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The Economics of New Media

The rise of New Media associated with the Internet has radically changed many aspects of daily life, and enabled us to do things that would have seemed unimaginable even a few decades ago. The speed and volume of communications has increased by a factor of a million or more since the Internet first emerged in the 1990s, and there has been a corresponding proliferation of information.

Yet the economic implications of New Media are hard to discern. The famous observation of Robert Solow (1987) that 'You can see the computer age everywhere but in the productivity statistics' is just as valid today as it was when he first made it more than twenty years ago.

The age of new media has produced only a handful of profitable new companies (Amazon and Google are the most notable examples). At the same time, while old media (newspapers, TV, radio) have proved more resilient than many observers expected, their business models have been severely undermined.

This chapter will discuss what economics can tell us about New Media. More interestingly, perhaps, at least to those concerned with the long-term impact of New Media, it will examine the implications of New Media for economics and economic organization, and offer some policy recommendations.

What can economics tell us about new media?

All media convey information. However, it is worth considering McLuhan's gnomic observation that 'the medium is the message'. For old media, and particularly broadcast mass media, information content is subordinate to the media product as a whole. As a result, economic analysis of old media can treat its outputs in much the same way as consumer goods, except for the fact, discussed below, that the provision of old media is typically financed by advertising rather than direct sale.

By contrast, with new media the flow of information is overwhelmingly dominant. Considered as media products, the output of new media is commonly of lower quality than that of old media (compare YouTube to broadcast TV, or

blogs to glossy magazines). What makes them so appealing is the vast profusion of information of every possible kind.

So, an economic analysis of new media must begin with the economics of information and, in particular, with the idea of information as a public good.

Information as a public good

The idea of a public good, due to Samuelson (1954), is central to modern economics. In the absence of public goods (broadly defined to include public bads, such as pollution, and related concepts such as 'natural monopoly') a competitive economy will produce the best possible outcome consistent with any given distribution of income. In this situation, the only role of government is to allocate, and then to enforce, property rights. Further, there is no need for non-market institutions such as clubs or non-government organizations. When public goods are present, everything changes. Market prices can no longer be relied upon to give a reliable guide to the allocation of resources.

Non-rivalry

A public good is defined by two characteristics: non-rivalry and non-excludability. The more important is non-rivalry, which means that consumption of the good by one person does not affect its availability for others. Once a non-rival good has been produced, it is socially undesirable to prevent anyone who wants to from consuming it — their consumption benefits them, and does not harm anyone else. A 'pure' public good has the happy property that it is non-excludable, so that it is impossible to prevent anyone from consuming it once it has been produced. It is also logically possible to consider goods that are rival in consumption, but not excludable. Unless the population of consumers is small, such 'open access' goods are typically exhausted or degraded very rapidly, and therefore tend not to be observed.

Information is an almost perfect example of a pure public good. It is completely nonrival and largely nonexcludable. Nonrivalry means that, once produced, information can be used by as many people as can gain access to it, without reducing its availability to others. The crucial development of the Information

Revolution has been to reduce the cost of distributing information, in many cases effectively to zero. Non-excludability means that it is hard (though not impossible) to make information available to some users while excluding others. The crucial development here is the ease with which information can be reproduced.

Most public goods are local in some sense. The usual textbook examples of a pure public good include national defence and protection against floods, both of which apply only to the nation or river basin being protected. Public goods are also, in most cases, time-specific. Services (for example, fireworks displays) are commonly consumed simultaneously with their production, while physical goods depreciate.

By contrast, information is naturally global and timeless in its non-rivalry. Once information has been discovered, it is available for all time and in all places. The words of Homer are still available to us, despite the thousands of years and (for Australians) thousands of kilometres that separate us from the courts of ancient Greece. Our inheritance from the past consists, ultimately, of information (technology and culture) rather than physical goods.

Not only is information non-rival, but are positive externalities from sharing information. As information is used or transmitted, it is refined and modified in various ways. Both conscious elaboration and the quasi-evolutionary processes that produce what Dawkins calls 'memes' (others might prefer terms such as 'folk tradition') allow information to be transformed into more useful or memorable forms through the very process of use.

Non-excludability

The second crucial characteristic of a pure public good is non-excludability. That is, if the good is provided at all, it is available to everyone. The classic example is defence against foreign invasion. If some particular region is protected from invasion, all the inhabitants of that region are protected.

Information is potentially excludable. The simplest exclusion procedure is secrecy. If I discover something and tell no-one else, the information remains a

private good. The same is true if information is passed on to a selected group (paying customers, for example) under the condition that they keep it secret. But, the more people that are in on a secret, the harder it is to keep. And even if I tell no-one, I may reveal my information by acting on it. For example, if I know that a company is going to announce an increased profit, I will naturally wish to keep the information to myself. But if I act on it, by buying shares, the price will go up, and others may guess what I have discovered.

More interesting in the present context are legal and technical devices to keep information private. The main legal devices are institutions such as copyright and patent laws which allow the owner of information (the original creator or someone who has acquired their rights) to take action against anyone who uses it without their permission.

The critical factor, in the end, is technology. Where information is hard to reproduce, it is relatively easy to protect. When manuscripts had to be handwritten, it was easy enough to control what was written. Similarly, in the early days of film, it was sufficient to keep control of a small number of copies distributed to cinemas. Over time, however, the general tendency has been to make both reproduction and dissemination of information easier. In the case of music and video, copying technology first became available to households with audio and video tape machines. Attempts by copyright holders to suppress or tax home copying proved unsuccessful.

Copying on a much larger scale became feasible with the Internet. While many consumers, from a variety of motives, continued to purchase CDs and DVDs, unlicensed copies were distributed on a large scale, Ferocious attempts at enforcement of copyright law proved largely unavailing. Moreover, these attempts created substantial political problems for the main industry associations (the Recording Industry Association of American and the Motion Picture Association of America) in cases such as the prosecution of a poor single parent for downloads apparently made by her children.

For a time it seemed that the whole industry model of sales of music and video might be in jeopardy. However, by reducing the transactions cost of online

purchases, and the price of the product, Apple's iTunes was able to create a viable market in downloadable MP3s, which attracted competitive entry from Amazon and others. Nevertheless, total music industry revenue has continued a downward trend. Many musicians have now moved to a model in which music is distributed freely, with the aim of building paying audiences for live performances.

Property rights and pricing

The system of property rights in market societies is based on private property in private goods that is, goods that are rival and excludable in consumption. There is a natural fit between these concepts, which sometimes obscures the fact that private property is a right created and ultimately enforced by law, while the economic concept of private goods relates to the properties of the good in question. So, not all goods that are rival and excludable are subject to property rights.

Conversely, public goods such as information may be the subject of property rights, most notably in the form of 'intellectual property' rights such as copyrights and patents. Enforcement of such rights typically involves the imposition, after the fact, or penalties for reproducing information without the consent of the owner of the rights. Their feasibility depends, to a large, extent on the existence of limits on the technology of reproduction

Even where the enforcement of strong intellectual property rights is feasible, it is commonly not socially desirable. The creation of intellectual property rights provides an incentive to generate new ideas, or at least ideas that are sufficiently distinctive in their formulation to attract intellectual property protection. But the enforcement of these rights means that use of the ideas in question is restricted, even though, since ideas are non-rival, there is no a social benefit to unrestricted use.

Economists have examined the trade off between the costs and benefits of intellectual property protection and have concluded, in general, that the costs of strong forms of intellectual property protection outweigh the benefits.

Another view of the trade-off is reflected in the famous observation of Stewart Brand (1987) that:

> 'On the one hand information wants to be expensive, because it's so valuable. The right information in the right place just changes your life. On the other hand, information wants to be free, because the cost of getting it out is getting lower and lower all the time.'

This quote frames the debate on the pricing of Public Sector Information. Much of the time, only the point that 'information wants to be free' is quoted. In some ways, this is appropriate — all economic goods and services are costly to produce, and therefore 'want to be expensive'. By contrast, only non-rival goods, of which information is the paradigm example, 'want to be free'.

But the term 'free' is itself ambiguous in English. Information can be 'free as in speech' that is, available for access, downloading and modification, without being 'free as in beer', that is given away for no charge, as is implied in the phrase 'free beer'.[1] The terms *libre* and *gratis* are often used to refer to this distinction.

Advertising

In the absence of explicit charges, the primary way of funding the 'free' provision of information through public media has been advertising. Mass media typically offer a package in which advertising is interspersed with information content, in such a way that it is difficult to consume the content without being exposed to the advertisements. So, it is not necessary to exclude consumers who are unwilling to pay.

Economists are divided both on how best to represent advertising in economic models, and on how to evaluate its effects. A traditional approach distinguished between advertising that is informative (Product X has property Y and sells for price P") and advertising that is persuasive, aiming at changing tastes (Things

[1] The juxtaposition of free beer and free speech is attributed to Richard Stallings, quoted in Gay (2002).

go better with Coke). This is problematic, since even pure statements of information can be (and usually will be) selected to promote the case for buying the product in question. On the other side of the distinction, the fact that consumers are willing to pay a premium for high-status brands, even when they are fully aware that a cheaper alternative may have the same objective properties, suggests that messages of the form "this product has high status for the group to which you (wish to) belong" are in fact informative.

A more modern approach (Becker and Murphy 1993) avoids the question. Advertising for a good or service is treated simply as a secondary service complementary in consumption with the good or service in question. Here 'complementary' means that consuming one encourages you to consume the other, in the way that free salted peanuts in a bar might encourage patrons to drink more beer.

In the Becker–Murphy approach, the value or otherwise of advertising may be evaluated in terms of whether consumers choose to consume it. In this respect advertising runs a spectrum. At one extreme are advertisements that consumers are willing to pay, or at least make a positive choice, to consume, such as "Trading Post" style magazines and their online equivalents. At the other are those consumed involuntarily such as billboards, direct marketing, and so on. On a Becker analysis, advertising of the first class is socially beneficial, while that of the second class is not. This distinction coincides in broad terms, but not exactly, with the older distinction between informative and persuasive advertising.

Media advertising falls between these extremes and is characterized by a spectrum of its own. Special-interest media (such as magazines) are commonly concerned with marketed activities, goods and services associated with the interest in question, and may be purchased as much for the advertising as for the editorial content. By contrast, television programs are aimed at a mass audience with disparate interests, with the result that consumers of the program would typically prefer not to consumer the associated advertising. A variety of techniques, from careful use of timing to product placement within the program are used to overcome this reluctance.

New media shifts activity along the spectrum in several ways. First, because of the unbounded profusion of the Internet, special interest media have expanded at the expense of, though not to the exclusion of, mass media. This encourages more narrowly targeted advertising which is more likely to be informative and desired by consumers. Second, the development of new media has made it easier for consumers to avoid advertising they don't wish to see. The early years of the commercial Internet were marked by increasingly intrusive attempts to force ads on consumers' attention (spam, popups, popunders and so on), but technological blocks and adverse consumer reaction have killed most of these. So, advertisements must be at least reasonably desirable.

The third, and perhaps the most important development has been the central role of search engines, and Google in particular.

Network economics

In recent decades economists have devoted a lot of attention to the economics of networks. Some of this literature has explored territory already familiar to sociologists, dealing with networks involving relatively small numbers of individuals, and focusing on the topological structure of the pairwise links between them. These ideas have been applied to questions such as the extent to which links between blogs reinforce or undermine ideological divisions between the left and the right.

More significant in relation to the dynamics of new media is the notion of network externalities. The central point is that the value of a communications network to its existing users increases as new users are added - there is no point in owning the only telephone in town. We can give this benefit a simple mathematical formulation. In a network with n members, there are $n*(n-1)$ possible one-way connections, since each member can in principle connect with all the others. A new user gets the benefit of potential connections with all the existing members of the network, but also creates an additional connection available to each other user. It is this latter effect that creates the externality

Network externalities aren't always positive. Connections may be unwanted (spammers) or the number of possible connections may make it impossible to find those that are actually desired. The first problem is real, but generally seems manageable through constraints of various kinds imposed on network abusers. The second creates room for a substantial industry of intermediates including directories, search engines and so forth. Often, though not always, these have proved sufficient to overcome the negative effects of network size leaving the positive effects dominant.

If the problems associated with increased network size can be overcome, network externalities create incentives for rapid growth, as we have seen in the case of the Internet as a whole, and in specific networks such as the blogosphere and Facebook.

The 'walled garden' concept was inherent in early private sector online services, the most prominent of which was CompuServe. These companies offered dialup access to a proprietary network, with its own interface, offering a range of services such as email, discussion forums and access to online applications.

Although highly successful in the 1980s, commercial online providers found it impossible to compete with the appeal of the Internet, and particularly the World Wide Web which emerged in 1991. By the late 1990s, most had disappeared. The only successful response was that of AOL (formerly America OnLine) which, rather than competing with the Internet, sought to join it.

AOL attempted, with some success, to transfer the "walled garden" concept to the Internet. The central idea was to allow its customers full access to the Internet, but to encourage them to remain, as much as possible, within the AOL online community. This strategy was designed to produce a group of 'locked-in' consumers, who would be unwilling to switch to cheaper Internet service providers and to increase the appeal of AOL to advertisers.

A weaker version of the "walled garden" concept was that of the "web portal", a website designed as the first point of access to the Internet for users, exemplified by Yahoo.com.

In the end, neither AOL nor Yahoo succeeded in convincing users to remain within their walled gardens, though both are still in business, unlike the vast majority of their would-be competitors.

Although the opening up of walled gardens has sometimes been seen as inevitable, Lessig (1999, 2001) argues that the emergence of open or closed systems is the result of political, legal and commercial choices, and that there will always exist substantial pressure towards closed systems, because of the potential for profitability.

The walled garden concept appeared, by 2005, to be dead. However, in confirmation of Lessig's view, it has reappeared with the rise of Facebook (opened to the general public in 2006) and Twitter. Apple's iOS for the iPhone (launched in 2007) and iPad (2010) represent a different version of the walled garden.

What does an information economy mean for economics?

In principle, mainstream economic theory has the tools needed to describe information as a particularly pure public good, characterized by network externalities. In practice, however, most economic analysis is undertaken on the assumption that public goods are peripheral features of an economy in which most economic activity is based on the production, processing, distribution and sale of physical goods (excludable and rival almost by definition) and, to a lesser extent, of marketed services. An analysis based on information as the primary driver of economic activity, as is needed in an information economy, will be radically different.

Information, scale economies and endogenous growth

Analysis of economic growth has traditionally focused on the accumulation of the physical factors of production - land, labor and capital (machinery and buildings). By the mid-20th century, however, it became apparent that an analysis of this kind could explain only a relatively small part of the growth in economic output and ultimately in living standards. Moreover, ever since the 19th century, economists had struggled with a paradox. For a given population

and supply of land, the well-established law of diminishing marginal returns implied that additional investments in capital would produce smaller and smaller increases in output until the economy ultimately reached a stationary state. However, experience showed (or seemed to show) that growth could continue indefinitely, with no obvious tendency to slowdown. Something was missing.

It was soon recognised that the 'missing factor' was technological progress, and models of economic growth were adjusted to include technological progress. This change allowed economic models to fit the observed data, but it did not really add any explanatory power. Technological change appeared as an exogenous deus ex machina, not affected by economic outcomes. But as Arrow (1962) observed, technological progress and the inventions and discoveries on which it rests are the product of economic activity.

Although various attempts were made to capture this insight in models of economic growth, the crucial advances were made in the 1980s with the development of 'endogenous growth theory' ('endogenous', as opposed to 'exogenous' means that technological progress is explained within the model rather than being imposed from outside). The most important observation was that, unlike labour and capital, information is a public good. That is, the use of information by one person does not reduce its availability for others. On the contrary, the more information is used, the more it is refined and extended.

This observation points the way to resolution of the great paradox that had bedevilled growth theory. The law of diminishing returns applies on the assumption that the economy as a whole is characterized by constant returns to scale; that is, if the inputs of land, labor and capital are all doubled, so is total output. The idea is simple. With a doubling of all inputs, each worker has access to the same amount of land and capital and so can produce exactly the same amount as before. Since there are twice as many workers, total output is doubled. More generally, if all inputs increase proportionally, output increases in the same proportion. The law of diminishing marginal returns now follows. If

only one input, such as capital, increases, output must decrease less than proportionally.

By contrast, since information is a public good, production based on information displays increasing returns to scale. If there are twice as many workers, and twice as much information, each worker has twice as much information to work with. So each worker will produce more, and with twice as many workers, output will more than double.

This insight is of fundamental importance in understanding technological progress in an information economy. Unfortunately, economists did not spend a lot of time thinking about it. Instead, they were concerned to show that the increasing returns to scale were consistent with steady economic growth, rather than an explosive acceleration producing what Kurzweil and others refer to as 'The Singularity'. Romer and others showed that, as long as new knowledge had to be produced by a commercial R&D sector, endogenous growth models could produce steady rather than explosive growth. Attention in the literature then turned to issues of industry structure that need not concern us here.

The shift of attention in endogenous growth theory left unexplored many crucial questions about the production of information and iits implications for the economy.

Household production and monetary incentives

One of the striking features of Web 2.0 and the associated technological developments is the extent to which crucial contributions have been made without any direct, or, in many cases, indirect, financial reward. The most striking example is surely the Wikipedia project, where an almost entirely voluntary effort has generated, in many different languages, the most comprehensive encyclopedia ever produced. But there are many more such examples, such as the Gracenote music database, a commercial enterprise which provides automatic identification of music tracks on CDs, a service valuable to anyone using software such as iTunes. All the information is uploaded by users cataloging their own collections.

Many different motives explain contributions to amateur collaboration (Raymond 1998, Quiggin 2006, Hunter and Quiggin 2008). 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 notes the absence of monetary side payments in the case of car-pooling and this is typical of co-operative endeavors of various kinds. There is a strong desire to keep money out of this kind of activity, except where there is necessary interaction with the monetary economy (for example, car-poolers contributing to tolls, bloggers sharing the costs of hosting services and so on).

The observation that financial motives may conflict with other motives has been discussed at length in the literature on motivational crowding out. However, this literature has focused on the conflict between monetary payment and altruism, where the incompatibility between motives is seen as being more or less self-evident. In view of the variety of motives associated with contributions to amateur collaborative content and innovation, it is necessary to consider when and why motives are going to be complements (mutually reinforcing) or substitutes (leading to crowding out).

One possible approach to this question is to consider the extent to which particular combinations of motives, such as altruism and self-expression are psychologically consistent or inconsistent. As we have observed, the evidence seems to suggest that a wide variety of motivations are potentially compatible. The problematic nature of monetary motives seems hard to analyze in purely

psychological terms. Rather, it is necessary to consider the social context of monetary interactions.

Monetary interactions naturally give rise to rational calculus of action that is a set of rules, based on a fundamental principle, such as profit maximization, which potentially govern all behavior in the relevant domain. . Rational systems of action may be contrasted with heuristic guides to action that applies under particular (not necessarily well-defined) circumstances. In general, a range of heuristics, associated with different kinds of motivation, can co-exist. By contrast, a rational calculus naturally tends to crowd out both heuristics and alternative rational systems.

At a superficial level, it is apparent that people act differently, and are expected to act differently, in the context of relationships mediated by money than in other contexts. Behavior that would be regarded favorably in a non-monetary context is regarded as foolish or even reprehensible in a monetary context.

One of the most important general differences relates to rationality and calculated reciprocity. In a non-market context, careful calculation of costs and benefits and an insistence on exact reciprocity is generally deprecated. By contrast, in market contexts, the first rule is never to give more than you get.

Why is it more important to observe this rule in market contexts? One reason is that markets create opportunities for systematic arbitrage that do not apply in other contexts. In an environment where trust is taken for granted, a trader who consistently gives slightly short weight can amass substantial profits.

If trading partners assume honorable behavior, none will suffer enough to notice. This is much more difficult to do in ordinary social contexts.

Similar points can be made about other motives. There are a whole range of sales tricks designed to exploit altruism, friendship, desire for self-expression and so on. Hence, to prosper in a market context, it is necessary to adopt a view that "business is business," and to (consciously or otherwise) adopt a role as a participant in the market economy that is quite distinct from what might be conceived as one's "real self."

Policy implications

Undersupply

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.

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.

Intellectual property

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.

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 advertisements in which 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 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.[2]

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.[3] 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).

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

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[2] ***http://en.wikipedia.org/wiki/Patent_troll***

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

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.

Creativity and public cultural institutions

It is difficult, 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 (creative) 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.

The opportunities and challenges created by the Internet-based information economy are both complex and potentially radically transformative as they relate to cultural institutions such as galleries, libraries, archives and museums (acronymically, the GLAM sector), not to mention botanical and zoological gardens, and performing arts bodies.

Concluding comments

To paraphrase Solow (1987), we can see the impact of new media everywhere but in the market economy. The transformations under way as a result of the development of new media have had relatively little impact on standard measures of economic activity. Whereas previous waves of technological innovation saw new companies rise to the forefront of economic activity, the age of new media has been more notable for spectacular collapses than for durable successes.

Economic theory provides many of the tools needed to understand new media. HOWEVER, consistent application of these tools would lead to a radical transformation of the way in which we understand the economy, which would in turn call forth substantial changes in economic policy. This process of change has barely begun.

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