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The value of Public Sector Information for Cultural Institutions

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'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 from Stewart Brand frames the debate on the pricing of Public Sector Information. But the term free is itself ambiguous in English. Public Sector 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.

In economic terms, the cost of getting information from providers to users may be separated into several parts. The first, declining rapidly is the marginal cost of transmitting and receiving existing information. The second, also declining rapidly is the cost to users of identifying and locating potentially useful information.

The third, and a central focus here, is the cost of the transaction in which information is transferred. This cost will depend crucially on whether information is provided freely (in both the *libre* and *gratis* senses) or subject to restrictions and requirements for payments. Beginning with the work of Coase (1937, 1960) and Williamson (1979, 1999) economists have increasingly recognised the centrality of transactions costs in determining feasible, and socially desirable, modes of economic organisation.

The central finding of this project is that, under the conditions created by Web 2.0, making information effectively freely available (*libre*) generally requires that it be provided free of charge (*gratis*). As the costs of disseminating and accessing

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

information have declined, the transactions costs associated with charging for access to information, with the concomitant requirement to control subsequent redistribution have come to constitute a major barrier to access in themselves. As a result, the case for free (*gratis*) provision of Public Sector Information is even stronger than has already been recognised.

From the transactions cost perspective, it is equally important that the provision of information should not be burdened with unnecessary restrictions on use, such as those associated with standard copyright. A good default choice, which provides for free (*libre*) use, protects this freedom in reuse and is consistent with free (*gratis*) is CC BT. Where the promotion of free sharing is actively desired, CC Share Alike, which requires all subsequent use to be copyright-free may be preferred.

Quiggin http://johnquiggin.com/index.php/archives/2005/07/20/the-creative-commons-as-a-default-rule/ notes

> The ideas I've associated with default rules are commonly, but not, I think, very helpfully, discussed in terms of the supposedly 'viral' nature of licenses, particularly in relation to software and the Gnu General Public License. The idea of a default rule clarifies what is going on here. You can only have one default. At one time this was public domain (since it was necessary to make a specific claim for copyright). Now it's copyright, and advocates of strong IP take this as normal and natural. But if you want to use GPL or CC material with a share-alike license you have to adopt this default. From the viewpoint of people who take copyright as natural, but see CC material expanding, this is like a virus.

Information as an economic good

Information is a special kind of economic good, and the information collected, produced, stored and disseminated by cultural institutions is a special kind of information; in fact, cultural institutions deal with a variety of kinds of information associated with media and physical artefacts. Economists and policymakers have struggled to understand the economic role of information and its implications for public policy in education, innovation and cultural policy, not to mention the policy process itself.

The rise of the Internet and related technologies for distributing, storing and transforming information has radically transformed many information-related activities, while leaving other parts of the information economy largely unaffected. Huge areas of activity have grown from nothing in the space of a few years, with the most spectacular examples including 'Web 2.0' developments based on user networks such as Wikipedia, Facebook and the blogosphere.

The rise of the Internet has invalidated many of the background assumptions made in discussions of the information economy. For example, it is widely supposed that any Internet-based version of the services historically provided by newspapers must be supported by a viable 'business model'. No such model has yet become apparent, but Internet sites and network providing news, opinion, and discussion of issues such as sport, fashion and family life have nevertheless proliferated. The quality of the material presented in this sites ranges from abysmal (incoherent rants and reckless untruth) to specialist coverage superior to anything previously accessible to the general public, and much more up-to-date than the academic journal literature (the 'psephblogs' covering opinion polling data provide an excellent example)

Any analysis of the information economy must begin with a careful reconsideration of the applicability or otherwise of existing models and a broader and more sympathetic understanding of human motivation, than the simple

model of narrow self-interested that has served economic analysis (often, though not always, quite effectively) in the past. Hunter and Quiggin (2007) discuss a wide range of possible motivations.

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. Even though the challenges cannot be ignored, the opportunities are by far the biggest news. Most obviously digital technologies can radically reduce the costs of disseminating cultural information through the internet – but this is implied in 'Web 1.0'.

Web 2.0 opens up wider vistas. It enables GLAM institutions to combine information from different sources, generically referred to as 'mashups', or to release their content so as to release their content so as to enable and invite others to mash the data up. And it enables them to access the enthusiasm, labour, experience and even the artefacts of volunteers within the community as the Powerhouse did when lodging its own digitised photographs on Flickr to receive an avalanche of contextual commentary and contributions in kind from the public.

On the other hand, processes such as digitisation can involve substantial fixed costs. These add to the costs of the traditional mission of GLAM institutions, based on the collection, storage and management of physical collections, and are being incurred in conjunction with sustained financial stringency in the public sector, reflected in the routine application of 'efficiency dividends' to public sector budgets.

In these circumstances, it is important to consider how best to maximise the value of the information embodied in GLAM institutions, taking account of the

need to finance both collection and maintenance of physical collections and the cost of digitisation.

Information as a public good

Information is commonly analysed as a public good, like air quality. The crucial characteristics of a public good are non-rivalry and non-excludability (Samuelson 1954).

Non-rivalry means that consumption of the good by one person does not reduce its availability for others. So, in the case of improved air quality, the benefit to me does not detract from the benefit to you. This property distinguishes public goods from other goods and services that are commonly provided by the public sector, such as education services. If my child is given a spot in a given class, the same spot cannot be provided to your child, except by providing additional resources.

Non-excludability means that, if the good is made available to some, others cannot be prevented from consuming it. Air quality is non-excludable in this sense, since if the air is clean, it is clean for everybody. However, few goods are perfectly non-excludable. In general, public good analysis is applicable whenever the costs of excluding consumers exceed the possible benefit (typically the amount they could be induced to pay).

Information is strongly non-rival. In fact, the more people who are aware of a given piece of information, the more likely others are to become aware of it. On the other hand, information is, to some extent, excludable. Most obviously, 'keeping a secret' consists precisely in excluding others from information. Under some circumstances, information can be confined to a group of paying customers through the use of legal and technological restrictions. However, as the number of people who are aware of a secret increases, so does the likelihood of a 'leak' to unauthorised outsiders.

The effectiveness of technological restrictions on information transfer has declined steadily as the ease of reproducing information has increased. Responses such as copy protection have been, at best, partially successful. Attempts have been made, with limited success, to adapt legislation and taxation schemes to the advance of technology.

The development of the photocopier and the adoption of policy responses such as Statutory License Schemes were one manifestation of this process. Similarly, the use of audiotape and videotape was met with private copying levy. Legislation to create such a scheme was passed in 1989. However, this legislation was declared unconstitutional in Australian Tape Manufacturers Association Ltd v Commonwealth [1993] HCA 10; (1993) 176 CLR 480 (11 March 1993) .

Since then, the development of the Internet has meant that most kinds of information are effectively non-excludable. Information in almost any physical or electromagnetic form can be digitised at relatively low cost. Once digitised it can be reproduced and distributed to an extent limited only by the number of computers linked to the Internet. Legal constraints have proved largely ineffectual or impractical as the costs of legal enforcement are increasingly outstripping the benefits of so doing.

Information as an experience good

An experience good is a product or service where product characteristics such as quality or price are difficult to observe in advance, but which can be determined by consuming the good. The concept was developed by Nelson (1970) who distinguishes experience goods from 'search goods' for which characteristics are known in the absence of consumption. The standard theory of demand, in which preferences are well-defined and unchanging, implicitly assumes that all goods are search goods.

Information, particularly in the form of education, is an archetypal example of an experience good. Someone discovering new information cannot, in advance,

know how this information will change their beliefs about the world or their preferences[2]. Indeed, it may be argued that 'experience goods' are precisely those in which consumption of the good is bundled with the acquisition of information.

Further, if we believe that humans are generally reasonable beings, their preferences after the receipt of information will generally be better than those they had before. Where this is a relatively simple observation in the case of a specific piece of information – say whether a particular surgeon has a good bedside manner – it has deeper implications for education. For to simply describe the outcome of an education as simply changing preferences impoverishes our appreciation of what is at issue.

Just as we believe that years of formal education will generally transform lives for the better so cultural institutions form part of the network of cultural assets of an educated and continually self educating community. They hold the promise, both in their contribution to formal education and outside it, that our lives may be transformed in ways small and large *for the better*.

The network character of information

In general, consumption of goods and services can be analysed reasonably straightforwardly in terms of a vector of quantities, with each element representing the amount consumed of some good or service. To some extent this is true of information, and of the goods and services with which it is associated. For example, we can and do measure sales of books, visits to museums and galleries, expenditure on Internet connections and so forth.

But the actual value of information to any recipient of that information depends upon a complex set of connections with their knowledge of the world, determined

[2] This point needs to be qualified. For some kinds of information, such as a standard weather forecast, individuals will be aware of all possible outcomes, and can in principle know how they value any particular outcome. Hence, information about the outcome has the character of a search good. The Bayesian theory of information deals with this case.

by the information they have received in the past. So, for example, the experience of visiting an exhibition at an art gallery will differ radically depending on the visitor's knowledge of the history of art, the social context in which the artist worked, physical theories of light, colour and perspective and so forth.

Amateurs and volunteers

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.

A number of writers, including Raymond (1998), Benkler (2004), Quiggin (2006) and Hunter and Quiggin (2008) have discussed the range of motives, from gift exchange to norms of reciprocity to pure desire for communication that lead amateurs and volunteers to contribute to projects of this kind. What is most significant in the present context is the fact that the public good character of information, combined with the capacity for communication created by the Internet generates conditions that allow voluntary action to be effective in a myriad of ways that were never previously feasible.

In public sector contexts, where voluntary effort has largely been seen as a source of low-cost labour, to be channeled into areas where it does not compete with the activities of paid employees, the new role of voluntary activity presents a considerable challenge. In particular, in relation to public sector information,

any restriction on the way in which information is presented and used may forgo opportunities for voluntary efforts which may represent, and re-present, information in ways that were never considered by the original source.

In economic analysis, the potential for re-use may be regarded as a type of positive externality, that is a benefit that is not mediated by market prices. The standard policy response to positive externalities is the provision of a subsidy. So, the case for free provision of information is bolstered by consideration of amateur and voluntary activity.

Special characteristics of cultural information

The GLAM (Galleries, Libraries, Archives, Museums) sector is largely a product of the 19th century, or more precisely, Hobsbawm's (1988) ' 'long 19th century' from the French Revolution in 1789 to the outbreak of the Great War in 1914. Although collections of various kinds were put together from the Renaissance onwards, the idea of publicly funded and publicly accessible cultural institutions belongs to the long 19th century, as do many of the most prominent examples such as the Louvre (1793), Library of Congress (1800), the French National Archives (1790), and the British Natural History Museum (1859). During the 19th century, the GLAM sector developed a set of institutions, cultural associations and supporting professions that remained relatively stable throughout the 'short 20th century', from 1914 to the end of the Cold War in 1989.

The 19th century GLAM model was focused on a physical collection of objects, typically housed in an imposing and centrally located building. The core mission of GLAM institutions was to preserve and develop this collection, to present it in ways that helped to transmit national and global culture to the general public and to make material available for scholarly research. Although the collections

changed over time, and there were significant technological advances, the experience of the public in visiting a GLAM institution in, say, 1990, was not fundamentally different from that of 1900.

By contrast with this long period of relative stability, the past twenty years have seen radical changes. Two interrelated changes are particularly noteworthy. The first is the rise of the concept of 'creative industries', seen as a central source of innovation and growth in a post-industrial economy. Although this idea initial focused on the production of audiovisual media such as film, GLAM sector institutions are increasingly seen as central to the development of an active creative industries sector. This forward-looking view marks a radical change from an older view of these institutions as focused on the preservation and transmission of a cultural heritage from the past.

The second, of more central interest here, is the development of the Internet and the associated information economy. The crucial effect of the Internet is that, rather than being tied to discrete physical objects, such as books, musical records, films and so on, information has become (more or less) infinitely reproducible and transmissible.

The rise of the information economy has been a challenging, but generally welcome, development for libraries and archives. Although libraries and archives have an important role in preserving books and documents considered as physical objects, their primary focus has always been the information contained in these texts. The conversion of these texts to digital form, and the development of systems for searching and retrieving the information they contain, is a challenging and costly task, but one that clearly represents a significant advance in the core mission these institutions. Further, although initial costs are significant, digitisation offers substantial long-run cost savings, many of which are already being realised.

Consider academic journals as an example. Before digitisation, the task of locating, and obtaining a copy of an academic journal article based on some information about its author or contents was often difficult and time-consuming both for the information user and the library providing the information. Identifying the desired article would require physical access to a database such as the Social Science Citations Index, use of which often required skilled assistance or training. Having identified the article, it was necessary to locate the journal in the library catalog, and gain access to the relevant volume, which might often be mislaid or in the hands of another user. For items not held by the library concerned, it was necessary to resort to the slow and resource-intensive procedure of an interlibrary loan. Finally, the user needed to make a physical copy of the article, and store the relevant citation information.

Now compare the same task after digitisation. Users can connect to their library system from any location, search using a variety of powerful engines (with skills enhanced by daily use of a wide variety of Internet search techniques) and connect directly from search results to a repository such as JSTOR. They can then download the article, along with citation information, in a format suitable for a bibliographic database, and automatically place the PDF file of the article in a collection organised by year and author. The entire process, which would have typically taken at least an hour, and often much longer, in the pre-Internet era, can be completed in a matter of seconds.

Journal articles are perhaps the most striking example, but the digitisation of books and archival collections is proceeding apace, and is already reducing costs of access to a wide variety of library and archival material, as well as offering significant cost savings to libraries and archives themselves.

By contrast, for galleries and museums, physical objects are, and are likely to remain, essential. Catalog information and visual images may be placed on the Internet, facilitating users' search for items relevant to their interests. But

unlike texts, physical objects cannot easily be converted into digital information; rather users can obtain a partial description of the objects in question. And, given the heterogeneity of physical objects, many different systems of description will be required, and each will require specialised interpretative skills.

The result is that making descriptive information generally available on the Internet may increase the costs of information provision for galleries and museums. As the group of information users with access to descriptive information expands, the volume of demands for assistance will increase. Moreover, whereas regular users of the physical collection are likely to be familiar with classification systems and with the general characteristics of items of interest, the Internet provides access to users who may lack these skills.

It follows that models of Public Sector Information pricing based on the assumption that information, once generated, is a free good, may be inappropriate for the gallery/museum sector, or at least, may require more careful application than for providers of information in the form of text or numerical data.

Summary

The special characteristics of information as a good mean that standard economic measures of willingness to pay are of only limited use in assessing the value of information. First, the non-excludability of information means that it is typically impossible to require payment from all users of information, so that willingness to pay must be elicited indirectly. But, more importantly, the cumulative network character of information, reflected in the 'experience good' nature of information acquisition means that attempts to value any particular piece of information are futile, except in very specific cases where all possible values of information are known in advance.

The cost of information

Information 'wants to be expensive' not only because, as is noted in Stewart Brand's famous aphorism, 'the right information in the right place just changes your life', but also because information is costly to produce, manage and distribute. The need to finance the creation of information and the value of that information to the right users generate incentives to charge prices for access to information. These incentives must be set against the public good character of information.

The cost of information

The most obvious and often the largest cost of information is the cost of discovering or creating new information. A significant proportion of society's most valuable intellectual resources, and large quantities of physical capital are devoted to the tasks of intellectual, technological and creative innovation, all of which may be encompassed by the notion of creating new information. The financing of innovation is discussed below.

A further set of costs are involved in integrating new discoveries into an existing body of knowledge which can be broadly communicated through the education system and other processes. These costs like the costs of creating new information, are largely independent of the extent to which information is distributed. This category includes costs such as those incurred in the digitisation of the collections and catalogs of cultural institutions.

Finally, there are costs of distributing information. As Brand notes, the cost of distribution or 'getting information out' has declined to the point where, in many contexts distribution can be treated as being costless.

In many contexts, but not in all. Complex forms of information may require interpretation involving direct interaction between information providers and information users. For example, users of digital catalogs may require help from

librarians to understand the results of their searches. The costs of this interpretation process remain substantial.

Potential users of information also face a number of costs. First, there is the price, if any, paid to the owners or distributors of information. Second, associated with this price is a transaction cost, associated with making a payment, keeping records to demonstrate legitimate ownership, maintaining required passwords, and so on. Third, there is an access cost consisting of costs incurred in searching for, copying and storing information. Of these, the transaction cost and access cost components represent a net cost to society, while the price is a transfer to the information owner.

Historically, access costs for information have been high. In particular, these costs were commonly large in relation to any transactions costs incurred in the process of seeking information.

As an illustration, consider an example generated by reading the first article selected using the Wikipedia random search function (about the Battle of Okinawa in World War II). Consider an information seeker, prior to the Internet, who might, perhaps, have read a newspaper reference to controversy the presence of US troops on Okinawa, and sought to develop an informed opinion on the issue.

A general reference source, such as an encyclopedia, might have some information, but would typically provide only limited further references (leaving aside the fact that many information seekers might not have easy access to an encyclopedia). To gain further information, it would be necessary to visit a library, use a card catalog, and locate books on the topic, which could be borrowed or read in the library.

A more ambitious goal, such as the collection of a set of reference materials on the topic, would require manual transcription or use of a photocopier, along with development of a more or less efficient storage system. Going further, and

seeking to locate periodical and newspaper discussion of the issue would be a task requiring substantial research skills and weeks of effort.

Depending on the individual's value of time, and the pricing policies of information sources, these access costs might be large or small relative to the payment required to acquire information, for example by buying books on the topic, or by paying for access to commercial databases accessible through libraries. But, almost certainly, access costs would far outweigh any transactions costs associated with purchasing information.

The development of the Internet has reduced access costs to trivial levels. A simple Google search "Okinawa + US + troops", produces hundreds of useful references (as well as some that are less useful!), along with suggestions for further searches. Using the results of these searches, it would be possible, even for an individual with limited specialist skills, to assemble a large collection of useful information in a short period.

Given some background knowledge and expertise and an initial investment in research skills, (more modest that required in the pre-Internet period), the creation of a high-quality reference database on any topic is now a relatively straightforward undertaking. Indeed, the reduction in access costs has been so dramatic that the primary access cost for information is now the time required to read, view or listen to information that has been acquired at such low cost.

There are, it is true, some additional access costs associated with use of the Internet. There is no simple way of distinguishing reliable from unreliable information, comparable to the filtering that takes place when books and periodicals are collected by, for example, public libraries. Superficially appealing tests, such as the apparent professionalism of a website are more fallible than the comparable tests applied to traditional media, such as books and newspapers, where high physical quality is hard to duplicate.

However, relatively simple rules, such as confining searches to sites of known reliability, or favourably linked by sites known to be reliable, provide a filter at least as powerful as that available to readers of books and magazines. And given moderate caution, users of the Internet have access to far more sophisticated checks than those available before the rise of the Internet. For example, presented with the views of a putative expert source on, say, an environmental issue, in traditional media, readers or viewers have little to go on beyond the one-sentence description typically provided in such media presentations, which might indicate an obscure organisational affiliation.

By contrast with the decline in access costs, transactions costs have remained high and, arguably increased. Whereas older search technologies might have alerted information-seekers to the existence of a substantial body of information collected in a book, newer technologies point to a disparate variety of information sources. In the case of the book, the transactions cost of a purchase would normally be small in absolute terms, and relative to the purchase price. By contrast, if desired information is held in a large number of separate collections, each protected by a paywall the transactions costs associated with gaining access may be large.

Collection, maintenance and storage costs for cultural information

The long term social cost of information is dominated by the cost of collection, maintenance and storage of the data. In some cases, data is collected in the course of business,

The situation of cultural institutions such as galleries, libraries, archives and museums is rather different. In a general sense, these institutions have always been devoted to the collection, maintenance, storage and dissemination of information. However, in the past, this information took the form of physical

objects, such as paintings, books, documents and cultural artefacts. To make a representation this information available and information replicable at low cost, as is now feasible with digital data of all kinds, it is necessary to undertake a process of digitisation. This process will typically be more costly than the distribution of the resulting data on the Internet or through physical media such as compact disks.

For most Australian cultural institutions, digitisation has taken the form of an unfunded mandate. That is, digitisation has been added to the institutional mission, but no additional funding has been provided to cover the associated costs. On the contrary, since the mid-1980s, cultural institutions, like other government agencies, have been subject to continuous 'efficiency dividends', amounting, in cumulative terms to cuts in real funding of more than 30 per cent.

In principle, efficiency dividends are supposed to reflect cost savings in existing activities that can be used to fund the cost of new programs. On average across the public sector as a whole, the result is that government expenditure has grown broadly in line with national income. However, as the Parliamentary Public Accounts and Audit Committee has reported, this process has not worked well for smaller agencies, including cultural institutions.

The efficiency dividend policy does not apply, at least directly, to revenue, such as user charges and private sponsorship, derived from agency operations. Hence, the policy has (and is intended to have) the effect of encouraging agencies to seek and expand such revenue sources.

The absence of additional funding for digitisation, and the pressure for continuous reductions in expenditure on the traditional collection, maintenance and storage mission is, therefore, an important factor in determining the pricing policies of cultural institutions. Such institutions will typically be very reluctant to give up existing revenue sources in the absence of reliable replacement

funding, even if economic analysis suggests that free provision of information is likely to yield substantial net social benefits.

In the absence of additional funding, or the capacity to implement differentiated pricing systems (discussed below) cultural institutions face an inevitable trade-off between collection and access. That is, income foregone through free provision of access implies a reduction in the volume or quality of new material collected, or in expenditure on preservation, classification and digitisation of existing material. Focusing on the final point, in circumstances where access to digitised collections is free of charge, the rate of digitisation may be slower.

Thus users are faced with a choice between a more comprehensive digitised collection, subject to pricing and the associated transactions costs, or a less comprehensive collection available without such costs. The experience of unsuccessful attempts at imposing premium pricing for access to material such as the archives of the New York Times suggests for material aimed at Internet users in general, free distribution is likely to be preferred, even at the cost of comprehensiveness or specialised tools. However, specialist users of particular collections, who are also likely to have long-standing relationships with the institution concerned, may prefer the former option.

The value of information

There is a well developed theory of the value of information for the case when information is a search good, that is, when all possible values for information are known in advance. This theory, based on Bayesian decision theory, is applied most commonly in relation to weather forecasts. A simple exposition is given by Anderson, Dillon and Hardaker (1977). However, this analysis is of little value for the case when, as is almost invariably true in relation to cultural institutions, information is an experience good.

The hypertext-based Internet allows fundamental changes in the way in which text is used to communicate information. Similarly radical changes are gradually emerging in other media, through phenomena such as 'mashups' in which samples from a variety of media are combined, sometimes with the inclusion of original material, to produce new products. The aim may be informative, for example, combining a Google map with an Amazon database of books relevant to particular locations http://www.junglethingy.com/. Or the object may be the creation of new artistic works perhaps combining one work with an earlier influence as in this combination of a Hockney painting with a still from the film Milk http://towleroad.typepad.com/.shared/image.html?/photos/uncategorized/2008/12/16/hockneymilkmashup.jpg .

The price of information

The problem of pricing for public sector information may be considered in the light of the earlier discussion of financing for innovation. The general problem is one of financing the creation, collection and management of information in the public sector. In general, ex post payments such as prizes are not applicable here, so the primary choice is between direct funding from general revenue and the use of the proceeds of sales at prices that exceed the marginal cost of provision.

Differentiated pricing schemes

One possible response to the need for a balance between the benefits of free provision of information and the need for revenue to finance data collection and digitisation is the provision of differentiated information products. In part, such differentiation arises naturally under conditions of marginal cost pricing.

For example, the Australian Government Spatial Data Access and Pricing Policy offers three forms of data delivery: Online, Packaged and Customised. They are defined as follows:

- Online. Online data is made available for downloading by the user from the Internet.

- Packaged. A Packaged product is one that is provided with minimum processing, e.g. on a CD-ROM, resulting in a standard product that is produced in bulk.

- Customised. A Customised product is one where a significant amount of processing is required to meet the requirements of each client, resulting in an individually prepared product for each transaction.

And imposes the following pricing rules

- Online fundamental spatial data will be made available Free, as soon as appropriate technology becomes available within the custodian agency (typically, marginal cost in this case will be close to zero)

- Packaged fundamental spatial data will be made available at a price not exceeding the Marginal Cost of Transfer (typically, the cost of printing and delivery an additional CD_ROM or other packaged product

- Customised fundamental spatial data will be made available at a price not exceeding the Full Cost of Transfer, , which includes all the costs directly related to the customisation and distribution function (as opposed to collection, maintenance and storage of the data). Restrictions may be applied to the use of data supplied at Full Cost. Those restrictions may include the application of a royalty.

In view of the general analysis of marginal cost and free pricing provided in this report, the only point in this policy that requires further explication is the possible requirement for a royalty payment. Such a payment is not in general

consistent with a marginal cost pricing policy but may be justified where the distribution function as a whole incurs unallocated 'overhead' costs.

In addition to differentiating the type of data provided and the format in which it is provided, the Spatial Data Access and Pricing Policy provides differentiated license conditions. The Spatial Data Access and pricing policy imposes more restrictive conditions on purchasers of customised fundamental spatial data, including possible royalty payments for commercial use.

The Spatial Data Access and Pricing Policy is appropriate, given the assumption that the initial task of data collection, storage and maintenance is financed from general revenue, and that raw data can be made available online at relatively modest cost.

However, in the event that the policy was required to raise net revenue, it might be possible to adopt a different approach to licensing conditions. Online and packaged data might be made available on the basis of a license for non-commercial use (the default Creative Commons license conditions of Attribution, Non-Commercial, Share-Alike would be well suited to this purpose), while the conditions for access to customised data, permitting commercial derivatives subject to a royalty payment, would remain unchanged.

For many purposes, and given the availability of customised alternatives. the non-commercial, attribution, share-alike version of the Creative Commons License may be seen as default rule. he optimal default rule is one that protects most rights the public creator might want to enforce, while allowing (without special permission) most uses that would be regarded as acceptable. Public domain fails on the first count, since it allows for private appropriation.

Standard copyright fails on the second count since it restricts many beneficial users.

A differentiated license system would be reduce the potential for existing commercial users to switch to the free online product , since freely available data could be used only for internal purposes, and not for the creation of commercial derivative products.

In economic terms, the impact on an existing commercial revenue stream from the introduction of a free non-commercial option would depend on the degree to which the two were substitutes. An associated quantitative measure is the cross-price elasticity of demand.

There are some avenues by which that the general availability of free information would increase the demand for customised services. First, different kinds of information are likely to be complements. The 'mashup' phenomenon provides an illustration of the way in which combinations of information from different sources can produce new and enhanced outputs. In some cases, a mashup might combine freely available data (for example spatial data) with limited quantities of customised data.

Hypertext and the paywall problem

Despite the massive variety of information it carries, the World Wide Web is ultimately based on text, and, more specifically on hypertext. The central innovations that gave rise to the Web were HTML (Hyper Text Markup Language) and HTTP (Hyper Text Transfer Protocol). The centrality of these innovations and of the hypertext links on which they rely has only increased over time. In particular, the dominant search engine Google relies primarily on tracking hyperlinks between pages as a way of determining the ranking given to sites associated with particular search topics. The role of hyperlinks was further

enhanced by the rise of blogs and other "Web 2.0" technologies. For blogs in particular, hyperlinks are a crucial medium of exchange.

Requirements for payments, and even some requirements for free registration, can disrupt the network of hyperlinks on which much of the value of the Web depends.

Such disruption was sought after by some early commercial users of the Internet. AOL, in particular, pursued a strategy of creating a "walled garden" containing a closed set of services available only to AOL users. The system was designed to make links outside the AOL system accessible to AOL users, but in such a way that they remained effectively within the garden, tied to AOL's services and available to AOL's advertisers. The strategy was initially highly successful, but it ultimately failed for two reasons. First, AOL users found themselves restricted unnecessarily. Second, and perhaps even more importantly, the strategy precluded links from the Internet at large into the walled garden. As the Internet grew more rapidly than AOL itself could possibly do, the costs of this strategy became more and more evident. AOL eventually opened itself up, but too late to prevent its decline from one of the dominant presences on the Internet in 2000 to the marginal player it is today.

The experience of other organisations has been similar. The New York Times briefly required payment for access to some content, including opinion columns, under the Times Select system. Opinion columns are commonly linked by bloggers, for praise or criticism, and such links are an important source of influence and, ultimately, readers. The presence of a "paywall" discouraged bloggers from linking to Times columnists. http://civilities.net/TimesSelect-Buzz-Aggregate Along with the direct price effects, the resulting loss of influence caused the New York Times to abandon the experiment after two years, and also opened its entire archives free of charge.

Transaction costs and the limitations of micropayments

The huge number of Web pages accessible from anywhere in the world by entering a URL or clicking on a link means that the range of information resources that can potentially be used in any project an Internet user might undertake is effectively unlimited, except by the user's own capacity to take in information. Averaging a couple of minutes per page, it would be possible to visit thousands of sites in a day, and take information from hundreds of them.

Obviously, however, even relatively modest charges for access and downloading (say, of the order of a dollar per item) would render such use of the Internet infeasible for the vast majority of users. Considerable attention has therefore been devoted to the idea that information-based services might be funded through 'micropayments', that is, very small payments (perhaps a few cents, or even fractions of a cent) for access to modest amounts of information. Nielsen (1998 http://www.useit.com/alertbox/980125.html) presented the most influential case for micropayments. He began by pointing out the limitations of alternative financing methods such upfront subscriptions and advertising, and argued that the saving in user time associated with faster ad-free access to Web pages would more than offset micropayment costs of a few cents per page.

A variety of 'online currencies' (such as beenz and flooz http://en.wikipedia.org/wiki/Internet_currency) were developed in the late 1990s with the aim of facilitating such micropayments. A number of news and media organisations have attempted to impose larger charges, of the order of $1 per download for access to content including newspaper articles, music, images and video.

The results have been almost entirely negative. The various micropayments systems failed, as did most attempts to charge for content.

At a theoretical level, Shirky (2003, http://www.shirky.com/writings/fame_vs_fortune.html) argued that

> the act of buying anything, even if the price is very small, creates what Nick Szabo calls mental transaction costs, the energy required to decide whether something is worth buying or not, regardless of price. The only business model that delivers money from sender to receiver with no mental transaction costs is theft, and in many ways, theft is the unspoken inspiration for micropayment systems.

Among the rare successes, the most notable is Apple which has successfully sold music and iPhone applications through its iTunes store. Apple also sells videos, though with rather less success.

Apple's success has a number of special characteristics which have made it very hard to reproduce, such as tight integration between hardware, software and the market platform. Equally important has been the Record Industry Association of America's campaign against filesharing, which, will achieving only limited success has driven a large number of users to prefer the legal iTunes option. This campaign has been hugely costly in both financial and public relations terms for the RIAA, but Apple has borne none of these costs. Even with all these positive factors, it has been estimated that the total sales from the iTunes store amount to 30 songs for each iPod/iPhone, as against a capacity of thousands of songs per device.

Elasticity of demand

The effects of pricing policies depend on the elasticity of demand, that is by the proportional responsiveness of the quantity demanded to a change in price. For example, if a 10 per cent reduction in prices generates a 20 per cent increase in demand, the elasticity of demand is equal to 2 (that is, 20/10). In general, the

higher the elasticity of demand, the greater the welfare cost associated with any given price in excess of marginal cost.

It is essentially impossible to determine an elasticity of demand for information in general. However, it is possible, though difficult to make some estimates of the elasticity of demand for information derived, from the Internet.

Estimation of the elasticity of demand for Internet services is difficult for a number of reasons. These include which the most important is the difficulty of defining quantity measures, the speed with which new services are being introduced and prices of existence services are declining, and, conversely, the relatively slowness with which some changes in Internet usage diffuse through the population.

Much of the analysis to be presented here depends critically on the conclusion, supported by a wide range of evidence, that demand is elastic. The precise value of the elasticity, which will typically depend on the way outputs and prices are measured, is of rather less importance.

Qualitative assessment of demand elasticity is straightforward. For any good or service for which demand is elastic, a decline in price will produce, other things equal, and increase in total expenditure. Conversely, where demand is inelastic, declining prices will result in declining expenditure.

Expenditure on Internet services has grown steadily since such services became available in the early 1990s. Expenditure has increased on all margins - the number of households subscribing to such services, the number of services per household (many subscribing both to fixed-location and mobile services) and the expenditure per service. Since prices have declined steadily, the evidence supports the view that demand is elastic.

With the qualifications given above, it is useful to consider some estimates of the elasticity of demand for Internet services in general and for information.

Numerous estimates, including ACMA studies for Australia suggest that the total volume of traffic on the Internet approximately doubles each year. The rate of price decline is harder to measure, but a plausible midrange estimate is that prices have declined by 30 per cent a year on average. This implies an elasticity of demand close to 2, which is consistent with a variety of estimates derived by Pollock (2009).

The implications of declining access costs and high transactions costs

The main contribution of this paper is to consider the implications for public sector information pricing of changes in the cost of information associated with the rise of Internet. Most importantly, while costs of distribution and access have declined markedly, the transaction costs of information services have remained high.

The central finding of this project is that, under the conditions created by Web 2.0, making information effectively freely available (libre) generally requires that it be provided free of charge (gratis). As the costs of disseminating and accessing information have declined, the transactions costs associated with charging for access to information, and controlling subsequent redistribution have come to constitute a major barrier to access in themselves. As a result, the case for free (gratis) provision of Public Sector Information is even stronger than has already been recognised.

From the transactions cost perspective, it is equally important that the provision of information should not be burdened with unnecessary restrictions on use, such as those associated with standard copyright. A good default choice, which provides for free (libre) use, protects this freedom in reuse and is consistent with free (gratis) pricing is the CC BY license

Work undertaken in the preparation of this report has shown how these points can be demonstrated, and estimates of the social loss associated with priced

access to information derived, using a simple diagrammatic analysis of the kind familiar to undergraduate economics. The central finding is that, under the conditions created by Web 2.0, making information effectively freely available (libre) generally requires that it be provided free of charge (gratis). As the costs of disseminating and accessing information have declined, the transactions costs associated with charging for access to information, and controlling subsequent redistribution have come to constitute a major barrier to access in themselves. As a result, the case for free (gratis) provision of Public Sector Information is even stronger than has already been recognised.

A summary is presented below.

A summary of the argument

The analysis rests on two key points. First, as noted above, the welfare costs of raising revenue through above-marginal-cost pricing are higher, the higher is the elasticity or price-responsiveness of demand facing information owners. However, the effective price faced by information users includes the cost of access to information and the transaction cost of making a purchase. The net price received by information providers excludes these items.

The analysis undertaken for this project shows that as access costs decline, and assuming the underlying demand for information is unchanged, the elasticity of demand with respect to the price charged by information owners increases. So, the loss in economic welfare associated with any given price for information increases.

The second, and critical, point developed in the report is that transaction costs of purchase are a fixed cost associated with levying any positive price. Hence, as discussed above with respect to micropayments, a price for information that is not substantially greater than the transactions cost of purchase cannot possibly yield net welfare benefits when access and distribution costs are low. But in

these circumstances, and with high elasticity of demand, the welfare costs of high prices are likely to be significantly greater than the revenue generated.

In practice, transactions costs associated with pricing access to information are often substantially larger than the revenue gained through pricing. For example, Bessen (2008) estimates that the cost of litigation concerning patents (other than chemical and pharmaceutical patents), is over $12 billion a year and four times greater than the profits generated by those patents.

Some rules of thumb

* In any problem of information pricing, it is necessary to consider two choices

(a) whether to charge a positive price, or to provide information free of charge and seek funding elsewhere (for example, from tax revenue). One should also explore whether volunteers might be able to achieve the goal.

(b) if a price is to be charged, how to set the price

* If transactions costs are greater than 20 per cent of the price charged, free provision, financed by tax revenue, will generally be preferable to any positive price

* If transactions costs are small, the optimal pricing policy will be to set price equal to the marginal cost of provision with a surcharge (typically about 10 per cent) reflecting the social cost of tax revenue

Concluding comments

The case for free 'gratis' provision of public sector information has always been strong. The rise of the Internet has made the argument for free provision for many categories of PSI overwhelming in general. It has also greatly expanded the range of activities that are naturally interpreted as information provision, to encompass, among other things, the activities of cultural institutions such as galleries, libraries, archives and museums.

However, technological change and its economic implications have run ahead of the organisational and financial structure of public sector institutions, including cultural institutions. Activities such as digitisation and distribution of information commonly receive only limited and sporadic funding, and more generally are regarded as a peripheral add-on to organisational missions conceived in the 20th, or even the 19th century.

The potential benefits of opening cultural institutions up to the community through Web 2.0 technologies are huge. In part these benefits relate to the traditional mission of bringing cultural content to the public. Importantly, however, there are potential benefits for institutions, including the possibility of tapping members of the community for their content, their information, their labour and their enthusiasm. As far as possible, funding, pricing and access policies should facilitate, and not obstruct, the realisation of these benefits.

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