WHY GROWING UP IS HARD TO DO: INSTITUTIONAL CHALLENGES FOR INTERNET GOVERNANCE IN THE "QUARTER-LIFE CRISIS" OF THE DIGITAL REVOLUTION

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I. INTRODUCTION

A. The Quarter-life Crises of Industrial Revolutions

The popular press tends to mark the birthdays and anniversaries of innovations and products by the date at which they became widely available to the general public. While this standard is never precise and there is a flow of inventions before commercialization, it is a useful benchmark for measuring social change. By that standard there is no doubt that the early years of the 21st century are a key period for the digital revolution and its most important manifestation, the Internet. The adolescence of the Internet is ending, which is typically marked by the shouldering of new, adult responsibilities. In humans it has come to be called the quarter-life crisis.

The **quarter-life crisis** is a period of life following the major changes of adolescence, usually ranging from the late teens to the early thirties, in which a person begins to feel doubtful about their own lives [sic], brought on by the stress of becoming an adult. The term was coined by analogy with mid-life crisis.[1]

The web celebrated its 20th birthday in 2011[2] and the PC its 30th.[3] The age of the Internet is also in the range of 20-30 years.[4] The Internet Society,[5] which houses the key bodies that set policy for the Internet, turned 20 in 2012. Search engines, which provide a critical function for navigating the vastness of cyberspace, are about 15 years old.[6] Broadband Internet service is in the same age range.[7] Using the dating technique of initial widespread commercial availability to calculate the age of wireless technologies that are playing an increasingly important role in the digital revolution we reach the same conclusion. In 2012, U.S. cellular service is about 30 years old[8] and Wi-Fi is about 20.[9]

To be a true quarter-life crisis, the life expectancy of the digital revolution would have to be about a

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* *Journal on Telecommunications and High Technology Law,* 11:1 (2013).

1 *Quarter-life crisis*, WIKIPEDIA, http://en.wikipedia.org/wiki/Quarter-life_crisis (last modified Aug. 19, 2012, 10:16 PM). Given that this paper is about an advance in the generation and distribution of knowledge that may prove to be among the great economic revolutions in human history, this paper relies, to the greatest extent possible, on sources that are readily available on the Web (i.e. not behind pay walls). Since the primary purposes of citations are to allow the reader to check facts, evaluate interpretations, and add to the body of knowledge by reinterpretation and extension (remixing), the ability to make sources instantaneously available is a symbolic marker of how much has been accomplished by the digital revolution. The fact that Wikipedia, a new form of collaborative knowledge enterprise, is the most frequent single source for this paper reinforces this message, as does the fact that Wikipedia provides many live links to available resources.

2. Julia Felsenthal, Heather Murphy & Chris Wilson, *Happy 20th Birthday, World Wide Web!*, SLATE (Aug. 5, 2011, 5:54 PM), http://www.slate.com/slideshows/business _and_tech/happy-20th-birthday-world-wide-web.html; *World Wide Web*, WIKIPEDIA, http://en.wikipedia.org/wiki/World_Wide_Web (last modified Sept. 30, 2012, 7:51 AM).

3. Chloe Albanesius, *On Eve of PC's 30th Birthday, IBM and Microsoft Debate Its Future*, PC MAG.COM (Aug. 11, 2011, 11:06 AM), http://www.pcmag.com/ article2/0,2817,2390897,00.asp; *Personal computer*, WIKIPEDIA, http://en.wikipedia.org/wiki/ Personal_computer (last modified Sept. 28, 2012, 6:04 PM).

4. The Internet protocol is over 40 years old. The first actual network of networks is 25 years old, and the first commercial network to join the network of networks did so 23 years ago, all of which makes the point that the adolescence of the Internet is over. *Internet*, WIKIPEDIA, http://en.wikipedia.org/wiki/Internet (last modified Sept. 25, 2012, 4:06 PM).

5. *Internet Society*, WIKIPEDIA, http://en.wikipedia.org/wiki/Internet_Society (last modified Oct. 1, 2012, 3:14 AM).

6. *History of Google*, WIKIPEDIA, http://en.wikipedia.org/wiki/History_of_Google (last modified Sept. 30, 2012, 12:43 PM).

7. *Broadband*, WIKIPEDIA, http://en.wikipedia.org/wiki/Broadband (last modified Sept. 29, 2012, 10:11 PM); *DOCSIS*, WIKIPEDIA, http://en.wikipedia.org/wiki/DOCSIS, (last modified Sept. 25, 2012, 11:06 PM).

8. *Mobile phone*, WIKIPEDIA, http://en.wikipedia.org/wiki/Mobile_phone (last modified Sept. 30, 2012, 5:14 PM).

9. *Wi-Fi*, WIKIPEDIA, http://en.wikipedia.org/wiki/Wi-Fi (last modified Sept. 29, 2012, 2:53 PM).

century,[10] as proved to be the case for the first two industrial revolutions (see Figure 1-1), but the math is less important than the fact that the digital revolution is confronted with a broad range of maturation challenges in terms of new issues and concerns that are pressing on its future.

As the discussion below shows, the maturation challenges confronting the Internet cover a host of issues, including concerns about

- the central technologies that underlie the revolution (e.g., Internet governance, communications network management, cyber security),
- the economy (e.g., antitrust, consumer protection, intellectual property),
- social issues (e.g., universal service, privacy, personal security), and
- the polity (e.g., free speech, surveillance).

As suggested in Figure I-1, it can be argued that the 1st and 2nd industrial revolutions also went through similar quarter-life crises as new social institutions were developed to ensure that the emerging mode of economic production serves the broader goals of society. However, it also can be argued the quarter-life crisis of the digital revolution promises to be particularly challenging because the digital revolution involves a uniquely powerful and dynamic set of changes.[11] These changes include:

- the unique, decentralized nature of the Internet as a communications medium;
- the speed with which changes are taking place;
- the central role that communications play in modern economies;
- the scale and scope of change that is having a pervasive impact on many aspects of daily life; and
- the fundamental importance of many of the values affected.

Confronted with a challenge of this magnitude, and having a set of fully developed institutions in hand, there is a tendency to assume, or hope that "old law maps to new interactions."[12] The old law we have today was defined by the maturation challenges of the 2nd industrial revolution, which makes many of the institutions over a hundred years old.[13] Because they are old does not necessarily mean they are outdated, and it certainly does not mean the values they express and seek to implement are no longer valid; it does mean they will be challenged to change.[14] Here, too, it can be argued that the quarter-life crisis of the digital revolution is likely to pose major challenges to the existing social institutions that can be expected to be called on as the vehicles for addressing the challenges (asserting authority) for a number of reasons:

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10. The quarter life calculation assumes a life span of a century, which is a reasonable historical period in which a technological revolution will be paramount before it is replaced by another. Thus, the "start" of the first industrial revolution is dated from the mid- to late 1700s, the second industrial revolution dates from the mid- to late 1800s, and the Internet from the mid- to late 1900s. *Industrial Revolution*, WIKIPEDIA, http://en.wikipedia.org /wiki/Industrial_Revolution (last modified Sept. 28, 2012, 4:30 PM).

11. Comparing general purpose technologies can be misleading, especially when one is only just reaching maturity, but the evidence on information technologies supports the conclusion that the technologies are spreading quickly and evolving rapidly in terms of price declines, which have traditionally been a major measure of impact. The technologies on which the Internet is based are probably moving faster than the overall IT sector. Boyan Jovanovic & Peter L. Rousseau, *General Purpose Technologies*, *in* HANDBOOK OF ECONOMIC GROWTH 1181, 1182 (Philippe Aghion & Steven N. Durlauf eds., 2005).

12. This observation was offered in an article reporting a (rare) criminal case involving personal security on the Internet. Somini Sengupta, *Case of 8,000 Menacing Posts Tests Limits of Twitter Speech*, N.Y. TIMES, Aug. 27, 2011, at A1 (internal quotation marks omitted), *available at* http://www.nytimes.com/2011/08/27/technology/man-accused-of-stalking-via-twitter-claims-free-speech.html.

13. Much of the structure was put in place during the Progressive Era, which is generally dated from the 1890s, *Progressive Era*, WIKIPEDIA, http://en.wikipedia.org/wiki/Progressive_Era, (last modified Sept. 29, 2012, 9:39 PM), although the New Deal updated and extended the institutional structure. *New Deal*, WIKIPEDIA, http://en.wikipedia.org/wiki/New_Deal, (last modified Sept. 30, 2012, 10:41 PM).

14. Each of the industrial revolutions "stand[s] on the shoulders of giants," i.e. the previous industrial revolution. *Standing on the shoulders of giants*, WIKIPEDIA, http://en.wikipedia.org/wiki/Standing_on_the_shoulders_of_giants (last modified Sept. 27, 2012, 11:34 PM). But each needs a new set of institutions to support the larger structure. Economist Douglass North uses the construction metaphor "scaffolding" to describe the institution building process. DOUGLASS NORTH, UNDERSTANDING THE PROCESS OF ECONOMIC CHANGE ix, 52 (2005). It is interesting to note that the expression dates from the 12th century, early in what North refers to as the second economic revolution – a revolution based on knowledge. *Id.* at 87.

- a lack of clear lines of authority stemming from the transnational nature of the communications;
- concern that institutions that move slowly and rely on rigid rules will have difficulty addressing the challenges without undermining the economic engine at the core of the new communications system that thrives on diversity and dynamic innovation; and
- a decline in the general legitimacy and capacity of the incumbent political institutions.

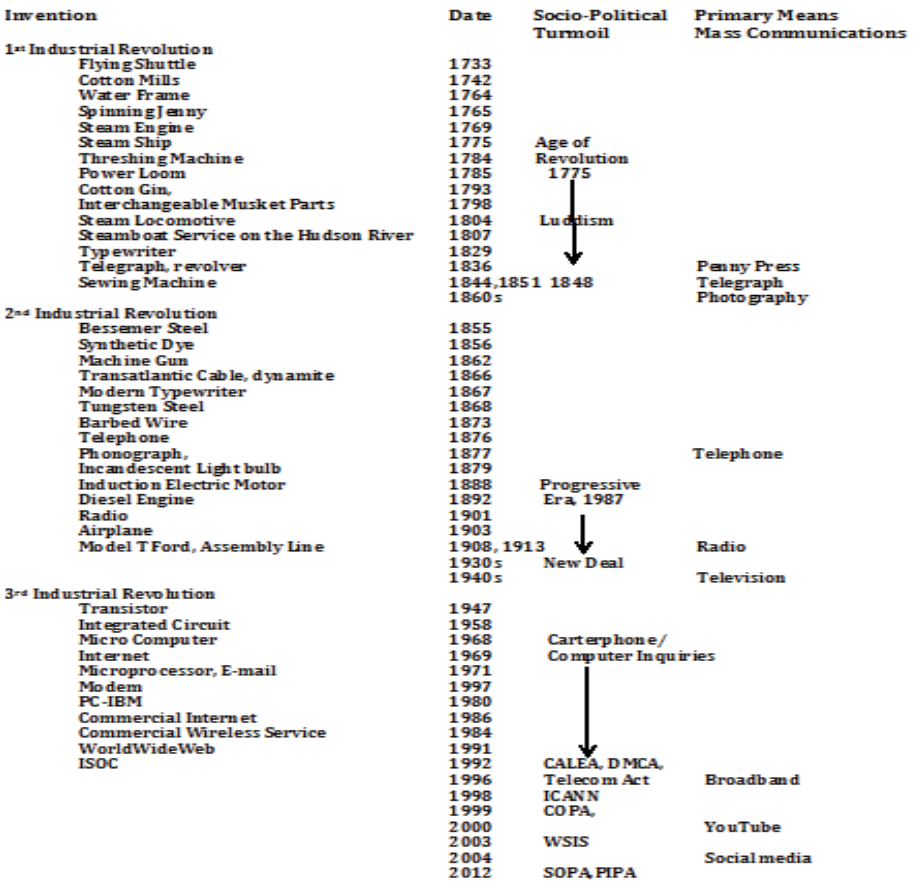

FIGURE I-1: LIFE CYCLE OF INDUSTRIAL REVOLUTIONS[15]

B. Purpose and Outline

This paper presents a comprehensive framework for analyzing the quarter-life crisis of the digital revolution with a focus on the Internet as an important (perhaps the most important) resource system at the heart of the digital economy. The way the Internet supports the flow of communications plays a key role in the remarkable success of the digital revolution. The institutions that manage the development and operation of the Internet as a resource system are unique in many respects and have come under pressure as the digital revolution and the Internet mature. The ultimate objective of the paper is to gain insight into how the governance institutions can **adapt** to the demands of the quarter-life crisis.

I choose the word **adapt** purposely, rather than reform, because reform is frequently associated with some sort of failure – "**Reform** means the improvement or amendment of what is wrong, corrupt,

15. Various Wikipedia entries; Bradford R. Smith, *The Third Industrial Revolution: Policymaking for the Internet*, 3 COLUM. SCI. & TECH. L. REV. 1 (2001).

unsatisfactory."[16] The characterization grounded in failure does not apply as a general proposition to the Internet and the digital revolution. This is a case where the need for change derives from remarkable success, not failure, because the dramatic growth of the resource system strains its own governance institutions and because the resource system has expanded so rapidly and penetrated so deeply into so many aspects of social life that it is having a huge impact on society. The fact that the driving force for change is a broad pattern of success, rather than failure, does not make it less urgent, but it does create a somewhat different orientation than reform driven by failure – the challenge of preserving and extending what is working well is prominent, if not paramount.

The analysis covers three levels—resource system (Sections II and III), socio-ecological setting (Section IV and V), and governance institutions (Section VI and VII). The Internet governance debate has come to include all three of these levels, with social policy issues taking center stage. The extent to which the social policy issues can be separated from the resource system issues is hotly debated. This paper argues that doing so is important because preserving the technical basis of success is so important.

Section II presents an analytic framework I call new institutional analysis to explain the success of the Internet as a "focal core resource system" in the 21st century economy. It develops the framework by combining concepts from the Institutional Analysis and Development (IAD) framework of Elinor Ostrom[17] with New Institutional Economics (NIE) offered by Douglass North.[18] By identifying the aspects of the resource system that combined to create its success, the institutional analysis is a useful tool for understanding how the unintended consequences of success create internal pressures for change, in addition to outlining the ways in which the socio-ecological setting places demands on the resource system. Several leading Internet analysts approach the Internet governance debate from the point of view of network theory.[19] I argue that the network framework is virtually identical to the new institutional analysis of a resource system. I prefer the latter because of the very rich set of analytic concepts and proposition that have been built up from a long and large body of empirical analysis.

Section III discusses the speed and scope of growth of performance of the Internet in the context of the digital revolution. The penetration of communications technologies and the increase in usage are the primary measures. It identifies several key pressure points for change within the resource system.

Section IV presents an analytic framework for assessing the demands that the socio-ecological setting places on the Internet resource system. It argues that there are four realms of social structure—technology, economy, socio-cultural, and the polity—that are fundamentally different in nature, giving rise to different maturation challenges. It examines examples of the maturation challenges from two perspectives to provide detail and context for the discussion of Internet governance. First, it identifies the issues that fill the international debate over Internet governance.[20] Second, it offers a U.S. perspective through the debate over the "end of the public switched telephone network," in part because the telecommunications network was and still is an essential, complementary resources system with a close relationship to the Internet.[21]

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16. *Reform*, WIKIPEDIA, http://en.wikipedia.org/wiki/Reform (last modified Sept. 19, 2012, 9:24 PM).

17. Ostrom's body of work is huge; her Nobel Laureate lecture provides a summary. Elinor Ostrom, Prize Lecture: Beyond Markets and States: Polycentric Governance of Complex Economic Systems (Dec. 8, 2009), *available at* http://www.nobelprize.org/nobel_prizes/economics/laureates/2009/ostrom_lecture.pdf.

18. North's body of work is huge; his Nobel Laureate lecture provides a summary, although he has continued to add to this body for well over a decade. Douglass North, Prize Lecture: Economic Performance through Time (Dec. 9, 1993), *available at* http://www.nobelprize.org/nobel_prizes/economics/laureates/1993/north-lecture.html.

19. *See, e.g.*, MILTON L. MUELLER, NETWORKS AND STATES: THE GLOBAL POLITICS OF INTERNET GOVERNANCE (2010); ELENA PAVAN, FRAMES AND CONNECTIONS IN THE GOVERNANCE OF GLOBAL COMMUNICATIONS: A NETWORK STUDY OF THE INTERNET GOVERNANCE FORUM (2012).

20. *See, e.g.*, Communiqué on Principles for Internet Policy-Making, Org. for Econ. Cooperation & Dev. [OECD], High Level Meeting: The Internet Economy: Generating Innovation and Growth (June 28-29, 2011), http://www.oecd.org/internet/innovation/48289796.pdf; Report of the Working Group on Internet Governance, Internet Governance Forum [IGF], Meeting of the Working Group on Internet Governance (June 2005), http://www.wgig.org/docs/WGIGREPORT.pdf; Code of Ethics for the Information Society Proposed by the Intergovernmental Council of the Information for All Programme (IFAP), UNESCO, General Conference: 36th Session (Oct. 10, 2011), http://unesdoc.unesco.org/images/0021/002126/212696e.pdf.

21. Mark Cooper, Statement at FCC Workshop: The Public Switched Telephone Network in Transition (December 14, 2011),

Section V identifies the key dilemmas that confront the resources system in responding to the demands for change from the socio-ecological setting of the system.

Section II-V provide considerable support for the proposition that the maturation challenges are numerous and substantial and that adaptation of existing institutions is the preferable approach to balancing the goal of preserving the dynamic Internet resource system while ensuring it effectively shoulders its adult responsibilities. Section VI and VII examine possible responses to the challenges.

Section VI presents high-level principles to guide the adaptation of Internet governance. It discusses the support for multi-stakeholder approaches as the widely supported institution for responding to the maturation challenges. It then presents a review of the literature of regulatory reform, which highlights the failure of the discussion of regulatory reform to give adequate attention to participation in the governance process.

Section VII makes the case for "participatory governance" as an institutional response to the need for a 21st century governance institution to guide the digital revolution. It argues that "participatory governance," is an approach that recognizes the declining ability and value of governmental agency oversight over the complex, dynamic and global activities of the digital economy, while asserting that civil society and economic actors can be mobilized to fill the gap that is developing between the need for oversight and the inability of the state to provide it. Extending the finding that the Internet thrived because it was located between the market and the state, Section G argues that the very factors that are making it difficult for the state to oversee economic activity in the digital economy—dynamic technological change on a global scale—also make it possible to increase direct public involvement in the process of overseeing these sectors because of the dramatically increased ability of the public to communicate and organize for collective action.

II. THE SUCCESS OF THE INTERNET AS A FOCAL CORE RESOURCE SYSTEM IN THE DIGITAL ECONOMY

A. The Success of the Internet Resource System

1. New Institutional Analysis

In this section, I describe the success of the Internet as a resource system in the context of an overall analytic framework that can be described as new institutional analysis. I argue that North and Ostrom analyze the creation, evolution, and adaptation of social institutions and social processes with similar concepts from opposite points of view.[22] North analyzes the issue from the macro level of political, economic, and social institutions focusing on the economic performance of societies across long periods of time.[23] Ostrom analyzes the issue from the micro-level performance of specific resource systems, which are embedded in social, economic, and political settings.[24] Combining the two we have not only a complete

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available at http://www.fcc.gov/events/public-switched-telephone-network-transition-0 (beginning at 79:20); *see also Public switched telephone network*, WIKIPEDIA, http://en.wikipedia.org/wiki/Public_switched_telephone_network (last modified Sept. 28, 2012, 5:46 AM).

22. The compatibility between these two schools of thought is underscored by the fact that the first person Ostrom cites in her Nobel Prize lecture is Douglass North. *See* Ostrom, *supra* note 17, at 408.

23. North, *supra* note 18, ¶¶ 3-4 ("This essay is about institutions and time. It . . . provides the initial scaffolding of an analytical framework capable of increasing our understanding of the historical evolution of economies and a necessarily crude guide to policy in the ongoing task of improving the economic performance of economies . . . . Institutions form the incentive structure of a society and the political and economic institutions, in consequence, are the underlying determinant of economic performance. Time as it relates to economic and societal change is the dimension in which the learning process of human beings shapes the way institutions evolve . . . . ").

24. Ostrom, *supra* note 17, at 432 (referring to the level at which most IAD analysis has been conducted as the "[m]icrosituational level of analysis.") The elements that constitute the analytic framework are microlevel detail. "To specify the structure of a game and predict outcomes, the theorist needs to posit the: 1. characteristics of the actors involved (including the models of human choice adopted by the theorist); 2. positions they hold (e.g. first mover or row player); 3. set of actions that actors can take at specific nodes in a decision tree; 4. amount of information available at a decision node; 5. outcomes that actors jointly affect; 6. set of functions that map actors and actions at decision nodes into intermediate or final outcomes; and 7. Benefits and costs assigned to the linkage of actions chosen and outcomes obtained." *Id*. at 415. This description of the analytic questions leads to seven types of operational rules.)

conceptual framework but also a rich set of methodological tools for empirical analysis.

My goal is not to present a comprehensive account and reconciliation of the work of Ostrom and North. Rather, it is to extract the elements from these very large bodies of work that shed light on why the Internet has been so successful as an institution and what this teaches us about the direction of change that should be followed as it adapts to its maturation challenges.

To appreciate the value of putting the effort into this conceptual framing, I start with the observation that Elinor Ostrom's Nobel Prize Lecture, entitled "Beyond Markets and States: Polycentric Governance of Complex Economic Systems,"[25] describes the current state of the IAD framework as "developing a more general theory of individual choice that recognizes the central role of trust in coping with social dilemmas."[26] In fact, one of the articles she cites as capturing the recent developments of IAD argues that "it has become clear that the real 'glue' that keeps an institution alive over time are the social mechanisms, i.e. trust, legitimacy, and transparency."[27]

The policy challenges that Ostrom derives from her work on resource systems are the challenges that Internet governance faces.

> Extensive empirical research leads me to argue. . . a core goal of public policy should be to facilitate the development of institutions that bring out the best in humans. We need to ask how diverse polycentric institutions help or hinder the innovativeness, learning, adapting, trustworthiness, levels of cooperation of participants, and the achievement of more effective, equitable, and sustainable outcomes at multiple scales.[28]

This statement of the real-world challenge of building institutions to create cooperation in the face of a social dilemma fits the ongoing debate about Internet governance perfectly. The search for polycentric modes of governance that fall between the market and the state where a community self-organizes to build institutions based on trust, legitimacy, and transparency is the search for the holy grail of Internet governance.

Douglass North's framing of the purpose and focus of New Institutional Economics is very similar in spirit and substance.

> Institutions provide the basic structure by which human beings throughout history have created order and attempted to reduce uncertainty in exchange. Together with the technology employed, they determine transaction and transformation costs and hence the profitability and feasibility of engaging in economic activity. . .
>
> There is a different, and I think, better story. It concerns the endless struggle of human beings to solve the problems of cooperation so that they may reap the advantages not only of technology, but also of all the other facets of human endeavor that constitute civilization.[29]
>
> Institutions form the incentive structure of a society and the political and economic institutions, in consequence, are the underlying determinant of economic performance. Time as it relates to economic and societal change is the dimension in which the learning process of human beings shapes the way institutions evolve. That is, the beliefs that individuals, groups, and societies hold which determine choices are a consequence of learning through time. . . .[30]

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25. Ostrom, *supra* note 17, at 408.
26. *Id.* at 409.
27. Michael Cox, Gwen Arnold & Sergio Villamayor Tomás, *A Review of Design Principles for Community-Based Natural Resource Management*, ECOLOGY & SOC'Y, Dec. 2010, Art. 38 at 12 (2010) (*quoting* Ingvild Harkes, Fisheries Co-Management, the Role of Local Institutions and Decentralization in Southeast Asia (May 15, 2006) (unpublished Ph.D. thesis, Leiden University), *available at* https://openaccess.leidenuniv.nl/bitstream/handle/1887/4385/Thesis.pdf) (internal quotation marks omitted).
28. Ostrom, *supra* note 17, at 435-36.
4129. DOUGLASS NORTH, INSTITUTIONS, INSTITUTIONAL CHANGE AND ECONOMIC PERFORMANCE 118, 133 (1990).
30. North, *supra* note 18, ¶ 4.

2. The Conditions for the Institutional Success of the Internet

The usefulness of the analytic framework goes beyond the fact that the central institutional problem it identifies fits the current Internet governance debate well. The "clear set of findings" that are the basis for the generalizations that IAD offers to explain successful institutionalization of a resource system provides a remarkably precise understanding of why the Internet succeeded as a "focal core resource system." As shown in Table II-1, a good case can be made that the Internet possessed most, if not all, of the empirically identified characteristics that make for successful cooperation to deal with a social/economic dilemma.

RULES, FUNCTIONS & INFLUENCES	DESIGN PRINCIPLES	FAVORABLE CONDITIONS
Structure and Units		
Boundary Rules Position Rules	Clarity of Membership Clarity of Resource Congruence between Membership & Resource	Size of resource system: Very large territories are unlikely to self-organize given the high cost of defining boundaries ... monitoring use patterns and gaining ecological knowledge. Very small territories do not generate substantial flows of valuable products. Thus, moderate size is most conducive to self-organization.
Control Appropriation Rules Provision Rules	Fair, orderly, efficient Incentive to contribute Reflect local conditions and be congruent	Predictability of system dynamics: System dynamics need to be sufficiently predictable that users can estimate what would happen if they were to particular rules or no entry territories.
Users and Uses		
Collective Choice	Participation Power to act	When users ... have full autonomy at the collective choice level to craft their own rules, they face lower transactions costs as well as lower costs in defending a resource against invasion by others. When some users of any type of resource system have entrepreneurial skill and are respected as local leaders as result of prior organization for other purposes, self- organization is more likely.
Payoff	Cost/Benefit	Users need to observe some scarcity before they invest in self-organization. Distribution of costs is proportional to benefits.
Governance		
Monitoring	Present Community Professional Monitor appropriation & condition of the resource	Due to the cost of observing and managing a system, self-organization is less likely with mobile resources. Group size is always relevant, but its effect on self-organization depends on other variables and the types of management tasks envisioned. Norms/social capital: Users of all types of resource systems who share moral and ethical standards regarding how to behave in groups they form, and thus the norms of reciprocity, and sufficient trust in one another to keep agreements will face lower transaction costs in reaching agreements and lower costs of monitoring.
Enforcement	Graduated response Accountable	Rapid, low cost arenas to resolve conflicts
Information:	Local Knowledge Flow for monitoring	When users share common knowledge of relevant system attributes, how their actions affect each other, and rules use in other systems, they will perceive lower costs of organizing.
Socio-ecological Setting		
External Drivers	Government Recognition of rights to organize	The long term sustainability of rules devised at a focal level depends on monitoring and enforcements as well as their not being overruled by larger government policies... Larger scale governance systems may either facilitate or destroy governance systems at a focal level.
	Economics	Market integration may effectively remove control of a resource from a user group... external integration alters local incentives, frequently by decreasing dependence on the resource used by a community... when members are not as dependent on the resource, their welfare is not as strongly tied to cooperative behavior.
	Nested enterprise	When a resource is connected to a larger socio-ecological system, governance activities are organized in multiple, nested layers. Establishing rules at one level, without rules at the other levels will produce an incomplete system that may not endure over the long term.

TABLE II-1: RESOURCE SYSTEM CHARACTERISTICS CONDUCIVE TO THE INTERNET'S SUCCESS[31]

In the beginning and for a significant period of development, the architects and users of the Internet were a fairly small, homogeneous set of engineers who shared norms, values, and a pragmatic problem-

31. ELINOR OSTROM, UNDERSTANDING INSTITUTIONAL DIVERSITY 259 (2005); Cox et al., *supra* note 27, at 15; Ostrom, *supra* note 17, at 422.

solving world-view. The perceived benefits expected from cooperation were quite large and non-commercial. The essential principle of the Internet was to allow local autonomy around a core set of communications protocols. The protocols were designed to resolve conflicts over resources in a low-cost manner (best effort, with the end-points responsible for dealing with the quality of output). The nature of the users and the resources system made it "easy" to decentralize decision-making and rely on distributed knowledge and assets to build the system.

These characteristics of the Internet resource system were reinforced by an external environment that was supportive. The most important external actor, the government, spawned the idea in the first place.[32] The Federal Communications Commission (FCC), which had regulatory authority over a closely related, essential complementary resource system on which the Internet was dependent, also made key decisions that supported the growth of an autonomous, decentralized resource system.[33] The Internet would not have functioned beyond a minimal scale without access to a key, related external resource system – the telecommunications network – that was the focal core communications resource system of the 2nd industrial revolution. The FCC instituted key policy decisions that forced the dominant incumbents in the telecommunications resource system to leave the Internet alone,[34] enabling the Internet to develop according to a radically different set of design and governance principles, while utilizing the existing communications resource system. I will elaborate on the importance of this point for the current debate over Internet governance in Section IV.

An important implication of these observations is that the unintended consequences of dramatic success can alter the internal and external relations of the resource system so much that the original conditions of success are no longer obtained. Thus, even a successful resource system must be able to adapt to change. Over the course of the youth and adolescence of the Internet resource system, its remarkable success transformed almost every one of those conditions. We now have a large number of much more diverse users spread over a vast geographic space creating an exaflood of much more complex and heterogeneous outputs. The complexity and heterogeneity challenge the predictability. Diversity reduces the sharing of norms. The expansion of the Internet as a communications resource system brings it into conflict with the telecommunications resource system on which it depended for its success. Commercialization changes the motivations of actors and their willingness to cooperate, leading some commercial interest to seek to completely overturn the constraint on telecommunications resource behavior that the FCC imposed.[35]

Challenges to predictability, norms, and cooperation trigger a search for new or "better" management mechanisms. Given the tendency to try to fit new relations into old laws, we should not be surprised to find many policy advocates turning to the state or the market to address the challenges. Yet, in significant measure the Internet succeeded because it was between the state and the market, utilizing tools from each to build a dynamic resource system based on a radically different communications principle.

B. The Basic Elements of Institutional Analysis

1. Building Success between the Market and the State

Both North and Ostrom locate their analytic frameworks between the market and the state based on a similar critique of neoclassic economic analysis and its overreliance on markets as the answer to every

32. *See generally* JANET ABBATE, INVENTING THE INTERNET (1999).

33. Robert Cannon, *The Legacy of the Federal Communications Commission's Computer Inquiries,* 55 FED. COMM. L.J.. 167, 169 (2003).

34. Lessig puts it bluntly: "Phone companies, however, did not play these games, because they were not allowed to. And they were not allowed to because regulators stopped them." LAWRENCE LESSIG, THE FUTURE OF IDEAS: THE FATE OF THE COMMONS IN A CONNECTED WORLD 148 (2001).

35. For a detailed outline of this conflict, *see* OPEN ARCHITECTURE AS COMMUNICATIONS POLICY: PRESERVING INTERNET FREEDOM IN THE BROADBAND ERA (Mark Cooper ed., 2003), http://cyberlaw.stanford.edu/attachments/openarchitecture.pdf

question and/or the solution to every problem. [36] Indeed, these two Nobel laureates provide the bookends for over a decade of Nobel prizes in economics that were given to scholars who demonstrated that the neoclassical approach to economics that dominated much of the 20th century was far too narrow.

Each framework argues that neoclassical economic analysis is so severely limited by its assumptions as to be restricted in its usefulness and counterproductive in the search for knowledge about change and stability across time. They identify a series of important situations/challenges that are not well suited to simple market solutions. Their analyses demonstrate that humans have much greater deliberative capacity and intentional ability to build organizations and institutions to meet economic challenges, so the resulting reality of economic life is far more complex than neoclassic theory admits.

The two frameworks share a similar schizophrenia about government. They are leery of government solutions from above/outside. External mandates have a tendency to make matters worse, not better, either because the outsiders do not have the necessary local knowledge to understand how to make the resource system work (and are too arrogant to ask) or because their interests are different from the local interests. However, both frameworks also recognize that meeting the challenge of building institutions/organization to solve economic problems requires supportive government action at some level, and the larger and more complex the resource system, the greater the need for governmental policy support.[37]

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36. *See, e.g.*, AMY R. POTEETE, MARCO A. JANSSEN & ELINOR OSTROM, WORKING TOGETHER: COLLECTIVE ACTION, THE COMMONS AND MULTIPLE METHODS IN PRACTICE 217, 218, 220-22 (2010) ("The conventional theory was pristine in the simplicity of its model of human behavior but made strong assumptions about information conditions. Individuals are assumed to have complete information about the structure of the situation they are in, including the preferences of other actors, the full range of possible actions, and the probability associated with each outcome resulting from a combination of actions. Each individual is assumed to select the strategy leading to the best expected outcome for self. . . . Based on the conventional theory, many analysts thought that the *only* way to solve the commons problem was to impose a solution from the outside. Fortunately, scholars who conducted case studies of diverse resource systems all over the world were not blinded by the conventional theory. . . . The clear and unambiguous predictions derived from the conventional theory of collective action have been replaced with a range of possible outcomes, including some that are far more optimistic. . . . We need to recognize that what has come to be called rational-choice *theory* is instead one *model* in a family of models that is useful for conducting formal analyses of human decision in highly structured, competitive settings. . . . A broader theory of human behavior views humans as adaptive creatures who attempt to do well given the constraints and opportunities of the situation in which they find themselves (or the ones they seek out). Humans learn norms, heuristics, and full analytic strategies from one another, from feedback from the world, and from their own capacity to engage in self-reflection and imagine a differently structured world. They are capable of designing new tools—including institutions—that can, for good or evil purposes, change the structure of the worlds they face. . . . If, as we assume, decision making relies on learning and adaptation, other-regarding preferences and norms, and heuristics, then trust can play a central role in influencing the prospects for collective action.") (citation omitted). *See also* NORTH, *supra* note 15, at 5, 65 ("The rationality assumption has served economists (and other social scientists) well for a limited range of issues in micro theory but is a shortcoming in dealing with the issues central to this study. Indeed the uncritical acceptance of the rationality assumption is devastating for most of the major issues confronting social scientists and is a major stumbling block in the path of future progress. The rationality assumption is not wrong, but such an acceptance forecloses a deeper understanding of the decision-making process in confronting the uncertainties of the complex world we have created. . . . Neo-classical economic theory provides an understanding of the operation of markets in developed economies but was never intended to explain how markets and overall economies evolved. It has three fundamental deficiencies which must be overcome to understand the process of economic change. It is frictionless, it is static, and it does not take into account human intentionality.") (footnote omitted); NORTH, *supra* note 29, at 111, 112 ("There is in economics a (largely) implicit assumption that the actors can correctly identify the reason for their predicaments (i.e., have *true* theories), know the costs and benefits of . . . choices, and know how to act upon them. Our preoccupation with rational choice and efficient market hypotheses has blinded us to the implications of incomplete information and the complexity of environments and subjective perceptions of the external world that individuals hold. There is nothing the matter with the rational actor paradigm that could not be cured by a healthy awareness of the complexity of human motivation and the problems that arise from information processing. Social scientists would then understand not only why institutions exist, but also how they influence outcomes. . . . Integrating institutional analysis into *static* neoclassical theory entails modifying the exiting body of theory. . . . Path dependence is the key to an analytic understanding of long-run economic change. . . . [I]t extends the most constructive building blocks of neoclassical theory—both the scarcity/competition postulate and incentives as the driving force—but modifies that theory by incorporating incomplete information and subjective models of *reality* and the increasing returns characteristic of institutions. The result is an approach that offers the promise of connecting microlevel economic activity with the macrolevel incentives provided by the institutional framework. The source of incremental change is the gains to be obtained by organizations and their entrepreneurs from acquiring skills, knowledge, and information that will enhance their objectives." *Id.* at 112.) (internal citation omitted).

37. NORTH, *supra* note 15, at 122, 132-33 ("Economists of a libertarian persuasion have for some time labored under the delusion that there is something called laissez faire and that once there are in place 'efficient' property rights and the rule of law the economy will perform well without further adjustment. . . . Transaction costs—here measurement and enforcement costs—will vary in each case; in order to reduce such costs there must be an institutional structure that will provide incentives for the players to compete at those margins, and those margins alone, that will be socially productive. Typically this entails a set of formal (usually a mixture of laws, rules, and

North's description of how and when the supportive decisions of the state can provide critical support, rare as it is, identifies a pattern of action that I argue typified the behavior of the state in the context of the birth and youth of the Internet.

> In rare cases the government designs and enforces a set of rules of the game that encourage productive activity. . . . Because there is a widespread prejudice among many neoclassical economists that simply an absence of government intervention is a sufficient condition for good economic performance in a particular market, it is important to stress that the performance characteristics of any market are a function of the set of constraints imposed by institutions (formal rules—including those by government—informal norms, and the enforcement characteristics) that determine the incentive structure in that market. . . . The crucial point is to recognize that efficient markets are created by structuring them to have low costs of transacting and these conditions will vary with each kind of market and with each market over time. . . . Well-functioning markets require government, but not just any government will do. There must be institutions that limit the government from preying on the market. Solving the development problem therefore requires the crafting of political institutions that provide the necessary underpinnings of public goods essential for a well-functioning economy and at the same time limit the discretion and authority of government and of the individual actors within government. . . . [A]n underlying structure that credibly commits the state to a set of political rules and enforcement that protects organizations and exchange relationships.[38]

Ostrom's description of nested resource systems expresses a similar view:

> [O]fficials and policy analysts who presume that they have the right design can be dangerous. They are likely to assume that citizens are short-sighted and motivated only by extrinsic benefits and costs. Somehow, the officials and policy analysts assume that they have different motivations and can find the optimal policy because they are not directly involved in the problem (citation omitted). They are indeed isolated from the problems. This leaves them with little capability to adapt and learn in light of information about outcomes resulting from their policies. All too often, these "optimal" policies have Leviathan-like characteristics to them. . . . While smaller-scale, community-governed resource institutions may be more effective than centralized government in achieving many aspects of sustainable development, the absence of supportive, large-scale institutional arrangements may be just as much a threat to long-term sustenance as the presence of preemptive large-scale governmental agencies. Obtaining reliable information about the effects of different uses of resource systems and resource conditions is an activity that is essential to long-term sustainability. If all local communities were to have to develop all of their own scientific information about the physical settings in which they were located, few would have the resources to accomplish this. [39]

> Furthermore, the long-term stability of rules devised at a focal. . . level depends on monitoring and enforcement as well as their not being overruled by larger government policies. . . . Larger scale governance systems may either facilitate or destroy governance systems at a focal. . . level.[40]

Institutions located between the market and the state can ground their economic success (superiority) in a number of possible economic dilemmas. Ostrom has been closely associated with the debate over social organization to exploit common-pool resources and produce public goods,[41] but that is far from the only

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regulations) and informal constraints to produce the desired results. . . . The mechanisms for contract enforcement appear to have had their beginnings in internal codes of conduct of fraternal orders of guild merchants, which were enforced by the threat of ostracism. These codes evolved into merchant law and spread throughout the European trading area; gradually they became integrated with common and Roman law and enforcement was eventually taken over by the state. The last point is critical. The economic institutional structure was made possible by the evolution of polities that eventually provided a framework of law and its enforcement.")(internal citation omitted).

38. *Id.* at 67, 76-77, 85, 105.

39. OSTROM, 256, *supra* note 31, at 278) (citation and footnotes omitted).

40. Elinor Ostrom, *A General Framework for Analyzing Sustainability of Social-Ecological Systems,* 325 SCIENCE 419, 422 (2009).

41. *See, e.g.*, Ostrom, *supra* note 17, at 408-09 ("Contemporary research on the outcomes of diverse institutional arrangements for governing common-pool resources (CPRs) and public goods at multiple scales builds on classical economic theory while developing new theory to explain phenomena that do not fit in a dichotomous world of 'the market' and 'the state.' . . . The market was seen as the optimal institution for the production and exchange of private goods. For nonprivate goods, on the other hand, one needed the government to impose rules and taxes to force self-interested individuals to contribute necessary resources and refrain from self-seeking activities.

economic dilemma that non-market institutions may be called on to address. North argues that the exploitation of knowledge poses a challenge that markets may not meet well and his list of challenges includes other well-known sources of market failure.

> Just how does it work? Sociologists looking empirically at information networks describe an immensely complicated communications structure that pulls the dispersed knowledge together in order to use it effectively in the growth of productivity of the modern economy. . . . It is only when that specialized knowledge can be integrated with other complementary knowledge at low cost that it is very valuable. The interconnections necessary to combine distributed knowledge effectively entail much more than an effective price system, although that is an essential prerequisite. The essential public goods, asymmetric information, and ubiquitous externalities require that institutions and organizations be created to integrate this dispersed knowledge. . . .[42]

The economic dilemma that the Internet navigates could be classified as a common-pool resource, a public good with a massive (positive) externalities or a transaction cost problem (asymmetric information plus others).[43] Any of these would provide a basis for concluding that there was an economic benefit that could be captured by cooperation. Or, it can be argued that the immense power of the Internet and its remarkably quick rise to dominance reflects the fact that it addresses **all** of these perennial sources of market failure in significant ways. The importance of the Internet resource system is magnified by the fact that communications and information flow are increasingly central to economic activity and have long been at the heart of important political and social processes. Thus, the Internet provides uniquely useful solutions to several increasingly important social/economic dilemmas. Failing to recognize the broad economic basis of the Internet's success seriously underestimates its value and power as a cooperative solution to important social and economic dilemmas.[44] More importantly, in order to avoid undermining the dynamic economic engine of the Internet in the process of responding to the maturation challenges, the rich and complex set of social and economic dilemmas it addresses must be considered.

As suggested by the above quotes, the challenge for institutional analysis has been to describe the rules that make resource systems work/economies perform well and to convince policymakers (among others) that the market or the state are not the only way to write effective rules. In the Internet space, we know the rules and the institutions. My goal is to understand why they worked so well and to caution policymakers that great care is needed in adapting them to the maturation challenges, lest the policies adopted undermine the ability of the resource system to continue it dynamic development. The proposed solution is to expand

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Without a hierarchical government to induce compliance, self-seeking citizens and officials would fail to generate efficient levels of public goods . . . .")

42. NORTH, *supra* note 15, at 120-21. ELINOR OSTROM, ROY GARDNER AND JAMES WALKER, RULES, GAMES & COMMON-POOL RESOURCES (1994) at 193, 194, 217. "Policymakers responsible for the governance of small-scale, common-pool resources should *not* presume that the individuals involved are caught in an inexorable tragedy from which there is no escape. Individual may be able to arrive at joint strategies to manage these resources more efficiently. To accomplish this task they must have sufficient information to pose and solve the allocation problems they face. They must also have an arena where they can discuss their joint strategies and perhaps implement monitoring and sanctioning. In other words, when individuals are given an opportunity to restructure their own situation they frequently, but not always, use this opportunity to make commitments that they sustain, thus achieving higher joint outcomes without recourse to an external enforcer. . . ." But once individual communicate (especially if they can communicate with one another repeatedly), they can build up trust through their discussions and through achieving better outcomes. If individuals come to these situations with a willingness to devise sharing rules and to follow a measured reaction, then communication facilitates agreement selection and the measured reaction facilitates agreement retention.

43. *See, e.g.*, YOCHAI BENKLER, THE WEALTH OF NETWORKS (2006); Brett Frischmann, *An Economic Theory of Infrastructure and Commons Management*, 89 MINN. L. REV. 917 (2005). Benkler is most closely associated with the commons argument, although he has a very broad perspective; Frischmann emphasizes the externalities view.

44. Mark Cooper, *From Wifi to Wikis and Open Source: The Political Economy of Collaborative Production in the Digital Information Age*, 5 J. ON TELECOMM. & HIGH TECH. L. 125 (2006) (arguing that the digital economy goes beyond the traditional four good framework based on rivalry and exclusion because it creates a new type of good, collaborative goods – that increases in value because they exhibit antirivalry and inclusiveness. *Id.* "[C]ollaborative production goods occur where having numerous producers participate in the production of the goods increases its value and where the value of the good goes up as the number of people who use it increases." *Id.* at 133.).

and reinforce governance institutions between the market and the state.

2. Creating Resources by Increasing Predictability

Both North and Ostrom launch their analysis from the desire and need to analyze systems that generate resources for groups of humans because the production and distribution of economic resources are central to human life and wellbeing.

> The revolution in technology of the past several centuries has made possible a level of human well-being of unimaginable proportions as compared to the past, but it also has produced a world of interdependence and universal externalities, and in consequence a whole new set of uncertainties.[45]

The ultimate goal of social institutions/organizations is the reduction of uncertainty through cooperation to capture collective benefits that exceed the benefits available from individual action. Figure II-1 presents a summary of the comprehensive variables and processes that the IAD approach has derived from experimental and field studies of cooperative responses to economic dilemmas. Predictability of actions results from roles that are clearly defined by formal rules and informal norms as to who can do what, rules and norms that are well monitored and backed by enforcement mechanisms. Predictability is enhanced by providing incentives and enforcing constraints on activity with sanctions. Effective sanctioning that maintains the order tends to be graduated. Trust in the action of others is the key to predictability of action and lowering transaction costs. Information and communications are central to developing rules and enforcing them.[46]

Consistency/congruence across these levels and between the elements of each level is a key feature of a successful social response to a resource challenge.

Both of the frameworks are focused on the causes and responses to external and internal pressures for change and the ability of the institutions that humans have built to adapt.

> Successful economic development will occur when the belief system that has evolved has created a "favorable" artifactual structure that can confront the novel experiences that the individual and society face and resolve positively the novel dilemma. . . . Put simply the richer the artifactual structure the more likely are we to confront novel problems successfully. That is what is meant by adaptive efficiency; creating the necessary artifactual structure is an essential goal of economic policy.
>
> Adaptive efficiency . . . entails a set of institutions that readily adapt to the shocks, disturbances, and ubiquitous uncertainty that characterize every society over time. The foundation of these flexible institutions resides in widely held beliefs embodied in the informal constraints of the society.[47]
>
> In light of still further evidence about the performance of self-organized systems that are consistent with the earlier derived design principles, we can conclude that there are ways of organizing governance that increase the opportunities for adaptation and learning in a changing and uncertain world with continuing advances in knowledge and technologies. . . .
>
> The contemporary use of the term *robustness* in regard to complex systems focuses on adaptability to disturbances: "the maintenance of some desired system characteristics despite fluctuations in the behavior

45. NORTH, *supra* note 29, at 20.

46. Identifying similar vitally important social bases of action and gives an example that is relevant to the issues examined in this paper. *Id.* at 75 ("Norms of honesty, integrity, reliability lower transaction costs. . . . The traders from the Islamic world developed in-group social communication networks to enforce collective action. While effective in relatively small homogeneous ethnic groups, such networks did not lend themselves to the impersonal exchange that arises with the growing size of markets and diverse ethnic traders. In contrast, the Genoese developed bilateral enforcement mechanisms which entailed creation of formal legal and political organizations for monitoring and enforcing agreements—an institutional/organizational path that permitted and led to more complex trade and exchange.").

47. NORTH, *supra* note 15, at 69-70, 78.

of its component parts or its environment."[48]

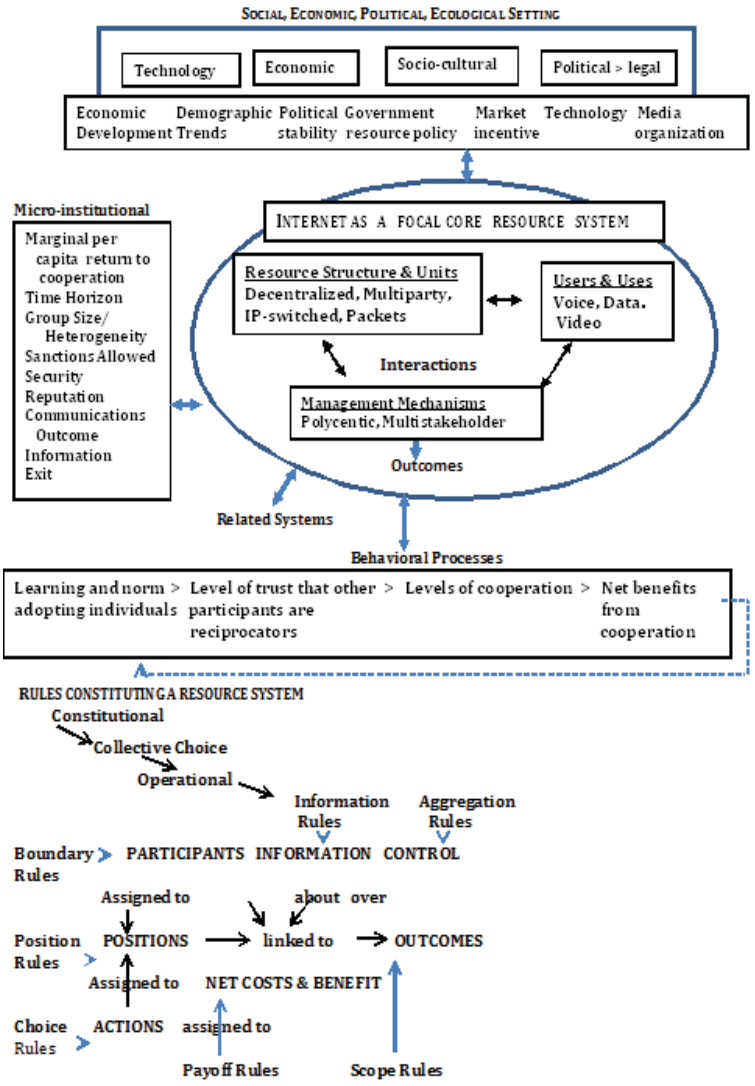

FIGURE II-1: VARIABLES AND PROCESSES THAT INFLUENCE THE DEVELOPMENT AND ADAPTATION OF THE INTERNET RESOURCE SYSTEM[49]

Change depends on the ability of the institutions to buffer themselves and the origin and nature of the forces creating the pressure for change. These pressures can be internal to the resource system (e.g., depletion of resources, conflicts over interpretation of rules) or external (e.g., external intervention, competition for scarce resources, change in the characteristics of the resource).[50]

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48. OSTROM, *supra* note 31, at 257, 258.

49. MARCO A. JANSSEN ET AL., WORKING TOGETHER: COLLECTIVE ACTION, THE COMMONS AND MULTIPLE METHODS IN PRACTICE (2010);, Elinor Ostrom, *A General Framework for Analyzing Sustainability of Socio-Ecological Systems*, SCIENCE MAGAZINE, July 24, 2009, at 24; Nives Dolsak & Elinor Ostrom, *The Challenge of the Commons*, *in*, THE COMMONS IN THE NEW MILLENNIUM: CHALLENGES AND ADAPTATION, (Nives Dolsak & Elinor Ostrom eds. 2003).

50. NORTH, *supra* note 29 (noting a number of sources of change including: the inevitable imperfection of understanding of realty, *id.* at 2, the fit between the institutions and reality, *id.* at 3, complexity, *id.* at 23, processes by which human activity changes the environment in which institutions exist, *id*. at 116, and entrepreneurship, *id*. at 125); *see also* Elinor Ostrom and Xavier Basurto, *Crafting*

C. The Internet as a Focal Core Resource System

1. The Elements of the Internet Resources System

To study this complexity one must examine the formal and informal rules of social institutions and organization that humans develop to increase the predictability of behavior. As shown on the left side of Figure II-1, above, the resource system can be conceptualized as composed of three aspects or sets of elements—the structure and units, users and uses, and the management mechanism—that interact to produce the outcome. The resource system is embedded in a socio-ecological setting and supported by behavioral processes.

In Figure II-1, above, I modify Ostrom's basic set of definitions in two ways. First, I combine the structure and units into one aspect of the resource system that captures the generally technical nature of the system. Second, the aspect that I label management mechanism is called the governance system by Ostrom. Ostrom used the term governance system broadly to include the decisions and choices made about the constitution of the resources system. The Internet governance debate has come to use the term governance even more broadly to apply to both the management of the resource and the host of issues that arise from the socio-ecological setting.

This distinction is well-recognized in the Internet governance debate. For example, a paper from the United Nations Conference on Trade and Development (UNCTAD) noted:

> It is important in this regard to distinguish "governance of the Internet" (that involves the physical and logical infrastructure of the Internet, and would probably be more appropriate to refer to as the management of the core resources of the Internet) from "governance on the Internet" (which concerns activities that take place over the Internet, particularly the exchange of information, goods and services).[51]

Throughout the remainder of the paper, I use the term Internet governance to refer to the very broad set of issues that have arisen in the international debate about the future of the Internet, while I reserve the term management mechanisms for the narrower questions of the operation of the structure, units, users, and uses of the resource system.

As shown on the right side of Figure II-1, the resource system produces beneficial outcomes by institutionalizing rules that govern the resource. There are three broad categories of rules that define a resource system.

- Constitutional rules govern the way the overall resources system is constituted, particularly how collective choice rules are defined.
- Collective choice rules embody the procedures by which the operational rules are changed.
- Operational rules govern the activities that take place within the borders of the resource system. There are seven operational rules that define the resource system by assigning participants to positions that are associated with actions that yield payoffs, subject to monitoring and control.

The central question posed by North is at the operation level, "just how does it work?" It can be answered in terms of Figure II-1 as follows. The Internet is a resource system in which anyone can do anything as long as it comports with the Internet protocols (IP). The protocols create a flow of resource units continuously. They place no restrictions on content. If there is congestion, the users are told to back off and each knows what needs to be sent to complete the communication. Users have the opportunity to design their uses or operate their networks in ways that can deal with the capacity of the system to handle traffic. Decentralized, user-based, local knowledge is allowed to play a large role in the resource system,

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Analytic Tools to Study Institutional Change, 327 J. INSTITUTIONAL ECON., 317, 324-27 (2011) (outlining various processes of rule change).

51. United Nations Conference on Trade and Dev. (UNCTAD), *Internet Governance*, *in* Internet Governance: A Grand Collaboration 256 (Don MacLean ed., 2004) [hereinafter *UNCTAD*].

another important characteristic that enables it to produce large benefits. The success of the system encourages the community of users to invest substantially in its maintenance and expansion. There may be some uses that the resource system is not well-suited for, but there are always work-arounds, and the vast array of activities that it came to support swamped the things it could not do precisely because there is so much freedom for users to figure out how to get things done.

The essence of the Internet resource system came to be described as a series of layers configured as an hourglass, as depicted in Figure II-2 by the National Academy of Sciences. The description that has become common is that the unique, revolutionary idea of the hourglass is that the protocols and standards at the waist enable any network in the bottom strata to communicate with every other network in the bottom strata, regardless of the application used, as long as the communication adheres to the protocols and standards at the waist. Interestingly, the hourglass can be described as two sections connected by a channel, which better fits the idea of information flows. The functionality of the hourglass lies in the fact that the two sections can contribute to the system functioning as the source of the flow is renewed with the turning over of the glass. This highlights a key characteristic of the Internet. It can be argued that networks and applications are strong complements in the creation of a successful resource system, and it is fair to say that the success of the Internet resource system reflects the "equal" contribution of the two sections – content and networks; hardware and software.

2. Networks as Resource Systems

With the Internet defined as a network of networks, it is not surprising that analysts of the Internet governance issue frequently adopt network theory as a framework. Network theory is virtually identical to the analytic framework that I have outlined in this section. As Mueller described networks, the quality of being between market structures and hierarchical structure is an essential characteristic of a network.

> A network was said to be based on *the relationship* rather than *the transaction*; it was composed of longer-term bonds of reciprocity and trust among economic actors that were too stable to be classified as market transactions and too loose to be classified as formal hierarchies.[52]

> The economic advantage of the network flows from the characteristics of the network that allow it to utilize local knowledge.

> Many of the advantages attributed to this form of organization were related to its efficiency in sharing and processing information and knowledge. Networks were characterized as relying on lateral as opposed to hierarchical channels of communication, which made it possible to more efficiently exploit complementary skills and knowledge dispersed among multiple actors. As learning and innovation vehicles, network organizations compared favorably to "passing information up and down a corporate hierarchy or purchasing information in the marketplace" because they facilitated the development of "new interpretations" and "novel linkages," and took advantage of the unique economics of information, in that sharing does not deplete it. . . . Based on the preceding discussion, it now is easier to see how the Internet triggers an explosion of new kinds of network organization and peer production processes; and also how the Internet enables a vast expansion of transnational issue networks or policy networks.[53]

It is interesting to note that in answering the crucial question of how to account for innovation and change, Mueller turns to the process of institutionalization and cites North and Ostrom. The description of the network structure and dynamics fits the resource system framework, in general, and the Internet, in particular, quite well.

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52. MUELLER, *supra* note 19, at 34.
53. *Id.* at 45.

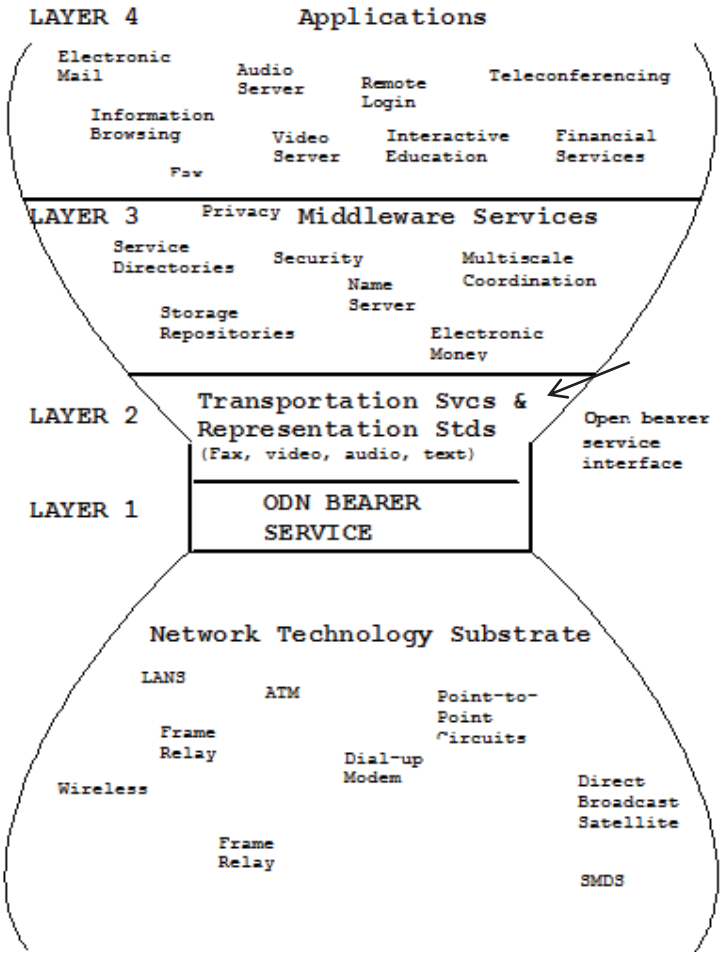

FIGURE II-2: THE INTERNET HOURGLASS AT THE HEART OF THE RESOURCE SYSTEM[54]

How might this result in innovation and change in the governance of communications and information?

At this juncture it becomes useful to link discussions of networks more directly to theories of institutions and institutionalization. When considering Internet governance we need to pay attention to the movement from informal, de facto association to formal organization; from loose consensual or cooperative action to the adoption of binding, agreed procedures. It is precisely this movement from the partially institutionalized to the formally structured that is the most critical and revealing part of the global politics of Internet governance.

Institutionalization implies that the parties involved in regular interactions understand and accept certain norms, conventions, and explicitly formulated rules governing their interaction, and that these rules can be enforced. This results in what game theorists call equilibrium outcomes, or stable patterns of interaction that reproduce and reinforce the rules and the organizational roles as the precondition for action. Mutual agreement on applicable rules and roles can generate collective benefits. Institutional theory suggests, however, that it is conflict or negotiation over the *distribution* of these benefits that moves loose associations of actors along the spectrum ranging from very informal, associative networks to more formal organization, and from there to the most hierarchical and binding forms of institutionalization.[55]

54. NATIONAL RESEARCH COUNCIL, REALIZING THE INFORMATION FUTURE 3 (National Academy Press 1994), *available at:* http://www.scientificcomputing.com/news-HPC-Internet-Architectures-Hourglass-Shape.aspx (updated version).

55. MUELLER, *supra* note 19, at 35, 45-46.

Pavan's formulation is similar:

> This focus on interaction is justified by a "decentralized concept of social organization and governance [for which] the society is no longer exclusively controlled by a central intelligence (e.g. the state); rather controlling devices are dispersed and intelligence is distributed among a multiplicity of action (or 'processing') units." . . . [G]iven the features of dynamism and complexity that characterize the global context, new approaches are needed to investigate the plurality of actors *and* interaction in which they engage . . . . To this end, networks are a powerful image for portraying the growing complexity of contemporary societies. . . . [N]ot only do networks constitute a lens for depicting and reducing the complexity of the situation, but their emergence is nowadays also considered a relevant political result . . . . Networks are preferred to markets and hierarchies as modes of organizing political processes with specific reference to three aspects: *the relations established between actors*, which are pluricentric as opposed to monocentric, entailed by state regulation and multicentric arrangements characterizing market competition; *the decisional mechanisms enacted*, which are based on reflexive rationality rather than on the substantial rationality characterizing state regulation or on the procedural rationality defined by markets; and finally, *the level of compliance with collectively negotiated decisions*, which is ensured not by means of coercion typical of the state or by the "*fear of economic loss"* but rather through the generation of trust and political obligation. In sum, network arrangements are adopted because steering activities about complex matters require the simultaneous presence of diverse actors and competencies: it is along network ties that participants' points of view can be coordinated and consensus is possibly achieved.[56]

56. PAVAN, *supra* note 19, at 44, 48 (citations omitted). Drawing on the works of Buchanan, MARK BUCHANAN, NEXUS: SMALL WORLDS AND THE GROUNDBREAKING SCIENCE OF NETWORKS (2002), Barabási, ALBERT-LÁSZLÓ BARABÁSI, (LINKED: HOW EVERYTHING IS CONNECTED TO EVERYTHING ELSE AND WHAT IT MEANS FOR BUSINESS, SCIENCE, AND EVERYDAY LIFE (2003), and Watts, DUNCAN J. WATTS, SIX DEGREES: THE SCIENCE OF A CONNECTED AGE (2003), I argue that decentralized, distributed network have unique efficiency characteristic that I call "[T]he principle of distributed efficiency . . . in which important shortcuts bypass hubs that have become congested or overburdened and allow nodes to communicate. . . . Important shortcuts (bridges) meet the criteria of reducing traffic between neighboring hubs that are already in communication through a third hub. By adding bridges to the decentralized network, it gains the characteristics of a distributed network. . . . (1) By adding links at the periphery, congestion of the core is reduced. Communications capabilities are distributed to the nodes or end points. (2) The additional links can relieve a great deal of traffic that had flowed through the central hub (c). Therefore, the network should have the necessary resources to free up to form the new links. (3) Moreover . . ., all clusters could communicate with one another . . . . (4) Under routine functioning, no node is separated by more than two degrees (one link, one bridge) from any other hub. (5) Under stress, should any module be removed, no node is more than three steps (one link, two bridges) from any other hub. (6) No matter how many modules are taken out, all the remaining nodes can continue to communicate although it becomes more difficult since each communication must traverse more bridges. While we tend to '"see'" networks as nodes and hubs and measure them by counting the quantity or assessing the quality of messages that flow between them, the architecture of the network is dictated by the rules of communications and connectivity. In the robust, efficient network, information flows because it can (connectivity) and should (functionality). The architecture makes the observed pattern of communications between nodes and hubs possible. . . . The hierarchical, modular network that exhibits both decentralized and distributed communications traits allows experimentation at the periphery, without threatening the functionality of the network. (citation omitted). Failure is not catastrophic; since it can be isolated and its impact minimized. Success can be pursued independently and exploited because of efficient communications. Successful nodes grow more rapidly through preferential attachment. . . . " Cooper, *infra* note 76, at 120, 122-23 (citation omitted). "Watts . . . identif[ies] searchability as a critical and '"generic property of social networks.'" Searchability is facilitated by paying attention to one's neighbors (chosen by preferential attachment). As he puts it: "By breaking the world down the way we do – according to multiple simultaneous notions of social distance – and by breaking the search process itself down into manageable phases, we can solve what seems to be a tremendously difficult problem with relative ease. Searchability is one of the key advantages of multiscale networks because '"in ambiguous environments, information congestion related to problem-solving activities causes individuals – especially those higher in the hierarchy – to become overburdened. The local response of these individuals is to direct their subordinates to resolve problems on their own by conducting directed searches.'" Watts argues that '"[w]hen problem solving is purely local, requiring messages to be passed between members of the same work team, for example, or subscribers to the same ISP, congestion can be relieved effectively by a process that corresponds to *team building*." *Id.* at 124.