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Abstract

The central common feature of a number of recent technological developments (collectively referred to as Web 2.0) is collaborative production of content on an amateur basis, that is, for motives other than commercial reward. Amateur production of content generates significant external benefits that are shared by society in general. Indeed the amateur production of various types of content is probably more socially beneficial since it is typically given away free The individual and social benefits of such activity therefore justify public policy responses to the opportunity now before us.

Amateur content production and innovation policy

Introduction

Innovation is a central distinguishing feature of modernity. Most attention has been focused on the the discovery and diffusion of technical innovation. Yet modern societies are also characterised by distinctive processes of cultural innovation.

Over the last two decades, both technical and cultural innovation have been transformed by the spectacular growth of the combination of information technology, communications systems and social networks that constitute the Internet, and its most notable manifestation, the World Wide Web.

A striking feature of the current era is the extent to which notable innovations have been driven by concerns unrelated to, and often antithetical to, the desire for commercial returns. These concerns may be described as 'amateur', a term that has shifted status from favorable to pejorative, and is now in the process of shifting back.

Even in the commercial sector, there is no obvious relationship between the social value of an innovation and the returns to the innovator. The creators of the Internet, the World Wide Web and vital building blocks such as the Linux operating system received much acclaim but little or no financial return, while the promoters of short-lived and ultimately unsound business ideas have regularly walked away with tens of millions of dollars.

These developments pose obvious challenges for innovation. Traditional models based on a distinction between publicly funded pure research and commercial development based on patents and other forms of intellectual property no longer appear relevant to the needs of a networked economy depending heavily on amateur production. The purpose of this paper is to consider the role of innovation policy in such an economy.

The paper is organised as follows. Section 1 is a summary of the evolution of models of innovation in the 19th and 20th centuries while Section 2 deals with the 21st century model of innovation, focusing on the recent convergence of

technical and cultural innovation. Section 3 is a discussion the role of amateur production. Section 4 deals with the economics of network innovation. Sections 5 and 6 develop the implications of recent development for innovation policy. The paper concludes with a discussion of future directions for innovation policy.

1. Models of innovation in the 19th and 20th centuries

While innovation is a continuous process, ways of thinking about innovation tend to persist long after they are obsolete. The 19th century idea of the individual inventive genius, epitomised by Davy and Faraday[1], remained influential through much of the 20th century long after the rise of large-scale research institutions and industrial research laboratories. Meanwhile, discussions of, and institutions for, cultural innovation remain in large measure, based from models developed in the 19th century[2].

The 19th century model of cultural innovation

Both the conceptual framework and the institutional structures associated with cultural innovation in contemporary societies can be traced back, in large measure, to the first half of the 19th century. The very ideas of art and culture in their modern senses emerged in this period (Williams 1988) and were reflected in institutional innovations.

The central actor in the 19th century model of cultural innovation is the artist, conceived, in the original Romantic vision, as an individual creator of works of art. Art, viewed until this point as broadly synonymous with such terms as 'skill' and 'craft', is conceived as a transcendent category of human activity, common to all societies, but produced only by a handful of exceptional individuals, and confined to a specific set of forms of expression, most notably painting, sculpture and certain forms of music and literature.

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[1] For biographical details, see Wikipedia (en.wikipedia.org/wiki/Michael_Faraday and en.wikipedia.org/wiki/Sir_Humphry_Davy).

[2] More precisely, from Hobsbawm's (1995) 'long 19th century' which ran from the French Revolution in 1789 to the outbreak of the Great War in 1914, with 1848 'the year of revolutions' as midpoint.

Although art and artists are rarely described in such explicitly Romantic terms nowadays, these conceptions are still embedded in the cultural institutions inherited from the 19th century.

Copyright provides one notable example. Although copyrights have become tradeable property rights, their terms are everywhere tied to the lifetime of the original creator. In some countries, the alienation of copyright is further limited by moral rights and rights to receive payment on resale.

The other major sets of institutions, largely created in the 19th century[3], and still highly influential, are public institutions such as art galleries and symphony orchestras. These institutions preserve and interpret the creations of those individuals recognised as great artists, for presentation to the public. They embody 19th century notions about the development of art and culture, the relationship between culture and society and so on.

The 20th century model of technical innovation

The process of technical innovation in the 19th century was seen in terms similar to those associated with cultural innovation. The central focus was on the work of individual inventors and researchers, commonly with little or no specifically scientific training. Humphry Davy began his career as an apothecary and Michael Faraday as a bookbinder.

By the early 20th century, this model was displaced by an industrialised process of innovation. The first major step in this process was the rise of the research university and the development of a large class of technically trained workers, beginning in Germany in the second half of the 19th century. In the 20th century, pure scientific research had become the preserve of universities and specialist research institutes.

The second major step was the development of corporate forms of business organisation, which allowed research and development to become an organised

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3 list of foundation dates Rijksmuseum Amsterdam 1800, Louvre 1793, Prado 1891, National Gallery 1824, Metropolitan Musem of Art 1870, La Scala, New York Met 1880, 1842 the New York Philharmonic and the Vienna Philharmonic were formed, and in 1858, the Hallé Orchestra

business activity, operated on industrial lines (Chandler 1977). The transition may be seen in the career of Thomas Edison, who began as an individual inventor, but established both a string of corporations that survive today and, in 1876 at Menlo Park, the first industrial research laboratory.

During the 20th century, innovation proceeded fairly broadly across a wide range of industries. If any industry was seen as characterising technical progress in the first 75 years of the century it was the transport industry. References to the Jet Age and Space Age were commonplace as descriptions of technological advance.

The 20th century model of innovation brought forth, and was explained by, theories of public goods and intellectual property. The central idea of the public goods theory is that the benefits of 'fundamental' or 'pure' research cannot be privately appropriate. Hence, the optimal policy is public funding of pure research, the results of which are made freely available. By contrast, applied research and development can be embodied in new goods and services, protected by intellectual property in the form of patents.

In the late 20th century, strenuous attempts were made to extend the scope of patents and other forms of intellectual property. However, even as this process reached its zenith with such measures as the Agreement on Trade-Related Aspects of Intellectual Property Rights(TRIPS)[4], negotiated in 1994, and the *Digital Millennium Copyright Act,* passed by the US Congress in 1998[5] and the, it was undermined by technological and social developments that rendered the whole idea of intellectual property questionable, and arguably obsolete.

2. Innovation in the 21st century

The pattern of innovation in the 21st century is radically different from that of the 20th in several important ways. First, it is highly uneven. In most sectors of the economy, the rate of technological progress has slowed

[4] See http://en.wikipedia.org/wiki/TRIPS

[5] See http://en.wikipedia.org/wiki/Digital_Millennium_Copyright_Act

substantially. Technological progress is characterised largely by incremental improvements to mature products. This is most evident in relation to transport.

The Boeing 747 'jumbo jet' revolutionised air travel when it was introduced in the 1960s. Forty years later, the 747 is still the workhorse of long-haul passenger travel, and its successors, such as the Airbus A380 and Boeing B787 represent only modest advances.

The same point may be made about the range of household consumer durables such as refrigerators, vacuum cleaners and dishwasher. Not only has there been little fundamental change in these products, but there have been no significant new products since the microwave oven in the 1970s. The situation in much of the service sector is the same.

By contrast, in computing and telecommunications, the rate of progress (which was already fast) has accelerated dramatically since the late 1980. The convergence of computing and telecommunications in the Internet has fundamentally transformed every activity it has touched.

Creative and technical innovation

The growth of the Internet has been made possible by technological improvements in the speed and power of communication and computation. But the growth of the Internet owes as much to cultural as to technical innovation. The Internet itself is not a physical network, but a set of institutions and cultural practices.

At the lowest level, the Internet Protocols embody a set of rules about connections between hosts, and the way in which data may be transferred between them. As Lessig (1999) observes, a crucial feature of the Internet is the minimal set of assumptions required for connection. This allows for maximal flexibility in innovation by users, at the cost of forgoing any significant central provision of services.

The open nature of the Internet rapidly gave rise to developments such as newsgroups where many of the cultural practices (good and bad) that are central to the Internet were developed.

A second, and arguably even more crucial set of cultural innovations arose with the development of the World Wide Web, originating from a hypertext language (HTML) designed to allow physicists to share data and working papers. The open and flexible nature of the Web, and the fact that it was based on royalty-free technology ensured that it quickly displaced alternative protocols such as Gopher (owned by the University of Minnesota which sought to charge for its use).

The rise of the Internet to its current position of dominance was not an automatic outcome of technical progress. Rather it reflected the fact that the cultural structure of the Internet made it more attractive than competing alternatives, including a range of commercial networks, such as Delphi and GENie

These competitors disappeared (or merged into the Internet) so long ago that most current users are unaware that there ever existed any alternative. Similarly, for many users, the Internet is, simply, the Web, and there is little awareness of other Internet protocols such as FTP for file transfer and the various protocols that support (non-Web based) email.

3. Amateurs

The Web has given rise to a huge range of cultural and formal innovation. In contrast to the 20th century model of innovation, many of the most significant innovations have been driven by amateurs seeking new ways to communicate with friends, colleagues and the world at large. The role of amateurs in creative innovation has been explored by a number of recent writers including Benkler 2004, 2006), Bruns (2005), Hunter and Quiggin (2008) and Leadbeater and Miller (2004).

As Hunter and Quiggin (2008) note, a wide range of motives lead people to contribute to amateur collaborative innovation. Possible motives include altruism, self-expression, advocacy of particular political or social views, display of technical expertise and social interaction. Different motives will be dominant in different situations.

In general, these motives are complementary or at least mutually consistent. For example, an altruistic desire to improve open source software will be complemented by enjoyment of a technically challenging task, and by a desire for the admiration of a peer group.

However, motives like these do not co-exist well with a profit motive. Benkler (2004) notes the absence of monetary side payments in the case of car-pooling and this is typical of co-operative endeavors of various kinds. The observation that financial motives may conflict with other motives has been discussed at length in the literature on motivational crowding out (Frey, Oberholzer-Gee and Eichenberger 1997).

Hunter and Quiggin (2008) further argue that it is necessary to consider the social context of monetary interactions. Monetary interactions naturally give rise to rational calculus of action in which there is no sensible alternative to the pursuit of one's own interests. This is because markets create opportunities for systematic arbitrage that do not apply in other contexts. Profit-oriented participants can make systematic gains at the expense of those who seek to behave in an altruistic manner or who anticipate, but do not contract for, reciprocity in contributions.

It follows that amateur innovation is unlikely to be promoted by policies that sharpen financial incentives. On the contrary, the greater the potential for well-informed market participants to extract profits from a given activity, the less willing amateurs will be to make uncompensated contributions.

4. The economics of network innovations

The changing patterns of innovation discussed above are a reflection of the increasing importance of networks at all stages of the process of innovation. With declining communications cost, it is possible for valuable innovations to arise from the efforts of large number of individual contributors, who may be physically separate and not subject to significant external coordination.

The Internet is both the most important single example of a network-generated innovation and the basis for the subsequent innovations. Among the

most notable are the open-source operating system Linux, and Wikipedia, the online encyclopedia that has become, in the space of six years, the most widely used reference source on the Internet and, as far as such things can be measured, the most widely used in human history.

A less obvious example is the 'blogosphere'. The blogosphere is more than the collection of 50 or 100 million individual blogs and the supporting software and hardware. A crucial feature of its significance is the set of links, social structures and conventions it has generated, which largely determine the collective capacity of blogs to influence discussion of political, social and cultural concerns.

From an economic viewpoint, the critical feature of networks is that value accrues to the network as a whole and cannot, in general, be reduced to the sum of individual contributions. The value of a network depends both on its size and on its topology.

Economic analysis of large-scale networks typically assume that the value of a network is determined by the number of nodes that are connected. As long as the value increases more rapidly than the number of nodes, each new connection generates a benefit to existing users, referred to in welfare economics as a 'positive externality'. For example, a new connection to a telephone network provides the person being connected with the ability to call others and to receive calls. This not only benefits the new connection but existing users of the phone service who might want to call them.

More recently, there has been a good deal of interest in smaller networks, and here attention has focused mainly on the topology, that is, on the pattern of links that sustain the network. Depending on the benefits to individual members, the network may or may not be sustainable. In general, the distribution of benefits required to sustain the network bears no clear relationship to the value contributed by particular users.

Both points may easily be observed in relation to the Internet. The value of the Internet as a whole, and of its various components, depends heavily on the

number of users, but the cost of access for particular users does not take account of benefits that may accrue to others.

As regards topology, the ranking given by Google depends primarily on the pattern of links to particular pages. The capacity to derive financial benefits from programs such as Google's AdSense also depends critically on network topology and the pattern of visits. Any correlation between the capacity of a site to capture AdSense revenue and the value of the site to its users is indirect and tangential at best.

In summary, innovation in a network economy typically requires contributions from widely distributed sources and yields benefits that are diffuse and hard to capture. There is no easy way of relating the rewards of innovation to the value of individual contributions. It follows that innovation policies based primarily on enhancing the capacity to capture such rewards are unlikely to prove effective.

5. What role for innovation policy?

What is the role for innovation policy in promoting network innovation? It seems clear that existing models are in need of substantial revision, to take account of the convergence of technical and creative innovation and the increasingly central role of amateur and user-based innovation.

Innovation and the market

Market processes are unlikely to generate adequate support for innovation, or to promote valuable innovations over trivial or even destructive innovations. It has long been clear that market models based on payment for content, including text, audiovisual material, data, and net-based software services, have only a marginal role to play in a networked economy. Apple's iTunes service is a notable success among a sea of failures, but attempts to replicate it have proved almost entirely unavailing.

The vast majority of market returns from internet services are tied to advertising. The most successful model is that of Google. Unfortunately, the sale of advertising provides a prime illustration of the point that the capacity to

capture returns from the internet bears only an indirect and unreliable relationship to beneficial innovation or to the provision of useful services.

Under the advertising model, it is critical to obtain a high rank in searches from Google and other engines. Rank is defined by large numbers of incoming links. This fact has given rise to numerous innovations aimed at increasing the rank of particular sites. Given the zero sum nature of competition for rankings (an increase in ranking for one site must mean a loss for others) such innovation yields no net gains.

Worse, many of the techniques used to increase rank are actively harmful, promoting various forms of spam. For example, spammers may use blog hosting services to set up fake blogs (splogs) linking to their own site or may submit large numbers of spurious comments to blogs and other sites that allow visitors to comment. As with other forms of spam, spurious traffic of this kind forms a large proportion of total traffic on many sites, and creates a large load on servers and on administrators.

In summary, there is no reason to expect that market forces will provide appropriate incentives for innovation. Neither the resources devoted to innovation nor the way in which those resources are allocated is likely to be socially optimal. Hence, there are potential benefits from a well-designed innovation policy.

What not to do

The first problem in innovation policy is to stop doing things that are clearly counterproductive. Throughout the period of collaborative innovation, the main thrust of reform in innovation policy has been actively counterproductive though, fortunately, largely ineffectual.

The key idea of this policy thrust has been 'strong intellectual property', the idea that all kinds of ideas, modes of expression and technical processes should be subject to unfettered private ownership, through devices such as copyright, patents and licensing. Limits on the duration of of such rights have

been attacked through extensions in the term of copyright and through devices such as evergreening.

The supposed justification for these measures was initially to encourage innovation by allowing innovators to reap rewards through exclusive rights to exploit them. While economists have given some support to this idea, they have pointed out that these incentive benefits must be traded off against the social costs of monopoly rights. As was shown by the *amicus curiae* briefs in the case of *Eldred v. Ashcroft* 537 U.S. 186 (2003)[6] economic opinion is virtually unanimous in the view that the balance has been shifted too far in the direction of intellectual property. Economists increasingly stress the public good nature of information and the benefits to be derived from such processes as open source innovation.

In the absence of strong economic arguments, advocates of strong intellectual property have relied heavily on legal and ethical claims, essentially based on the assumption that since patents and copyrights are called 'intellectual property' they have the same status as ordinary property rights over goods. The familiar advertisementts in which 'stealing' (actually copying) a video clip is compared to stealing a car are an illustration of a simile that can be extended to almost any intellectual activity over which someone seeks to exert a property claim.

Strong intellectual property regimes represent an obstacle to network innovation. The problem is most obvious in relation to amateur and open-source innovation, which has played a central role in the development of the networked economy. Amateurs have little or nothing to gain from intellectual property rights and are correspondingly unwilling, and often unable, to pay others for the right to

[6] One such brief was signed by 17 economists, including five Nobel Prize winners, and covering a wide range of viewpoints from interventionist to strongly free market. The full list is: George A. Akerlof, Kenneth J. Arrow, Timothy F. Bresnahan, James M. Buchanan, Ronald H. Coase, Linda R. Cohen, Roy T. Englert, Jr, Milton Friedman, Jerry R. Green, Robert W. Hahn, Thomas W. Hazlett, C. Scott Hemphill, Robert E. Litan, Roger G. Noll, Richard Schmalensee, Steven Shavell, Hal R. Varian, and Richard J. Zeckhauser. The brief is available at http://cyber.law.harvard.edu/openlaw/eldredvashcroft/supct/amici/economists.pdf

use patented or copyright items that derive much of their value from the collective contributions that make up the network.

Even in for-profit enterprises, intellectual property rights such as patents are widely seen as a barrier to innovation. The ease of filing patents on ideas that are, at most, minor variants on existing techniques means that even simple steps to improve software run the risk of infringing on intellectual property. On the other hand, the actual revenue that can be obtained by licensing intellectual property is typically modest at best.

Formal and informal systems of patent pooling overcome many of the problems. Innovative firms can make use of the ideas of others, while sharing their own ideas. However, this system has been undermined by the recent emergence of 'patent trolls', firms that specialise in accumulating patents and suing actual innovators for (often highly dubious) infringements in the hope that their victims will prefer to pay to settle cases rather than put up with long-running disruption and legal costs.[7]

Fortunately, it appears that the push to strengthen intellectual property is failing. The most prominent instance of patent trolling, the SCO Group's attempt to assert ownership over Unix and Linux code, an action financed by Linux rival Microsoft, ended in failure on all points and bankruptcy for SCO.[8] Courts have become less willing to sustain patent claims.

Social attitudes have similarly changed. The majority of people routinely violate copyright and licensing prohibitions, such as prohibitions on 'ripping' CDs to digital media. Recent attempts to strengthen copyright law in Canada have provoked strong opposition, particularly among younger and more highly educated voters (Angus Reid Strategies 2008).

Provisions of the US-Australia Free Trade Agreement that strengthened intellectual property rights were similarly controversial. The Australian government was forced by public opposition to amend the legislation implementing the Agreement in order to restrict patent evergreening and protect

[7] http://en.wikipedia.org/wiki/Patent_troll

[8] The case is documented in detail at Groklaw http://www.groklaw.net/

its ability to purchase pharmaceutical products at low cost under the Pharmaceutical Benefits Scheme.

Finally, and most importantly, the emergence of alternatives to strong intellectual property such as open source software and the Creative Commons license has changed the default assumptions under which innovation takes place. The volume of material available under explicit Creative Commons conditions has grown massively. More generally, despite the legal presumption, introduced in the United States in the 1970s, that published material is automatically subject to copyright, the norm of free sharing has emerged as the default presumption for items published on the Internet. Attempts to restrict access to paying subscribers, or to prevent republication have largely been abandoned as counterproductive. Such restrictions discourage the inward links that are crucial to high rankings from search engines such as Google.

If strong intellectual property, often presented as the market model for innovation, is undesirable, the polar opposite of central planning is no more appealing. Attempts to predict and control the path of network innovation have proved ineffective at best, and counterproductive at worst. The fiasco surrounding attempts to manage the shift to digital television in Australia (Lebihan 2001) provides one of many examples.

6. Some general principles

It is impossible, at this stage, to formulate a detailed policy program for networked innovation. However, some general principles and policy directions can be indicated. First, it is necessary to encourage creativity in all its forms. Since the outcomes of creativity cannot be prescribed in advance, policies to encourage creativity must rely on providing space for creativity, including access to the necessary resources, free time for creative workers to pursue their own projects and the communications networks necessary to facilitate creative collaborations.

The coalescence of technical and cultural innovation suggests the need for a hybrid between models of support for scientific research and technical

innovation and those that have been used to promote cultural innovation, particularly in the creative arts.

Another important direction of support for network innovation is that of public contributions to the commons. Moves to extend claims for intellectual property over publicly-funded creative works should be abandoned and replaced by a commitment to make all such work available either as part of the public domain or on free-sharing conditions such as those of the Creative Commons license.

Public cultural institutions such as the Australian Broadcasting Corporation (ABC) have long played a major role in supporting the public good model of creative production. This model needs to be extended. Gruen (2008) provides a number of useful suggestions, beginning with the development of a freely accessible archive on the World Wide Web, and continuing with suggestions of ways in which the ABC could help to develop the resources of Web 2.0 and community broadcasting.

Much of this seems like common sense. However, the required measures run directly against some of the main policy directions associated with the dominant policy reform movements of recent decades, including market liberalism (also called neoliberalism or, in Australia, economic rationalism), managerialism and the 'new public sector management model'. The policy reforms associated these movements are characterised by increased reliance on incentives, accompanied by an increased focus on accountability, and measurement of outcomes against objectives determined by strategic planning. The implied goal is to match the outcomes of an idealised competitive market, either through actual privatisation or through the adoption by the public sector of practices which deliver market-like outcomes.

In view of the collaborative, creativity-driven character of network innovation, such policies are likely to be at best ineffectual and at worst actively counterproductive. Nevertheless, they are deeply embedded in the thinking that surrounds policy formulation in Australia and elsewhere.

7. Looking ahead

The convergence of information technology and telecommunications has brought about radical changes in the process of cultural and technical innovation. These changes are likely to continue, and even accelerate, in the future.

Innovation policy must change in response. The 20th century model in which publicly-funded pure research was converted into commercial products through corporate research and development is no longer adequate. Innovation facility must facilitate and support amateur, collaborative, networks that generate both technical and cultural innovations driven, in large measure, by non-monetary concerns.

As technical and cultural innovations are increasingly intertwined, cultural policy must be aligned with innovation policy. The ultimate object should be a creative society, in which opportunities for cultural, technical and social innovations are open to all.

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