

The Social Informatics of the Internet: An Ecology of Games

William H. Duttonⁱ

Oxford Internet Institute, University of Oxford, U.K.

Director@oii.ox.ac.uk

Abstract. Key insights revealed by social informatics studies have come from the new light they have shone on the social dynamics underlying broad changes tied to technological innovations. In particular, they have shown how major developments in computing and other information and communication technologies (ICTs), such as the Internet, are often the outcome of complementary or conflicting social movements, and their intersections. This paper focuses on an important supportive and complementary framework that helps to further understanding of these social dynamics: the concept of an ‘ecology of games’. The focus of this approach is on examining the unfolding interaction of various actors pursuing a diverse array of goals and objectives in a variety of interrelated arenas where everyday and strategic decisions are taken about whether to use – or not use – various ICTs.

Keywords: Social shaping of technology, social informatics, computerization movements, ecology of games, Internet, information and communication technologies, Internet governance.

1 Introduction

A key contribution of social informatics to enhancing understanding of the social dynamics that translate a landmark technical innovation into a breakthrough in real-world contexts has been the way it has connected technical innovation to social change by showing that computerization movements, such as personal computing, should be understood as social movements [1]. As Kling and Iacono [2] commented, computerization movements “communicate key ideological beliefs about the favourable links between computerization and a preferred social order ...”.

This conception provides an important advance over a narrow technological focus on innovation because it demonstrates how the nature of technologies and the outcomes of their use are ‘socially shaped’ by, and inseparable from, the economic,

social, institutional and policy contexts in which the technologies are designed, developed, and used (see also [3]). Multidisciplinary social informatics researchers have placed the users of computers and related ICTs and the social contexts of their use at the centre of their enquiries and analysis. This has helped to illuminate, for example, how the Internet and its applications, such as the Web log 'blogging revolution', are more than only a technical innovation – they are social phenomena that have emerged and grown because of their relevance to people's lives.

An earlier example of a computerization movement was the way personal computers (PCs) were initially developed in the late 1970s by 'home brewing' do-it-yourself technical entrepreneurs. Initial attempts by managers and professionals to introduce PCs into the workplace were actively discouraged as being institutionally counter-productive until, fuelled by experiences with home-based PCs that seemed more beneficial than corporate systems, there was a groundswell of grassroots demand for PCs within organizations. On the other hand, top-down initiatives to promote a breakthrough, such as frequent government and industry attempts to encourage use of the videophone, have been rejected by users who couldn't see their relevance to their lives [4].

Such insights also help to explain how technologies enable people to reshape fundamentally how they do things, for instance in using the Internet to reconfigure how they gain access to other people and to information, services, and technologies [4]. They also demonstrate that major developments like the Internet are not the outcome of a single social movement, but are tied to several intersecting social, technical, regulatory, political, and other movements and counter-movements

This paper argues that it would be useful to embed these different conceptions of social movements, technical invention and public policy within a larger framework of action represented by the concept of an the 'ecology of games'. Within this, computerization developments can be understood as the outcome of the unfolding interaction of various actors pursuing a diverse array of goals and objectives. This approach is proposed as a useful integrative framework within which to analyze the co-evolution of economic, cultural, organizational, legal, and other intertwined dimensions of social transformations associated with technological change.

2 The Ecology of Games

2.1 Defining the Concept

The ecology of games framework explored in this paper depicts a wide system of social, institutional, and technological action and interaction composed of two or more separate but interdependent 'games' [4]. Here, a game is defined as an arena of competition and cooperation, with each game structured by a set of rules and assumptions about the strategies used by players to achieve a particular set of objectives. The rules, strategies, and players in different games offering a 'grammar' for describing the system of action shaping technological change in the overall ecology. All games share several key attributes.

First, each game has a set of goals, purposes or objectives (e.g. a bureaucrat within a regulation game might seek to avoid conflict), with some games having multiple objectives (e.g. a telecommunication regulator in a European Union member state seeking to enhance industrial competitiveness in that country while promoting the harmonization of open networking standards across the EU). In addition, a game has a set of prizes (e.g. a higher salary or larger office for a bureaucrat who achieves the goal of resolving conflict).

Games also have rules that govern the strategies or moves open to players (e.g. in a regulation game governed in part by administrative law, there could be guidelines on the need to make rules public and fair, although in some games played for private and other interests the rules may not need to be public or fair). Rules may change over time, and there may not even be consensus on a definition of the rules [5]. Finally, a game has a set of players. These are defined by the fact that they interact in competition or cooperation with one another in pursuing a game's objectives (e.g. a regulatory game incorporates bureaucrats, legislators, and regulated firms and industries, as well as the possible involvement of the public, courts, and other actors).

In such an ecology, individual games can be interrelated in several ways. Some players might simultaneously participate in different games, and some might transfer from one game to another. Moves or actions made in one game can affect the play of others. Also, the outcome of one game might affect the rules or play of another. Players might be able to anticipate a range of strategies open to individuals, organizations or other actors if they know what roles those actors play in the game(s) most central to them. Conversely, when the actions of players appear irrational, it is likely that the observer does not know the rules and contexts of the games in which players are most centrally involved (e.g. that the players' moves in one game might be constrained by their moves within other games). This can help to reveal the dynamics of technical, social, and policy choices shaping the development of technological innovations and outcomes tied to their use.

In the approach discussed in this paper, it is important to note that the terms 'game' and 'ecology of games' are not employed in a formal game theoretic sense, as has been used for example in formal game theory (e.g. [6]) The 'grammar' of the games employed here is less precise and rigid, used as sensitizing concepts, but nonetheless of equivalent value in simplifying and revealing the complexity of the underlying dynamics of the interplay between interrelated and continuously co-evolving social, institutional, and policy arenas.

2.2 Background and Benefits for ICT-related Policy and Practice

The framework of an ecology of games as developed here first emerged in a field far from innovation in ICTs. In the 1950s, Norton Long [7] used the idea to provide a new perspective on the pluralist versus elitist debate over who governs local communities. Previously, most such theorists viewed policy making as an isolated game in which all players seek to shape policy within the rules defined by the political and economic system. Long claimed that local events are generally governed neither in rational-comprehensive ways nor by a pluralistic set of elites or a more networked economic elite. Instead of primarily being concerned with

governing the community, as both pluralist and elite theorists assumed, major players were as much – or more – focused on such matters as being elected to the city council, developing land, creating a general plan or finding a decent home. To understand the behaviour of these players, it was therefore useful to think of them as candidates for the council, land developers, planners, and house hunters, rather than people only or even primarily seeking to govern their community.

The development of communities could then be understood as the consequence of an unfolding history of events driven by often unplanned and unanticipated interactions among individuals playing relatively independent games, in which they most often make decisions as the occupant of a particular role within a specific game, rather than as individuals making decisions about the larger community. Thus, the evolution of local communities might be viewed as the outcome of a history of separate but interdependent games that give ‘a sense of purpose and a role’ and offer ‘a set of strategies and tactics’ [7: 252]. Long [7] identified local communities as the ‘territory’ of a game, but in the approach discussed here the arena in which games are played could also be a household, a locale, a firm, non-governmental organization (NGO), government department, region, nation or global body.

Since Long published these ideas, although elitist and pluralist debates have been sustained they have also been overtaken by new perspectives on power and public policy. Nevertheless, the ecology of games continues to offer a viable alternative to prevailing theoretical perspectives, for example by providing a heuristically rich and useful framework for understanding the dynamics of decision-making in technology and public policy in a wide range of areas [4, 8, 9].

Within this framework, structural, and institutional factors can be linked to the behaviour of actors by the manner in which they help to define the goals or rules of particular games. For instance, the separation of powers distinguishes the rules of some games shaping communication policy in the US from those in parliamentary democracies like the UK [4]. It is in such ways that the ecology of games can help to bridge levels of analysis in social and policy sciences.

3 Games Shaping the Internet

The value of the ecology of games approach can be illustrated through the Internet phenomenon, which encompasses some of the most important ICT-oriented social movements of recent times. This perspective reveals that a complex innovation like the Internet’s ‘network of networks’ is best viewed as the outcome of actions and interactions in an ecology in which specific actors seek to achieve their own goals within one or more separate but interrelated games. The search for a single source of invention or governance of the phenomenon can then be seen to be a misdirected exercise.

The ecology of games view helps to explain how direction of technological change is shaped by the unfolding consequences of strategic choices about matters more directly significant to the actors than those related to specific technical choices. For example, although much has been written about the invention of the Internet in terms of the relative contributions of different innovations, groups, organizations, and technical advances (e.g. [10-11]), it actually emerged through the interaction of

different advances across different sectors, made by a variety of individuals, groups, and organizations with different aims and objectives. Significant social movements, such as the Internet Society (ISOC)ⁱⁱ, developed around the team within the US Department of Defense's Advanced Research Project Agency (ARPA) that developed the ARPANET network in the 1960s, initially as an experiment to link together only a few small computers but which laid the foundations that still underpin the Internet's infrastructure that now interconnects vast numbers of computers around the world.

Social movements have also formed around other Internet-related innovations. For instance, the Web in its current form emerged from a set of networking projects at the European Laboratory for Particle Physics (CERN) in Switzerland, with Tim Berners-Lee [12] as a key driving force. However, its design and cultural ethos was strongly influenced by an earlier hypertext design concepts inspired by Ted Nelson's visionary work on the Xanadu project [13], which in turn drew on Douglas Engelbart's 'oN-Line System' (NLS) at Stanford Research Institute that aimed to make computers a more useful tool to help people think and work. The rise of computerization movements around open source software [14-15] and a 'creative commons'ⁱⁱⁱ of more flexible copyright licences have also been facilitated by the Internet and Web. The origins and development of these movements were distinct from efforts to invent the Internet, but have become interwoven with the evolving culture of Internet producers and users. The Internet and Web continue to be shaped by contributions from a vast number of users embedded within a variety of games.

This illustrates how the growth of the Internet from an experimental network within an ecology of defence, public policy, and technical innovation games to become today's worldwide phenomenon did not happen just because a few people turned bright ideas into practical systems. It resulted from a huge number of players in intertwined academic, commercial, technical, industrial, and other games making decisions about how specific aspects of the Internet should be designed, developed, used, or governed. Each decision met goals and made sense within different arenas, and the interaction between choices in each game combined to create the 21st Century phenomenon represented by the Internet and related ICTs. The developments in broadband and Internet governance discussed in the next two subsections further illustrate the value of an analysis of Internet-related activities based on the ecology of games concept.

3.1 Games Relating to Broadband Internet Infrastructures and Services

Delivering to Internet users the advantages of having 'always on' high speed broadband access to multimedia content whenever and wherever they want has been a key goal in overlapping sets of telecommunications, media, regulatory, and policy 'broadband Internet games' (see Table 1). In the economic development game in this table, governments, and other agencies around the world have typically seen broadband as a means of reaching key economic and industrial competitiveness goals [16], with overall economic growth a main prize. In developing countries, NGOs, and local activists often play a strong role in a variation on this game, where the rules take account of lower levels of existing telecommunications infrastructure, skills, and financial resources. Activists in local communities throughout the world have also been influential in their own communitarian broadband games, for example in the promotion of free or low cost access to a creative commons. At the same time,

commercial and professional players in the content provision game seek to maximize their profits in competition with each other and with other content providers, such as bloggers, offering free or low price alternative channels. Telecommunication regulation and broadband supplier games are also crucial influences on the other broadband Internet games in Table 1.

Table 1. Illustrative Broadband Internet Games

<i>Game</i>	<i>Main players</i>	<i>Goals and objectives</i>
Economic development	Governments, public agencies, investors.	Players build broadband infrastructures to attract business, investment, and jobs to localities, nations, and regions.
Developing country	Governments, NGOs, local activists, investors, local Internet content and service providers.	Players seek to close social and economic divides in developing countries using widely available broadband infrastructures.
Communitarian	Neighbourhoods, community groups, Internet enthusiasts.	Individuals and groups seek free or low-cost open access to broadband Internet, including competing with commercial players.
Telecommunication Regulation	Telecommunications firms, regulators, investors, consumers.	Regulators umpire moves of competing firms, taking account of conflicting and complementary goals of players.
Broadband suppliers	Traditional telephone companies using Direct Subscriber Line (DSL) digital adaptation of existing lines, cable TV firms, wireless, and other vendors	Suppliers compete for shares in a market, where DSL and cable vendors have often been the main broadband players winning lines into homes and offices.
Content provision	Media giants v. Internet entrepreneurs; media novices and non-profit content producers v. professionals.	Established and emerging producers of Internet content compete to reach audiences.

Source: Dutton et al. [16: 54, Table 4].

Broadband Internet could change the rules of some media games, for instance through outcomes from the continuing attempts to build new forms of integrated multimedia operations by exploiting technical digital convergence, such as voice and video services delivered over the Internet. Cultural and policy contexts also matter to outcomes of these kinds of games. For instance, in some countries the provision of a multimedia package that mixes television, telephony, and broadband Internet services involve a number of regulatory games within and between different

institutions responsible for different media; in others, just one regulator covers many old and new media, such as the UK Office of Communication (Ofcom) formed in 2003 to cover telecommunication, broadcasting and print industries. Certain governments have a strong general anti-monopoly agenda backed by legislation, even though the digital convergence of different media makes it harder to define the precise boundaries of ICT and media marketplaces within which one player can be said to be over-dominant. Other countries see these industries as being either part of an economic game that is best left to market forces or, conversely, wish to place them under state control. In addition, goals set for regulators vary according to the particular political and economic policies being pursued.

Important social movements and initiatives that have developed around broadband Internet included the WiFi (Wireless Fidelity) grassroots nourishment of local wireless-based computer networks [9] and the peer-to-peer (P2P) file sharing used in key music distribution services. Broadband Internet can also open up new roles for those who have been communicatively empowered by broadband access, as when media consumers become media producers by setting up Websites offering their own blogs, online news media, and discussion forums.

3.2 Internet Governance Games

The ecology of games viewpoint can assist the reassessment and rethinking of appropriate Internet governance institutions and mechanisms to take account of the network's rapid global expansion and significance. Despite the development of an increasingly well informed debate on this issue, discussion on Internet governance often seems to stumble over the notion that 'someone' or 'some body' can govern it [17]. However, the Internet community, policy makers, and the public at large are divided about who, if anyone, should be involved in such regulation. This is illustrated in an Oxford Internet Survey (OxIS) conducted in 2005 by the Oxford Internet Institute (OII), which found that Internet users in Britain are not predominantly pro- or anti-government regulation of the Internet – they are divided. Most (45%) survey respondents did not know or were undecided while roughly equal numbers were pro- and anti-regulation by governments [18].

To some involved in Internet development, provision and use, the word 'governance' conjures up the unwelcome notion of governments moving into a thriving arena that has been fostered by seemingly ungoverned entrepreneurial and technical ingenuity. This raises the spectre of killing the vitality of the Internet through governmental, administrative, political, industrial, and legal barriers to technical innovation. On the other hand, there are those who contend that there has always been some form of Internet governance, although this has been highly informal and non-governmental, and that more national and international public oversight and regulation is essential because of the Internet's growing significance in most sectors of society worldwide.

Difficulties in resolving such conflicting views, interests, and goals is reflected in the final report of the United Nation's Working Group on Internet Governance (WGIG), which recommended 'the creation of a new space [a 'Forum'] for dialogue for all stakeholders on an equal footing on all Internet governance-related issues' [19]. It offered a number of options for consideration, rather than a specific

recommended route to global governance of the Internet, and concluded [19: 12]: “The organizational form for the governance function will be multilateral, transparent, and democratic, with the full involvement of Governments, the private sector, civil society, and international organizations.”

This indicates that the governance of the Internet is most appropriately viewed not as something capable of being in the control of any one set of actors but as the outcome of an ecology of games, as illustrated by the Internet governance games summarized in Table 2. For instance, the management and operation of the Internet is greatly affected by the system of allocating and managing names and numbers used within the Internet’s infrastructure, such as Web domain names and e-mail addresses. Key players in this game included the non-profit Internet Corporation for Assigned Names and Numbers (ICANN), commercial Internet service providers (ISPs), registries, and users. Substantial commercial, personal, and national interests and convenience are at stake in these games, so great store is placed by most actors on establishing rules that create a fair playing field, without an over-dominance by particular vested interests.

Table 2. A Few Selected Games and Players Shaping Internet Governance

<i>Game</i>	<i>Main players</i>	<i>Goals and objectives</i>
Names and numbers	Individual experts, ICANN, Registries, ISPs, users.	Obtain, sell, and allocate domain names, addresses, etc. to identify sites, users, etc.
Standards	Standards-setting bodies, World Wide Web Consortium (W3C), Internet Engineering Task Force (IETF).	Efforts to establish and propagate standards for the Internet.
Jurisdictional ‘turf struggles’	ICANN, International Telecommunication Union (ITU), UN, national governments.	National actors participate in Internet governance bodies to gain or retain national control over policy (e.g. by filtering Internet traffic or gaining access to encrypted data for security reasons).
Political speech, freedom of expression	Media rights advocates, activists, politicians, news media, governments, writers, artists, censors.	Individuals and organizations aim to facilitate or constrain flows of information, political views, and creative works.

Interactions between a growing number of players in the kinds of games shown in Table 2 are making it harder to reach technical agreements, which is increasing the difficulty of implementing core technical changes to Internet protocols and infrastructure [20]. For instance, until the late 1990s such changes could be determined largely by a relatively small group of public-spirited and mutually-trusting experts in a relatively simple ecology of Internet-related games. The escalation since then in the number of players with an interest in the Internet is shown by more recent meetings of about 2000 members of the IETF, the international community of network specialists concerned with the evolution and

smooth operation of the Internet. An even greater challenge is getting a technical decision adopted on the millions of computers linked to the Net once a decision is taken because there are a growing range of technical barriers to core innovations, such as firewalls, and decisions in each specialist arena of expertise overlap and intermesh in highly complex and often conflictual ways with decisions by actors in other key arenas, for example in challenging users' investment in older technologies and skills that might need to be replaced.

The ecology of games perspective therefore shows that not only is there unlikely to be a central source of Internet governance, but that very few people or organizations are actually seeking to govern the Internet as such. Instead, most actors try to win more focused prizes, for instance developing a market for registering names and numbers, keeping a bank's computer system secure from hackers, avoiding spam e-mails, and so on. Governance of the Internet can then be understood as the outcome of a variety of choices made by many different players involved in many separate but interdependent policy games or areas of activity. By decomposing or unpacking this complex ecology, policy makers and activists can better focus on the objectives, rules, and strategies of specific games that drive particular players, while also recognizing that each game is being played within a much larger system of action in which the play and outcomes of any one game can reshape the outcomes of other games.

4 Conclusion: Understanding How the Future Unfolds

The notion of an ecology of games outlined in this paper places the computerization movements concept within a larger system of action in order to offer a framework for thinking about the highly complex entwining of social, technical, organizational, governance, and other forces that shape the emergence of changes tied to the increasingly ubiquitous use of the Internet and related ICTs. At the same time, it embeds many ideas from the computerization movement concept and reinforces the value of its central illumination of the ways in which the motivations and actions of people and organizations in particular social contexts shape the ultimate design and impacts of the technology and related policies in real-world settings.

The ecology of games also recognizes the significance of many technical inventions and new ideas that may fail to kindle social movements. Its emphasis on the potential for unanticipated, unplanned developments raises doubts about perspectives on technological change, such as the 'single inventor' thesis, that posit a more governed, isolated, and predictable system of action. This helps to explain why accurate prediction is likely to elude those involved in technology and policy studies who seek to attain this goal. It also challenges some traditional tenets of structural and institutional explanations of social and political orders.

However, this framework strongly supports the thrust of the kind of institutional perspective developed by March and Olsen [21: 9), who argue that the long-run development of political institutions 'is less a product of intentions, plans, and consistent decisions than incremental adaptation to changing problems with available solutions within gradually evolving structures of meaning' (see also [22-24]). Policy-

makers and many technologists might like to deal with more predictable outcomes, but the real world is far more 'messy' than indicated in narratives telling stories of the inevitable, unfolding paths towards a future carved out by heroic inventors and their technologic swords. In reality, those swords are two edged, for example with the same Internet delivery mechanisms carrying software viruses, spam, and paedophile contacts as well as the communication, educational, news, and entertainment channels that enhance people's lives. Actual outcomes are also determined by a multitude of people making small and large strategic decisions every day about whether or not to use the Internet or other ICTs.

Major upheavals in industry sectors, the opening of significant new patterns of domestic and working life and shake-ups in major policy sectors, such as Internet governance, are often created by using technological developments that few, if any, have predicted well in advance. The examples related to the Internet given in this paper illustrate the value of the ecology of games framework in analysing the ways inventions, new ideas, and myriad choices by consumers and users contribute to such transformations.

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Notes

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- ⁱ My thanks to several anonymous reviewers for their helpful comments on an earlier draft, and to Malcolm Peltu for his assistance in editing the final manuscript.
 - ⁱⁱ A major international association of people championing the Internet, with more than 20,000 members in over 180 countries (see <http://www.isoc.org> [accessed 21 January 2006]).
 - ⁱⁱⁱ See <http://creativecommons.org> [accessed 21 January 2006].