

Re-visiting the Valuing and Pricing of Digital Geographic Information

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Abstract

Geographic information (GI) comprises all information with a location attribute, e.g. addresses, administrative boundaries, and topographic data describing the natural and built environment. GI is very expensive to collect, process and maintain, yet ever easier to disseminate cheaply via Web-based services and products. Various studies from developed nations around the world show that GI plays a crucial role in underpinning whole economies and delivering efficient government, indicating that it should be used as widely as possible. Much GI is collected by local and national government for specific purposes. How such public sector information (PSI) is made more widely available for other uses and to other users, and at what price, has created heated debate and led to the adoption of diverse PSI charging regimes in different countries. The purpose of this paper is to re-examine the dogma inherent in the bi-polar viewpoints at the heart of the charging debate, from the perspective of economic reality and diverse public information policy cultures.

Keywords: charging for information, digital geographic information, value of geographic information, public sector information, information access policy, information exploitation

1. Introduction

Confusion surrounding charging for information arises partially from terminology, for example charging for what 'information', by whom and to whom? The right of commercial companies to charge for the information they disseminate, whether in the form of newspapers, books, periodicals, scientific and technical information (STI) databases, road maps or satellite imagery,

is seldom challenged. However, some commercial information products are derived wholly or in part from data originally gathered by or for the public sector or with public sector funding. Therefore, the real debate focuses primarily on public sector information (PSI), on who should have access to PSI versus exploitation rights for PSI, and under what terms and conditions. It is important to differentiate between the value of information as determined by the marketplace, especially when value is added by numerous actors, versus the value implied by dissimilar PSI charging (cost recovery) regimes implemented by different governments. The latter typically depend upon government information policy and national information culture, especially where public sector geographic information is concerned.

It is equally important to recognise the distinction between PSI that is basically data, e.g. facts held in a database, versus geographic PSI which typically takes the form of printed maps showing various topographic themes or the specialised databases used to hold such information in digital format. A PSI database of simple facts is often of limited use to an outsider 'as is', e.g. a database of house prices or insurance premium rates. However, the maps produced from a topographic database are of immediate use, over the range of scales produced, whether as printed maps which virtually any citizen can understand or as digital input to simple map-making software. Yet, such geographic PSI has far more value than as a map alone, as the underpinning framework to tie other data together for presentation, analysis and comparison, e.g. comparing house prices and insurance premiums to crime rates and environmental indicators for your own home to the area to which your company is relocating. It is this unique aspect of geographic information that leads to its greater value than many other types of PSI, depending upon how widely it can be disseminated and used in value added information products and services.

“All animals are equal but some animals are more equal than others” (Orwell 1945). Does ‘Animal Farm’ warn us that it may be impossible to achieve information equity in society? Should all public sector information, geographic or otherwise, be available free of charge to citizens, or is it possible to charge for PSI and still be 'fair' in its distribution? Simply making available to citizens raw data or processed information collected for specific purposes of governance does not necessarily benefit the citizen who is incapable of using that data or information without further processing, integration, harmonisation or explanation. What level of resources (people and money) should a public sector agency expend to turn data required to perform its legally mandated work into information in a format useful to, and usable by, the average citizen, and in funding the cost for disseminating that information? Such value adding and publishing tasks have typically been the role for commercial organisations with the relevant skills, experience and access to capital, for which they expect a profit in return. This highlights the issue of access to PSI versus exploitation of PSI and who is best able to exploit PSI for the benefit of citizens. When is it appropriate for a public agency to assume the role of a commercial data provider? Are public agencies competent to assume this role? Do such agencies foster unfair monopolistic information control regimes? Who benefits when PSI is readily accessible, but for a fee, in formats of immediate use to non-experts, versus being available for free, but in formats of little use to the layperson? These are but a sampling of the questions typically raised in the debate on access to and pricing of geographic information created in the public sector.

2. Policy context

The authors have commercial and academic familiarity with data access and pricing policies spanning many years. Our overall experience is that PSI debates seldom progress beyond entrenched positions based on ideology and emotion. Furthermore, policies on access often are complicated, riddled with contradictions and inconsistent across government agencies even within single states.

- A government may declare that all PSI should be freely available to anyone for any purpose at no cost or low cost, including raw data and such processed (value-added) information products as are created by the agency in fulfilling its legal mandate.
- A government may require a public agency to provide its PSI to one and all for any purpose, including full commercial exploitation rights by the commercial sector, yet permit the agency to also sell information products that have value added, in order to make a contribution to cost of data collection, dissemination and archiving.
- A government may require a public agency to provide certain levels of PSI to any citizen for 'own use', excluding commercial exploitation, while more detailed information is licensed to the commercial sector to create value-added products and services. The agency retains the right to sell its own value-added information products under varying cost recovery regimes.
- A government may require that a public agency recover all or nearly all its operating costs and build reserves for future capital needs from sale of its PSI rather than depend on tax payers' funds. This effectively puts the agency outside the federal budgeting process, an action with both positive and negative implications for the agency, for information users and for the government and national economy.

These disparate policies all exist in various countries around the globe and typify the extremes of such policies regarding access to PSI. For geographic information, these PSI policies normally include some national security restrictions and operate within the bounds of privacy legislation and established intellectual property rights (IPR) regimes. Yet as a result of new anti-terrorism legislation, the conflicting requirements of national security versus personal privacy introduce further challenges.

Even when nation states had some form of physical control over their data, there were idiosyncrasies and contradictions. Portugal and Finland initially had a rule that only their citizens could acquire maps at detailed scale from the Internet, based on the domain name identification of a registered user's e-mail address. But such rudimentary access control techniques do not stop data leaking beyond the physical borders of a country. Other countries, such as India, have restricted the level of detail that can be shown on maps of their border and coastal regions or other sensitive areas in their country, for national security reasons. However, availability of remote sensing imagery with 1 to 4 metre resolution from suppliers such as Spot Image or Space

Imaging, render such policies less and less effective.

In Europe, concern over access to public sector information resulted in the European Commission publishing guidelines promoting synergy between the public and private sectors for information market development (Europe 1989). Guidelines are non-binding and are the weakest policy enforcement tool within the European Commission's legislative arsenal. Failure of the guidelines to have any important impact resulted in continuation of the debate on access to PSI in Europe at the European Commission in 1995 (Europe 1995), leading to a series of draft consultation documents (Europe 1996a; Europe 1996b). By 1998, focus of the discussion and consultation shifted from merely accessing PSI to exploitation of PSI beyond its originally intended use (Europe 1998; Europe 2002b). The European Commission's subsequent proposals were clearly motivated by a policy of maximising access while minimising charges only to cover onward reproduction and dissemination costs: "The public sector bodies should have the possibility of applying lower charges or of not charging at all" (Van Velzen 2003). Such a policy will, however, be heavily constrained by the difficulties of funding an unknown demand for PSI solely from direct taxation. Unfortunately, disagreements over terminology and semantics once again threatened proposed EC PSI policy goals. Many apparently 'government sector' agencies appeared able to remove themselves from the 2003 Directive regarding exploitation of PSI simply by declaring that they were not in the government sector as defined by the Directive.

The USA has maintained a Federal policy comprising freedom of information (FoI) for information collected at the federal level or using federal funds (GAO 2002), no government copyright, and no charging for spatial data. This policy is sometimes contradicted by agency behaviour in suppressing information (Borger 2001) and in charging for spatial data, especially to recover mission costs of remote sensing platforms (Thompson 2003). The FoI policy was often promoted as the 'ideal' policy to ensure the widest possible access to PSI, and was largely uncontested until the events of September 11th 2001 (Blakemore and Longhorn 2001). A policy of unfettered access may therefore have empowered terrorists by providing them with readily accessible information, thus invoking a "debate over how public is too public" (Halchina 2002). The events of September 11th have led to restricting freedom of information rights in Zambia (anon 2003b), and in the USA, to the practice of "data scrubbing" (Matthews 2002), with the resultant concern that the removal of hitherto accessible PSI "could affect citizens' ability to fulfil their democratic responsibilities and could shape their views of government and e-government" (Halchina 2002).

During 2002 there was a realisation that the 'free' US national mapping information from the US Geological Survey (USGS) may cost little to acquire, but some of it has not been updated for 50 years (Brown 2002). To overcome this deficiency, USGS proposed a vision for a National Map that will contain updated information gathered from state and local authorities, then integrated into a new, up-to-date map series. According to the US National Research Council, "a motivation behind The National Map vision is the need to update an ageing paper map series that is, on average, 23 years old" (NRC 2003). So, is not charging for data detrimental to data update and quality? Consider that UK Ordnance Survey data, sold at commercial rates, are integrated, spatially and temporarily detailed, structured for GIS use, and updated for users within hours of updates being entered into the National Digital Topographic Database (Survey 2001c).

The debate over charging for government-produced data (geospatial or otherwise) has ebbed and flowed. Depending on who is arguing the case, direct charging for data is considered either good or bad, and polarised debates form around the competing goals that everything should be available to anyone in an 'information commons' (Onsrud 1998; Stallabrass 2002) versus capitalist arguments and business strategies based on the premise that if you need something you should pay for it (HMSO 1981). Charging for information is therefore a contested issue, confused by arrival of the Internet and the World Wide Web, which provides very low dissemination costs. Early proponents of the Web espoused free availability, for example of media information, the supporting revenue stream supposedly arising from advertising, not direct charges (Salkever 2002). This business model started to disintegrate as the global economy became unstable (anon 2003a), although by then the expectation of data consumers had assumed a land of milk and honey with 'free' information for all (Runett 2001). The debates can be surrounded by ideology, with access to information being equated on one hand with empowerment of citizens (Agre 2001; Pigg 2001; Taubman 2002) and on the other hand being contested as being largely irrelevant in Marxist terms, in the context that information is valuable when it is knowledge, and knowledge increasingly is being commodified by capitalism, removing it from people into machines (Söderberg 2002). Related to this is the technological focus in recent years on 'modern' and 'scientific' languages of 'artificial intelligence' (Booth and Buluswar 2002), 'knowledge-based systems', building on from 'expert systems' goals of the 1980s, implying that machines may be used to replace people in many functions.

It may be possible to invoke human rights (Miller 2002) and universal access policies (COMUNICA 2001; Europe 2002a) to promote the unrestricted availability of PSI. Citizens may have 'rights', even human rights, to unconstrained access to government-produced data. Data made available can on one hand engage and empower citizens (Kevill 2002), or disempower users because while ICTs are seen widely as a means of promoting democracy and reducing social and economic divides "we not only have an instance of ideological simplification but also an advanced form of technological fetishism" (Hand and Sandywell 2002, p.198). Access to information can increase business activity (Liikanen 2001), but also can unwittingly assist terrorists in the planning of sabotage and destruction (Kovacich and Jones 2001). Data can be essential in informing citizens and planning strategies and response to environmental events (Environment 2002; Europe 1990; FEMA 2002), yet their availability can exacerbate fears in contexts where data users are unable to effectively conceptualise risk (Davídsdóttir 2002; Hunt, Frewer, and Shepherd 1999).

Like policy changes in 'Animal Farm', to charge or not to charge for PSI has become a binary debate. It's good, or it's bad, largely along the lines of Jessica Litman's view that it is debated rather like religious fundamentalism (Litman 1994). This paper does not rehearse those arguments yet again. It attempts to link the charging considerations into a general discussion that brings the debates together. It aims to evaluate the discourses so that we can try to see the debates not in terms of polarities, but in terms of processes and trends.

3. Demonising and un-demonising charging

Here the imposition of any form of charging for data is seen as un-democratic, in forcing exclusions in society at a time when overcoming social and economic exclusion is a key policy goal, and in forcing organisational behaviour that focuses not on need to use, but on ability to pay.

Demonisation too often follows from arguments based on refutation of a competing position using a singular exception. For example, consider the questions: (a) Why does our nation not follow the USA federal policy of free information with no government copyright? (b) The USA has the biggest economy in the world, and the most active GI industry, so surely that must have been built on a ready supply of geospatial information? (c) Access to geospatial information is essential for the education process, and charging diminishes the use of data in the curriculum. Refutations can include: (a) But the USA federal data at a scale of 1:24000 are not effectively maintained and developed because they cannot build extra capacity through charging (Brown 2002); (b) The USA economy is large, yet so are levels of inequality and poverty, so free access to data is no determinant of social equality - the sort of reaction that encouraged the Peoples Republic of China to counter USA criticisms of Chinas' human rights record with a countervailing critique (PRC 2002); (c) Yes, data are freely accessible to the education process in the USA, but why does the National Geographic Society report such high levels of geographic illiteracy among US citizens (RoperASW 2002)?

It is not just in the dissemination of PSI where tensions emerge. When is something both commercially lucrative, yet has such potential public good that there are ethical tensions over whether the information could be commodified. Such concerns apply to all types of information where there is both sales potential and public good. In February 2003 the 'Slammer worm' was threatening to cause havoc on the Internet. Symantec, specialists in Internet security, claimed that they identified the worm very quickly, but "Symantec then shared the information only with select customers, leaving the rest of the global community to get slapped around by Slammer" (Delio 2003). Symantec invested considerable resources in creating its service, yet it also seems that the nature of the Internet may demand that commercially produced information be regarded as public domain, since the Internet is such a huge public domain.

Commodification can work positively in a context of building trust and institutional capacity to service users effectively. For many years in the UK there were tensions between higher education researchers and the Ordnance Survey (OS) over costs and access to OS digital data. The development of the DIGIMAP service (EDINA 2001) was a negotiated outcome that not only overcame the OS fears of intellectual property leakage through academic use, but also ensured that the availability of detailed UK mapping data was through an intermediated process. Academic users were supported and advised (so removing resource fears of user support demands directly onto OS), and their use was monitored (so providing both an audit trail and a feedback mechanism to OS on the use of their data and on possible new uses and data products).

Concerns over commodification versus openness were focal to the concern of the US National Research Council who argued that "the development of any new database protection measures directed toward protecting private-sector investments take into account the need to promote

access to and subsequent use of S&T data and databases not only by the not-for-profit sector, but by for-profit creators of derivative databases as well” (NRC 1999). So, on one hand the debate would argue that maximising the availability of data to all users is a form of public good, yet the counter-argument in a global political context of extreme uncertainty is to argue that removing data from the public domain is a sensible anti-terrorism precaution, and that the public good may be enhanced by data scrubbing and statist surveillance of the individual, for technology is seen now less as a threat to personal privacy and more as “serving the common good, as reflected in legislative reactions such as the USA PATRIOT Act” (Nelson 2003, p.73). Related to this there is an argument that privacy itself can be viewed as some form of commodifiable property where individuals 'sell' parts of their informational privacy in return for commercial product targeting and the expectation of more personally focused services (Litman 2000). The existence in many countries of legislation protecting personal data and of enforcement agencies relating to such laws (data protection registrars) indicates the value that governments - and citizens - place on such data.

The conceptual basis for the argument against charging is that it leads to a form of prejudice against those who cannot pay for access. In societal terms this is linked to policy interventions in the context of social exclusion, especially in the debate on the so-called 'Digital Divide'. This debate adds important context to that of the information access debate, for it sets into context the fundamental question of why information and data, above anything else, should be made free. The analogy would be like making electricity free to all citizens, but still expecting them to purchase the machines, the light-bulbs, and the wires so that electricity can be made useful. The 'free data' debates seem to argue that information in isolation can have a direct public good impact, and in a digital environment there is the widespread assumption that the reproduction costs of information are near to zero, or at least are negligible. Therefore, let data be freely available! However, for information to be useful requires the machinery of data processing, skills to analyse and interpret the data, transformation of data into information and thence into socially useful information, incurring real reproduction costs of infrastructure, machinery and skills (Shapiro and Varian 1999). As Slevin argues in the context of freedom of speech “guaranteeing the rights of members in a community to free speech and free association, for example, has never led to the successful creation of community” (Slevin 2000, p.99), the corollary being that there is a better chance of creating a successful community with freedoms than there is with none.

Policy interventions in the Digital Divide have shown how difficult it is to decide where free availability ends and charging begins. Particularly in the USA context, it also shows how the politics of intervention determine the policy. During the Clinton Presidency the focus was largely on a target of social inclusion, of researching where divisions were most exacerbated and planning interventions to overcome them (Commerce 1999; Commerce 2000; Commerce and NTIA 1999). The policy intervention aimed to reduce differential access to technologies, focusing on categories of citizens such as race, ethnicity, economic wealth, rurality, age and gender. By levelling out the differentials and ensuring that the disadvantaged had access, it was assumed that society would become more inclusive, or as the UK government argues more “e-democratic” (Commons 2002a). However, as Slevin argues “an analysis of the Internet and society must be cultural and must build on a framework that does more than just map out the Internet as just another means of distributing and communicating information” (Slevin 2000,

p.7). With that argument goes the need to map out information distribution as involving much more than just distributing and communicating a file of geospatial information to an end-user.

The change from the Clinton/Gore to the Bush/Cheyney administration in 2000 saw a re-orientation of intervention away from the 'glass is half empty, how do we fill it' approach, to one that saw the glass as increasingly filling up independently of government interventions. The USA was now "A Nation Online" (Commerce 2002). The extent of being online could be ascribed to the success of previous interventions (Benner 2002), a view supported by UK studies that in the absence of similar government intervention the divide was worsening (Porter 2002). Much of the policy debate has progressed largely in isolation from the research literature, and in an important re-conceptualisation of the digital divide Warchauer argues:

the digital divide term - which attached overriding importance to the physical availability of computers and connectivity, rather than to issues of content, language, education, literacy, or community and social resources - is difficult to overcome in people's minds. (Warschauer 2002)

With the prior requirements of literacy in mind, attention could now turn from making information freely available to some forms of subsidy that invest not only in distribution of information, but also in developing 'information literacy' that empowers people to make sensible use of the information. Maybe we can re-interpret subsidy not as a process of levelling out market distortions, but as investment in social and intellectual capital formation.

4. Demonising charging as the imposition of double taxation

The logic seems simple. If the production of PSI has been funded through taxation then citizens have already paid for the information. Therefore, there can be little basis in governance to charge for the further use of the data, which imposes a form of double taxation. This dilemma can be re-conceptualised not from the basis of human rights or the apparent iniquity of double charging, but from the basis that charging exists in some form no matter what the dissemination policy. The charging can be direct, indirect, or a hybrid that combines both direct and indirect charges. A further basis for this argument notes that while it is possible to distribute data electronically at minimal cost:

information industries still have to cover large fixed costs needed to pay their managers, writers and the fixed costs of acquiring information. This means that the cost of creating the first copy of an information good remains very high, while the costs of making additional copies of the original document is nearly zero (Dedeke 2002).

Therefore, we can set a number of propositions that provide much of the framework for our arguments:

- No data are produced without a cost being incurred. Even public participation information creation, such as the public domain Wikipedia (Hammersley 2003; Wikipedia 2003)

has creation costs that are donated by those building the data resource.

- Assigning zero end-user cost to information can lead end-users to denigrate the value of the data or demonstrate lack of discipline in requesting data (Harris 2002). Since all data has a cost, this can lead to significant inefficiencies in data production and over supply, especially for PSI.
- Dissemination costs include more than passively placing data on an Internet site. A useful Web site represents a non-trivial cost. Data documentation, maintenance and enhancement costs can be significant, as many government agencies have found out when their Web sites have received significant levels of criticism (COL 2002; COL 2003; TNSOFRES 2002). Only if the Web site is populated with metadata and customer assistance, and those elements are also written off as sunk costs, is the direct access cost for users near to zero. Some governments now explicitly state which related costs are to be included in setting prices based on dissemination cost only, e.g. providing offices, facilities, equipment, consumables and additional staff resources (Australia 2000). Taking such costs into account can have a major impact on what formerly appeared to be a near-zero distribution cost.
- Making data available, even free of cost, can create important dependency relationships with data consumers, therefore placing resource demands on the providing agency: “the notion of blindly communicating (and even transacting) in a one-way manner with nameless, faceless consumers simply does not constitute a relationship” (Geissler 2001, p.498).
- Data consumption patterns are not always predictable through market research (Blakemore and McKeever 2001). Therefore, there is no guarantee that demands for data can be serviced by existing resources within the providing agency.
- End-user needs for geographic information are seldom satisfied from a single data source, but rely on integration of information from several sources and delivery of that information via many different channels. Consider how many times an official (licensed) request for topographic information arrives at a national mapping agency Web site versus the far greater number of accesses made daily to the various travel routing Web services already available on a global basis, which are underpinned by that same topographic information originating in the public sector.
- Policy and business externalities frequently perturb the data market, and dissemination strategies seldom are directly controlled by PSI data producers. The five-yearly review of the Ordnance Survey (GB) in 2001 discussed the possible governance structures for the future, ranging from the existing Government trading fund, through to privatisation. Privatisation was ruled out not for business but for strategic reasons, in particular the uncertainty about national interest mapping. The Review proposed that the OS “should evolve to a Government Owned Limited Company (GOPLC)” that would give it commercial and strategic freedoms apparently not available as an Agency of Government (CMG 2001). However, while this proposal was strongly supported by the OS (Survey 2001b), the House of Commons Select Committee on Transport, Local Government and the Regions was strongly opposed to such a change, arguing

that there “is nothing to suggest that the proposed change to a GOPLC would address the problems of OS status as a commercial and public service provider in terms of cost recovery, regulation, costs, competition and the boundaries of OS business” (Commons 2002b).

A funding mechanism that involves only direct taxation¹, with no onward user costs for data access and usage, has at its base a number of critical assumptions. It assumes that there will be enough taxation income to cover the costs of production and dissemination, no matter what the demand. This concept negates important costing principles in business, namely that the cost (sale price) of the product, even in a non-profit environment, must cover production costs, distribution and customer support costs, and reinvestment and product enhancement costs. Second, it assumes that those who make decisions on the allocation of taxation income have full cognisance of the strategic needs of the data production process. This may be why GI producers have been so keen to 'prove' the value of their data to a national economy, starting with the ANZLIC study of 1995 and its oft quoted claim that “for each dollar invested on producing land and geographic data, \$4 of benefit was generated within the economy” (ANZLIC 1995) The 1999 OXERA report for the OS GB argued that “in 1996, OS products and services contributed to 12-20% of gross value added (GVA). This amounted to £79-£136 billion worth of gross value added (GVA)” (OXERA 1999). More recently a study for Austria stated “the benefits associated with the Cadastre amount to ATS 15,824.3 million (€1,150.0 million)” (Frank 2002). Third, direct taxation models of funding critically assume a correspondence in the trends of data production costs, data consumption demands, and taxation income. It is difficult to see any theoretical model in economics and government that would support such wide-ranging linkage assumptions.

A policy where information production is funded through direct taxation and data are made available free at the point of demand is, then, a direct funding model. The policy assumes that by absorbing the costs within taxation, and allowing any citizen to access the data, the overall benefit to the economy is better, for example enhanced social capital and better communities (PIU 2002b), than would be obtained through indirect funding via the charging for data acquisition (purchasing access to data) and onward processing of data (licensing and value-adding). This assumption suffers from serious external limitations.

First, it is exceptionally difficult to ‘prove’ the argument quantitatively through a cost benefit model, as it is with the Solow paradox of IT cost benefits (Whelan 2000). Second, funding through direct taxation is a luxury seldom afforded to governments in developing nations, where not only are the costs of digitising and structuring PSI data considerable, but there are often prior requirements to update existing geographic data coverage (Bishop et al. 2000). Such nations often do not have reliable taxation income streams. Third, in most developed nations there have been significant shifts in demographic structure and the composition of the labour market. Fewer people are in work (the direct taxpayers) and the number of aged and retired citizens increases. These are indirect taxpayers who place increasing demands on health and related services, and who have increasing electoral power to demand those services (Peterson 2001). The focus of governments is much more towards taxing sales rather than income, and to reducing financial

¹ We are assuming here that direct taxation involves both income taxes and sales taxes. Both result in an income to the national exchequer.

risk through governmental reorganisation (Cabinet 1999; GAO 2000) (Osborne and Gaebler 1992), modernisation and aggressive auditing and budgeting strategies (Flynn 1999). One such strategy is to place entrepreneurial demands on data producers to recover some or all of the costs of their activities through sales (DTI 1990; Treasury 2000; Zealand 2002).

This section has underlined the tensions in funding models that rely only on direct taxation. Externalities are notoriously difficult to accommodate when there is dependence on a single source of finance, and where the finance is allocated by the government Treasury. In the context of information business strategy, there is a need for PSI producers to deliver both “richness (accuracy, currency, relevance, security etc.) and reach (the number of people who participate in the sharing of information)” (Evans and Wurster 2000, p.23). Those two themes demand attention to the minimisation of risk and for strategies to build capacity within an organisation that can deliver extra resource when needed. The latter is little different to many resource providers such as electricity generation, where in the UK a combination of nuclear (constant production), gas (cheap production), and pump storage (using spare capacity to provide a rapid injection of production to meet short-term demand) indicate that a plurality of resource provision is sensible risk management.

5. Charging as risk management and capacity enhancement

Governments are finding it increasingly difficult to govern as the impact of globalisation intensifies. They are in an “endless process of damage control - fighting crime, pollution, poverty, transport, security, food safety - and each of these is undertaken by new powers of monitoring and surveillance” (Slevin 2000, p.17). On one hand government departments are being expected to undertake risk management assessments (Cabinet 2001) that identify strategies to cope with uncertainty and with the risks resulting from the impact of policies. Strategies must “be robust against different futures – but at the same time implementation plans need a degree of flexibility to respond to events” (PIU 2002a). On the other hand, governments need to instil an element of fear and risk into society:

Engendering a sense of fear in terms of economic change and the threat of being left behind, is one of the clearest examples of Giddens' suggestion that scaring communities and individuals is an effective means of making them act in particular, directed ways ... Creating subjectivities which encourage subjects to act in appropriate ways is critical to the impacts that policy measures may have. (Raco 2002, p.44)

Governments therefore manage risk and uncertainty in the context of national policy, but also need to use that very risk and uncertainty to condition the agencies of government and citizens in society, to comply with policies. In short, government needs to become more managerial and controlling even though there are increasing moves to local devolvement of governance, and it does this through institutional, managerial and technical levels (Lynn Jr 2001). In spite of the many cookbook models of how to achieve successful government reform (Lanvin 2003), institutional reforms often fail, and “they do not fail because, once implemented, they yield unsatisfactory outcomes. They fail because they never get past the implementation stage at all.

They are blocked outright or put into effect only in tokenistic, halfhearted fashion” (Polidano 2001, p.346). They fail because they threaten to disrupt the singular public service focus, leading to “a growing tendency to think of government as no more than a bundle of loosely linked contract-based services” (Plowden 1994, p.139).

If organisational reinvention has proved so very difficult to achieve, perhaps a simpler mechanism is to minimise income streams from taxation and to force the PSI producers to search out other income streams. Risk management in the context of PSI production therefore is fundamentally financial. How can new technologies reduce collection and production costs? How can organisational change reduce overall costs? How can new ways of information distribution, for example via intermediaries and value-adders, reach a wider market and generate capacity-adding income? How can the uncertainties of taxation income, where a decision to raise taxes one year may result in lower overall taxation income because of a global economic downturn, be minimised by stimulating other income streams? How long does it take to instil an entrepreneurial information marketing spirit (and the required skills level) into a public agency with no prior experience in this field, in order that such agencies can partake of new revenue streams?

Institutional strategies to combat risk combine both fear and empowerment. The fear is of uncertain, and usually declining, core budgets from taxation - the ubiquitous phrase 'efficiency gains' is the inevitable justification of the treasury mandarins in providing budget rises below the rate of inflation, so reducing budgets in real terms. The empowerment is in direct accountability through the management of its own budget by a government department or agency. However, this then requires managerial skills beyond those of the civil service. It is very different to move from managing a fixed budget by allocating moneys within an organisation of a yearly basis, to managing complex budgets with separate income streams and product development strategies. Hence the many attempts at civil service reform and the development of electronic government for example in the USA (Gore 1993), the UK (Cabinet 1999), Peru (Scott 2001), and India (Pradesh 2001). Hence, also, the appointment of people with entrepreneurial and business skills to executive roles within PSI producing agencies, no more typified than the change in culture in appointments to the Director General of the GB Ordnance Survey in the 1990s from traditional military surveyors to David Rhind (GI research, policy, and information strategy), Geoffrey Robinson (ex IBM with a business focus), and Vanessa Lawrence (publishing and the GIS industry).

It is for reasons of cultural change within global economic uncertainty, coupled with the uneven supply of direct taxation and ideologies of marketisation, that data charging has received so much attention from policy makers. It is, in the end, one of the few strategies that builds extra financial capacity so that PSI producers can meet more effectively their diverse user needs. We have moved a long way from the restricted views, articulated in the early 1980s in the UK by the Thatcher government, that “Information should not be collected primarily for publication. It should be collected primarily because the government needs it for its own business” (HMSO 1981). PSI is collected for all potential users, and the more diverse the users the more diverse the demands on PSI producers to expand activities and to diversify their product lines.

6. Charging as a contest over market, dominance and unfair competition

Policy outcomes seldom perform to the script articulated within a vision document, and it is hardly surprising that strategies built to manage uncertainty are themselves perturbed by uncertainty. The most direct uncertainty impact is ideologically driven change. In UK Official Statistics there was a significant policy change to free statistics in 2000, where “the most important government facts and figures will now be available to the public free of charge on the new National Statistics website” (Cook 2000). The risk here, however, is that the PSI owner becomes the sole distributor in a one-size-fits all model. The Neighbourhood Statistics Web site (Statistics 2002a) follows the professional practice of official statistics, and does not 'mix' statistics from different geographies. The business approach to data production, however, is that users do not like data vacuums, so provide the best data available and surround it with qualifying metadata. Compare Neighbourhood Statistics (Statistics 2002b) and Upmystreet (Upmystreet 2002) for the same UK postcode and the disciplinary differences are starkly identified. The commercial site has a richness of data that are loosely linked geographically and statistically, whereas the National Statistics site takes a purist approach. This is not to say one is good and another bad, but that a plurality of distributional types is essential for diverse and demanding markets.

Ideology can change, for example in New Zealand. Rhind reviewed data charging outcomes after New Zealand had imposed a rigorous cost recovery programme on national mapping, noting a reduction in sales between 1989 and 1994 of 60%, “although income was 25% greater in real terms, indicating that a smaller number of users tolerated (or did they simply have no alternative?) higher prices” (Rhind 1992). By 1995 the strategy was to accelerate commercialism, with the Director General of DOSLI (Department of Survey and Land Information) noting that economic crises in New Zealand were the primary motivator for such policies (Robertson 1995). The new commercial manager for DOSLI argued that privatisation would be preferable to move away from the controls of treasury and civil servants with their frequent changing of ground rules and moving of performance targets (Gartner 1995). Logically, therefore, increasing commercial focus would be expected to develop, until 1999, when a new Government realigned dissemination policy. John Luxton, then Minister in charge of Land Information New Zealand (LINZ), stated “the copyright charge meant that very few organisations could afford to use the data. Access to affordable topographic data will greatly assist New Zealand's participation in the information age” (LINZ 1999).

One of the four core responsibilities and outcomes for activities of LINZ became a clear focus on maintaining high-quality geographic information for nationally-defined needs such as security and emergency services. This was to be achieved through the “provision of accurate up-to-date core land and seabed geographic information which is available to the public in the most efficient and cost-effective manner” (LINZ 2001; LINZ 2002b). A ministerial briefing in 2002 stated that

Government policy requires that LINZ make topographical information available easily, widely and equitably to the people of New Zealand. To this end, LINZ has commissioned

online access to its basic 1:50,000 topographical information. Free access will be provided initially to LINZ's primary customers and subsequently to the general public ... (via) online means by which users will be able to obtain digital data for incorporation in a GIS. (LINZ 2002a).

The goal posts therefore dramatically shifted away from maximising financial independence to maximising public good. To what extent policy shifts have led to a perturbation of product line is debatable, but the LINZ move to full digital topographic data availability in a public private partnership with IBM has led to some concerns about product quality and timeliness (Gifford 2003).

Interestingly, while the bulk topographical survey data is "freely available" at cost of distribution (NZ\$ 270 per order), this applies to raw survey data provided on a digital tape in a proprietary GIS format. Potential customers are recommended to contact a short list of accredited resellers to acquire the data they may need. Many of the other (non-topographic) information products available from LINZ, such as title searches and survey searches, do incur license fees, digital certificate set-up fees and transaction costs. Also, in April 2003, LINZ announced a new schedule of fees and charges applicable to all electronic and manual transaction processes for implementation in early July 2003, and the "fees and charges schedules are the first step in the alignment of transaction charges with the real costs involved in providing the services" (LINZ 2003). So there was yet another swing in charging policy for PSI GI in NZ in less than 18 months.

The last area of attention under this theme is the most contentious. If PSI producers start to produce their own value-added products does that lead to fears of market dominance, unfair competition, or even monopoly behaviour? If PSI producers are expected to build income streams and enhance capacity, then what is the most successful income stream? Can they achieve it by purely selling or licensing their basic (core) data, in which case the market is the mechanism to service the diversity of users? Or, should they build their own value added products that have a higher return on investment, so accelerating capacity building? Research in business information products seems to provide clear guidance, since "the average cost per unit of information will continue to decline, but that the share of revenue taken by application rather than content will rise" (Hughes 2001, p.10). This statement is clear advice for PSI producers to move into value-adding rather than raw data sales.

If that is so clearly the case, then the scene is set for tension and contention. Hughes further notes that large organisations in the business information market will almost inevitably dominate and absorb many of the smaller companies (Hughes 2001). Can such a process be acceptable in PSI production when the PSI producers may be autonomous 'business' sectors, but are not companies subject to company law, who can purchase other companies subject to competition law? Government PSI producers with a business focus therefore are severely constrained in their ability to behave according to market principles. Hence the request of the UK Ordnance Survey to become a full business (CMG 2001), and the resultant tensions within the UK geographic data market over interpretations of the behaviour of the Ordnance Survey. The OS 'own' their data, and as any user knows, the copyright is aggressively protected. The UK Automobile Association

was fined £20 million in 2001 after 'fingerprints' in OS digital data proved that the data had been used illegally (Clark 2001; Survey 2001a). In 2002 a value-added reseller of OS data, Getmapping plc, claimed that the new Mastermap product being developed by the OS would unfairly compete with the Getmapping Millennium Map, itself built using licensed OS data (Getmapping 2002a), and this legal move had an immediate impact on the market value of Getmapping (Getmapping 2002a). An interim injunction in May 2002 ruled in favour of the OS, accepting the OS argument that the Getmapping product did not meet OS accuracy expectations to be an official OS product (Getmapping 2002b; Survey 2002). In January 2003 a press release from Getmapping announced that "Getmapping has won a new aerial mapping contract worth over £1/2million from Ordnance Survey to photograph Scotland from the air. ... The digital aerial map will be created to Ordnance Survey's exacting specifications" (Getmapping 2003).

This particular example shows just how difficult it is for a public body to behave both commercially and also to fulfil the obligations of a public agency. It is a tension that is not unique to geographic data, and the Ordnance Survey is used here as an example primarily because it has proceeded far down the information commodification route and as such will therefore be at the forefront of articulations of tensions between PSI producers and agents. Furthermore, such tensions are evident in many other areas, such as; the growth of Web-based independent travel sites being threatened when the airlines themselves developed their own sites (DiSabatino 2001; Foss 2001); agglomeration within the global media industry (DeLong 2001); the British Broadcasting Corporation (BBC), funded through obligatory license fees, developing its own search engine (Gibson 2002) and electronic education curriculum (Cassy 2003); and, quite perversely, the very visible impacts of uncertainty regarding global electronic connectivity where individuals can be awarded patents for what are widely accepted as public domain functions. For example:

A map of the area of a client computer (10) is requested from a map server (11). Information relating to a place of interest is requested from an information server (12) by the client computer (10). The information is superimposed or overlaid on a map image at a position on the map image corresponding to the location of the place of interest on the map. The information (or "overlay") server (12) may contain details of, for example, hotels, restaurants, shops or the like, associated with the geographical coordinates of each location. The map server (11) contains map data, including coordinate data representing the spatial coordinates of at least one point on the area represented by the map. (USPTO 2001) (see also (Multimap 2001a; Multimap 2001b))

This in effect patents the process of using a mouse to move a cursor over a map image on a screen and linking to spatial information. The extent to which public domain practice can be patented has caused increasing concern in the USA (Landry 2002).

7. Conclusions

Confusion over the 'best' PSI access and charging policy remains, particularly for developing nations where significant governance reform is required, and where existing PSI is often

seriously out of date and requires significant investment that may not be available from government resources. From those who have led the development of global economic development policy there is clear advice that government institutions have an obvious role in providing PSI to the public. Yet the government enters value-added information marketing at considerable risk in terms of monopoly accusation, meaning that “government should be allowed to maintain proprietary information or exercise rights under patents and/or copyrights only under special conditions (including national security)” (Stiglitz, Orszag, and Orszag 2000).

There often is misunderstanding, especially among non-GI-specialists, of the value of geographic information and the cost to produce it versus the apparent ‘no cost’ ease with which the data is delivered to the user, especially via Web-based services. Pricing policy depends upon complex relationships between users and suppliers, between the perceived value of primary GI and possible substitutes. One long-term view is that “widening the definition of the value of the data will alter the balance of the pricing policy debate” (Harris 1997). This requires further education of potential users concerning some very basic tenants underlying the whole concept of an information market underpinning an information society.

Confusion over pricing of PSI will increase in the future as more governments outsource more of their data collection, processing and dissemination workloads. Data access policies, contract terms and intellectual property rights will need to be formulated to take account of the natural tendency of a third-party data supply contractor to want to maximise the return on the data collection effort, even when the work is carried out specifically for a public sector body. Tensions will remain surrounding the extent to which PSI producers can generate sufficient capacity from selling data and selling services and value-added products. Tensions will remain surrounding fears of unfair competition and control over the supply chain to agents. What this paper has aimed to achieve, however, is a re-orientation of attention away from charging as dogma to charging as economic reality in a changing world.

By surrounding the debate with positions of religion - free, civil rights, information commons - the debate remains polarised. By re-articulating the charging debate as one of differential strategies to build capacity in an uncertain environment, the focus now is on the dogma that best achieves flexibility and quality of user service. This envisions the US national mapping situation (USGS 1:24,000 coverage) as a form of central planning where the PSI producer has no flexibility over capacity building other than to focus on priorities that can be funded by Federal Government core budgets. It therefore is little surprise that the data are so outdated. The debate now needs to be extended into the development arena, to explore how it can articulate the challenges and tensions facing countries with low levels of existing PSI productivity, limited government resources, and who increasingly are being persuaded to build PSI 'infrastructures' that, allegedly, will help them position themselves successfully within globalisation.

Most importantly, it is time to re-examine the sometimes competing theories underlying valuation of public sector geographic information so that rational charging policies can be enacted in consultation with the fully informed end-users of that information, whether private citizens, commercial enterprises or other government agencies. In a world where all governments have finite resources and constantly changing priorities regarding support for their citizens,

slavish adherence to dogma provides no viable long-term solutions.

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