Keller James H. **Coordinating the Internet**. Cambridge, MA: MIT Press, 1997.

National Research Council, System Security Study Committee. **Computers at Risk**. Washington D.C.: National Academy Press, 1991.

Neumann, Peter G. **Computer-Related Risks**. New York: Addison-Wesley, 1995.

Postel J. and Reynolds J. "A Standard for the Transmission of IP Datagrams over IEEE 802 Networks." updated February 1998, ftp://ftp.isi.edu/in-notes/rfc1042.txt (cited 17 December 1999).