

# Emergent Commercial and Organizational Charging Strategies for Geostatistical Data: Experiences Disseminating United Kingdom Official Labor Market Information

*Michael Blakemore and Sinclair Sutherland*

**Abstract:** *A 15-year experience of developing and marketing an online geostatistical database of United Kingdom official statistics is used to evaluate the impact of charging strategies for geographical information and services, and to explore the relative cost benefits of charging and not charging for information. The experience of charging is set first within the policy frameworks for access to Public Sector Information (PSI) and conceptual frameworks for information charging. The historical development of the system and its user market is then detailed in the context of changing technologies, emerging user requirements, and government policy shifts. Conceptual frameworks from the strategy literature are then used to identify the emerging charging strategies.*

## Introduction and Context

This paper investigates some of the paradoxes of charging for geographic information (GI). We all want a “free lunch,” and would prefer that someone else pay. If the free lunch is not to our liking, however, what recourse do we have with the restaurant, for the standard capitalist society reaction is to withhold all or part of the payment? If the restaurant is government-funded, and our taxes have paid for the physical infrastructure and training and salaries of the staff, should we expect the lunch to be free to us as taxpayers? If the same price is charged for all lunches in the restaurant, how does the chef find the resources to experiment with new recipes and foods, and does the restaurant have to charge the same flat price if a more expensive recipe is created?

GI is more than a recipe—it often is promoted as the fundamental ingredients of most recipes. Many of the studies over the past decade argue that its role in the functioning of society is almost ubiquitous—the regularly cited statistic is that GI is used in 70 percent of all governmental information applications, and that it contributes significant value adding to an economy (Clinton 1994; Coopers & Lybrand 1999; Craglia and Masser 1997; CSDC 2001; Europe 1998; KPMG 2001; OXERA 1999; PIRA 2000). This paper will review access and charging experience over 15 years in a UK online labor market dissemination service that provides detailed access to official UK labor market geostatistics. A key aim of the paper is to evaluate the impact of pricing of data on usage, to place that within the frameworks provided by the literature, and to extend the discussion from access (i.e., volume extraction of data) given price or no price to the consideration of effective and efficient usage, the overhead costs of user support, and the extent to which policy contexts and shifts themselves influence charging, access, and use. There is a range of conceptual frameworks within which the pricing of information can be structured, although it must be stressed that these are not mutually exclusive frameworks:

- Rights. The basis here is that information is fundamental for the functioning of a democracy (Article 19 2001) and should be regarded as a human right (Ostergard 1999); the taxpayers have already funded the collection of information and therefore GI should be readily available within an “information commons” (Onsrud 1998). An information commons may also be constructed for altruistic reasons such as international development, as with the free provision of research literature (Anon. 2004). Even with an information commons there can be, however, the potential for commercial sales, as was experienced by the U.S. Government 9/11 Report—while freely available on the World Wide Web (the Web), it sold significant copies commercially (Glasner 2004). Even Freedom of Information is freedom with a cost restriction, and new legislation in the UK will focus on a fee policy where “There will be no charge for information that costs public bodies less than £450 to produce. And for central government, the cost ceiling will be set at £600” (Falconer 2004).
- Regulatory interventions—integration and agglomeration. Here the existence of government GI is not enough, for it is produced in disparate formats, contexts, and geographies. There are significant overhead costs in making GI useful, and Government intervenes to provide a compulsory mandate, or a collaborative framework, within which GI can be organized and delivered to users (Europe 2003). The broad context here is the recent promotion of information infrastructures (Europe 2004).
- Information society—inclusions and exclusions. This goes beyond rights, supply, and even infrastructures, to the role of information in globalization and the postindustrial society and the uneven distribution of knowledge spatially and structurally within society (Bonfadelli 2002). Delivering integrated and structured GI is of little use unless the recipients have the skills, knowledge, and technological contexts (Garnham 2000) to interpret and add value to the

information. Contexts here are universal service, government interventions to overcome digital divides, and the emphasis on “lifelong learning” that stresses the responsibility of citizens to keep their skills up-to-date as they experience many jobs in a turbulent economy.

- Governmental risk management—charging for access and reuse. Here we encounter the practices such as marginal cost charging and cost recovery. A primary motivation for Government here is to move away from potentially accumulating costs that arise from an accretion over time of centrally funded initiatives to provide GI. Existing initiatives can only continue to be funded if taxation income is adequate to meet the demands of supply, update, and innovation. However, there is no causal link between tax income and societal demand for GI, and in the postindustrial society with a reducing direct tax base and increasing demands for social and health services, Government needs to reduce as many funding commitments as possible. Hence the focus here on “user pays,” whether for using roads or public sector information (PSI) such as topographic mapping.
- Capacity management. Can GI be provided free at the point of use and still meet the demands of the “market”? In the context of USA Federal Mapping, this clearly is not assured, as the “Weaving the National Map” review identified, noting the significantly outdated GI within copyright-free, free-at-the-point-of-use federal mapping (NRC 2003). In a review of these issues, Longhorn and Blakemore conclude that in the context of stretched supply chains and complex reuse of GI, charging of some sort enables essential capacity management (2004). Furthermore, the experience of information markets is that the exchange value (sale value) of information is less than the use value (value adding), and that use value is both dispersed and complex, placing significant demands on data suppliers to innovate ever more quickly in an environment of “stretched productive relations” (Lash 2002, 207).
- Profit. GI here is simply a business, or a means to a business goal, but in reality it can be conceptualized as capacity management that generates a financial surplus that is not reinvested in product development. The commercial geodemographics sector is the archetypal commercial GI with direct sales dominating the revenue stream, but the widespread availability of Web mapping services such as Multimap and Mapquest also show the complex strategic interrelationship in providing some GI free as a means of marketing other services and encouraging users to spend on those services. News media sites have, as Schiff notes, focused revenue generation around eight themes: “1. Advertising revenue; 2. Online traffic; 3. Infant industry profits and stock values; 4. Digital content delivery; 5. Continuous breaking news; 6. Information retrieval and storage; 7. Portal conduit; and 8. Interactive networking” (2003). Themes two and four to six are dominantly direct income, whereas the others are from indirect funding or from add-on services.

- Business strategy and competitive forces. This is a turbulent extension of profit, where pricing strategies are reflexive in the context of competition from other GI services, combined with the uncertainties of globalization and information markets. The recent experiences of the mass media newspapers illustrate this process, where in the late 1990s there was a rush to build online Websites that were richly populated with content and archives, but which were largely free to use. The assumption of most media companies was that the cost of maintaining the sites would be met by advertising revenues, an assumption that was not met, and the information consumption strategies of new users also would be changing (Penenberg 2004). Competition between major market players also results in complex pricing strategies, such as that between Hotmail and Googlemail—Microsoft promoting charging in 2003, and retreating from aggressive pricing in 2004 with the advent of the competitive e-mail service from Google (Asaravala 2004).
- Pricing through enforced absorption of costs by the consumer. Within this category spam e-mails are an example of information that is forced onto a consumer, and where the cost of avoiding it or removing it requires consumer investment in software tools or in his or her own time (BBC 2003). This clearly is a highly unlikely strategy for PSI.

## Nomis, the Policy and Commercial Contexts

These frameworks provide some context within which to evaluate Nomis<sup>1</sup>, the official labor market dissemination database of UK National Statistics. Nomis is an online database comprising, mid-2004, some 550 gigabytes of geographically disaggregated time series of data on unemployment, employment, job vacancies, and demographics. Nomis disseminates both presupplied aggregate data and also processes some anonymized microdata within customized software for the real-time creation of aggregate data series. The aggregate series are then restructured into a consistent geographical base, validated, documented, and put online for dissemination purposes. The service has been in existence since the late 1970s and has functioned as an operational official system for disseminating UK labor market data since 1983. During this period, the system has experienced a highly turbulent period in governmental attitudes toward the role of data within policy, economy, and society.

The Nomis service has “lived through” mainframe, distributed network, and Internet technologies, and through major UK political and policy shifts in charging and dissemination strategies, in particular when direct user charges were abolished through a policy change in 2000. Before 2000, Nomis needed to find customer strategies that cope with fluctuating user communities where, over time, it became increasingly difficult, for example, to differentiate between academic research that can be commodified as consultancy, and commercial research and development activities that have policy and research roles. Furthermore, charging

models needed to provide a reasonable continuity of overall user payment levels, while often having to change the fundamental basis of charging as a result of changes in IT platform and associated software capabilities.

For most of its existence, Nomis has applied direct charges to users, but within a charging environment of government agency policy on the nature and levels of costs to be recovered. The charging policy has emerged during a period of considerable turbulence over the acceptability of charging for PSI. Charges may be indirectly levied, through the provision of taxation income to fund statistical agencies—that is as much as is levied by the U.S. federal statistical system (Wattenberg 1976)—or they can be levied directly by setting an up-front price to information. Controversy usually emerges once direct charges are levied on the supply of the data to users of data, whether it is all users or only some users. Charging may be set only to recover the onward costs of data distribution (Van Velzen 2003, 9), but that method provides no income stream to reinvest in new and improved PSI.

Cost recovery, where the full operating costs of the agency in collecting, creating, and disseminating the data are charged to users, in effect recovers the “large fixed and sunk costs” of information products (Varian 1996). Semicommercial pricing can involve “a government-owned public limited company” of the form proposed by the UK Government for the Ordnance Survey mapping agency (Survey 2003; Survey 2004), where income beyond the agency cost recovery can be retained. A further option is to transform an agency into a commercially tendered agency or privatized profit-driven service (BBC 2001; Dembeck 2000; Webb 2001). In all of these forms, however, there is a substantive difference between public sector and commercial approaches to charging. In PSI charging, there usually is some acknowledgment to a universal service requirement (Muir and Oppenheim 2002) that mandates data must be collected throughout the nation to the same standards irrespective of whether the resulting data will be used. Second, there usually is a commitment to product stability that acknowledges the need for analysis over time that then informs policy development.

The policy regarding the imposition of costs is a crucial influence on the actual level of costs, but it is not the only one. Agency dissemination and marketing strategies, and the changing nature of technologies also exert strong influence. For example, a policy that mandates no end-user costs can impose significant resource overheads on an agency unless specific dissemination resources are provided, and it is not enough to argue just that Internet dissemination incurs little replication costs (Shapiro and Varian 1999, 21), because the costs of data maintenance and metadata creation are significant. Furthermore, a shift in policy can be internally generated within government, be externally stimulated as in the case of the destabilization of the dominance of the Encyclopaedia Britannica in the commercial encyclopedia market in the late 1990s, and also can be exacerbated by a failure of corporate ability to confront rapid change (Evans and Wurster 2000, 5).

Radical changes to computing architectures can have dramatic implications for information services. Britannica’s historical

dominance in the encyclopedia market was based on the high sunk-cost investment required to reach its levels of coverage, consistency, accuracy, and market prestige. Microsoft’s Encarta product was, however, launched on the basis of addressing a lower-cost global mass market that generated large revenues that would then go into sunk-cost investment (Shapiro and Varian 1999). The low start-up and distribution costs of the Internet had by then encouraged new information sources to compete with the established encyclopedias (Frauenfelder 2000). Britannica attempted to maintain its status by reducing costs until, in 1999, it went free online with the business model being the characteristic one of that time—advertising revenue would underwrite the costs. Apart from being a single income-source business plan, it did not foresee corporate embarrassment when the demand from nonpaying customers seriously exceeded IT capacity (Raspberry 1999). When the advertising model collapsed in 2000, Britannica attempted coventuring strategies with other portals and distributors (Scasny 2001), reduced the cost base by sacking staff (Anon. 2001), and by March 2001 it had gone almost full circle by reintroducing fees (DiSabatino 2001). Only the first few sentences of an entry were still free, and there was a charge to view the full entry. In July 2001, the cost of online access was set at \$5 a month, or \$50 a year (Bellandi 2001). In December 2001, a new 32-volume paper edition was being promoted, so paper-based information is hardly moribund (Rynkiewicz 2001). During 2003, new forms of encyclopedias were emerging, such as Wikipedia (Mayfield 2003), that added further turbulence to the previously stable encyclopedia market.

A policy requirement to recover costs can lead to a focus on those customers who have to use the data, with the costs divided among them. This was the case with New Zealand in the late 1980s when the Government imposed an aggressive cost-recovery mandate on the mapping agency (DOSLI) and in “1989 the number of sales was only 60 percent of 1984, although income was 25 percent greater in real terms, indicating that a smaller number of users tolerated (or did they simply have no alternative?) higher prices” (Rhind 1992, 26). A policy that mandates the widest possible dissemination can therefore lead to a more sectoral approach to cost setting, or the need for subsidies.

Policy shifts can force quantum shifts in charging strategies that perturb existing business models. New Zealand national mapping (LINZ) went from a public-service orientation to a marketing orientation in the 1990s, only to return through a further policy shift when the Minister, John Luxton, admitted that “The copyright charge meant that very few organizations could afford to use the data. Access to affordable topographic data will greatly assist New Zealand’s participation in the information age” (Anon. 1999). Nevertheless, that did not mean that data would be free in any format, because the strategy for LINZ now would be to “only supply raw data. Private sector data resellers and major users would need to reprocess this into formats required by the various geographic information systems” (Robson 2000). However, even the 1999 policy shift itself was shifted in 2003 with the announcement that fees are to be revised “in the alignment

of transaction charges with the real costs involved in providing the services” (LINZ 2003).

The UK Thatcher Government in 1981 articulated an ideologically driven charging approach (HMSO 1981), known as the “Rayner doctrine,” of full cost recovery (Hoinville and Smith 1982), a doctrine that was only changed towards a softer public-need approach in 1992 (Treasury 1992). Charging policy here was mostly about expanding the capacity of an agency to cope with changes in market demand, and to reprioritize information activities without constant recourse to renegotiating central Treasury budgets. This has become seriously evident in the state of USA Federal Mapping, provided by the U.S. Geological Survey (USGS) through central funding, with no copyright containment and no user charges. The lack of financial flexibility has seriously impaired product development and:

As USGS’ priorities shifted toward scientific research, however, its mapping program languished. As a result, while towns went boom and bust and landmarks such as airports, buildings, and parks spread and dwindled, the topo maps lagged further and further behind the landscape they represented. Today, the maps are only sporadically updated, and some are 57 years old (Brown 2002).

A new “National Map” strategy aims to work on a partnership basis with “updated information gathered from state and local authorities, then integrated into a new, up-to-date map series” (NRC 2003). Even the U.S. Bureau of the Census aims to create “Geographic Partnerships” with state and local government bodies in a strategy to build capacity for the urgent maintenance of basic geographical data for census use (Census 2003). Consequently, the discourse of data charging has a complex language. The term free does not mean free in any user-demanded format, and New Zealand demonstrates that “free” often tends to relate to “raw” or basically formatted data. There is even a potential debate as to whether government agencies are the best suited to construct information dissemination platforms, as in the case of the U.S. federal system where “money, technology, and competition, combined with an inconsistent Congress and the initiatives of individual agencies . . . lead to inconsistency, inefficiency, or duplication of effort” (Cocklin 1998, 409).

To overcome organizational friction and inefficiency, mandates to share and integrate data exist in the context of information infrastructure strategy, such as in U.S. Circular No. A-16 (Revised) where “the Circular affirms and describes the National Spatial Data Infrastructure (NSDI) as the technology, policies, standards, human resources, and related activities necessary to acquire, process, distribute, use, maintain, and preserve spatial data” (OMB 2002). From these instances, an observation can be made that increasing levels of “free” access can be generated by efficiency gains, the mantra being “Creating a Government that Works Better and Costs Less” (Gore 1993). Cost reduction and a flexible and reduced civil service (Flynn 1999) was at the heart of reinventing government initiatives during the 1990s, in the United States coordinated by the Reinventing Government task force (GAO 2000), and in the UK was labeled as “modernizing

government” (Cabinet 1999), although the process of modernization was not effectively handled in the face of competitive departmental behavior between “ministers and mandarins” (Kavanagh and Richards 2001).

Even an information product set at a zero cost, therefore, has no definitive stability unless the funding/income stream is stable and assured for a medium to long term. A product that goes from free to fee also is highly susceptible to the uncertainties of demand: while the “distribution” costs across the Internet are minimal, the server-resourcing costs have a direct relationship to volume of demand, hence the popularity of denial-of-service hacking mechanisms to bring down an Internet site (Cabinet 2001, 20). The Internet and the expected flourishing online advertising market (Gallaugh, Auger, and BarNir 2001) led to a rich vein of free content until 2001, much of it being online archives of the mass media. Reducing income streams and increasing archival maintenance costs led to rapid returns to charging for access to information (Smith 2002), with The New York Times Digital Chief Executive Officer Martin Nisenholtz quoted as saying, “We shouldn’t be talking about free versus paid content. It’s over, end of debate” (Pruitt 2002). Similar endings of free content have occurred for the Atlantic Monthly (Murphy 2004) and the Far Eastern Economic Review (Wern 2004), and even the UK Guardian site that strongly retains free content is looking to raise extra revenue through premium services (Bell 2004). It is debatable whether these experiences underpin the argument of Lash that use value is more significant than exchange/sale value of basic data (Lash 2002). In part it does, but in part it also shows how information sites have to react rapidly and unexpectedly to uncertain market developments.

Using the experiences of Nomis, this paper will explore whether sudden adverse changes in charging policy suppress levels of use and therefore diminish the potential use of data in all sectors, leading to a reduction in potential revenue for the government agency. Conversely, does the abolition of charges stimulate a previously suppressed data market?

## **Nomis, Its Recent History and the Charging Contexts**

The Nomis system has been “owned” by a succession of UK government agencies. It was originally developed in the early 1980s for the Manpower Services Commission (MSC). MSC was later incorporated into the Employment Department (Blakemore 1991), which itself was closed (through merger) in 1996, leading to the acquisition of Nomis by the Central Statistical Office. The CSO then merged with the Office for Population Censuses and Surveys to create the Office for National Statistics. The system was resourced historically (prior to 1986) as a fully funded service where income was used to build development capacity beyond the core grant from MSC. From 1986 to 2000, the contractual emphasis was much more on open competition to develop and run a service that was funded primarily for government agency needs. Therefore, income was needed to underwrite the additional

costs of delivering the service to other user sectors. Within that period, a more direct mandate to cost-recover (through apportioning nongovernment income) was required, with the direct usage costs (beyond system development) to government users being zero.

During the period 1986 to 2000, the challenge to Nomis was to develop charging strategies that both generated income and also maximized the use of the database. The charging strategies were contingent not only on the ability of users to pay, but also were strongly influenced by the technological platforms on which the system was designed and delivered. These consist of three major periods of mainframe, to distributed Unix servers, and recently to a Web-delivered service<sup>2</sup>. Each of these transitions has placed significant demands on developing new charging regimes that were acceptable to users, that as far as possible were cost-neutral or even delivered cost reductions (on the assumption that efficiency gains should be evident with new developments), and did not perturb the overall income stream. The latter point was important because the contract did not allow risk sharing. If a new charging regime was implemented that led to income reductions, the contractor would have to bear the impact, while any increase in income would be shared.

The early years (the beginning of the 1980s) of academic charging were largely “seat-of-the-pants” for no other existing charging models were available for a mainframe service accessed through 300-baud acoustic modems. The charges were low enough to encourage use by a cohort of about 20 academic research groups active in UK local labor market research. These researchers made a conscious decision to pay-for-use on the basis of the speed, integration, and customer support provided by Nomis. They could, as others did, acquire most of the data held on Nomis free of charge from the University of Essex Data Archive, with limited data customization, documentation, and support<sup>3</sup>. On that basis, academic researchers made conscious decisions about the cost assigned to their own time. They could pay money to acquire data from Nomis or incur time costs developing their own software, etc.

Nevertheless, the early experiences with the reaction to charges from academic researchers indicated a number of key considerations. First, there was a widespread inability (coupled often with a reluctance in principle) to pay for data by academics. In part, this is a view held that data collected using taxpayer revenues should not then be recharged to the taxpayer. More realistically, the inability to pay lies in the fact that academic salaries are largely “written-off” investments. Few academics cost their time by the hour when carrying out a task; therefore, the cost-benefit assessment balancing off purchase of a customized service versus self-developed software is seldom carried out. Indeed, the way in which research is funded, with funds allocated for the purchase of staff time such as research assistants, actually tends to encourage localized development of software rather than purchase of customized data services.

Second, much research and teaching requires significant experimentation with data, and the implication of this is a need to

have the widest possible access to data. Third, there are resource implications in supporting users of statistical data, particularly in training, documentation, metadata, and support services (Blakemore and McKeever 2001). Constructing a database is only one, relatively modest component of a data service. Simply making data available in the original formats from the data owners does not necessarily inform potential researchers. They are best served through advice on methodologies, on definitions, and on geographical issues. Fourth, academics also are likely to engage in commercial consultancy, so would the widespread provision of free data give unfair competition to the commercial sector that pays full costs?

Fifth, academia has a long-established behavior of sharing information, so is there a danger that intellectual property will leak? This is much more of a risk for topographic data (only a small proportion is volatile) than it is for statistical data, where frequent updates and revisions encourage users to return to the original source. Hence the Ordnance Survey of GB required significant levels of audit and security in the system designed for UK academic access to digital map information (EDINA 2001).

## The Transition to Semicommmercialism: Changing Business Cases

In the years between the Rayner doctrine (HMSO 1981) and its revocation (Treasury 1992), the UK Department for Trade and Industry had published guidelines in its Tradeable Information Initiative (DTI 1986; DTI 1990). Manpower Services Commission (MSC) decided in 1986 to start offsetting some of the development costs of Nomis by making it available to all users, grouping them into sectors of Government, Government Agencies, Local Government, Academia, and Commerce. A joining cost was imposed to cover the considerable production costs of documentation, metadata, and updates. A yearly renewal cost also was introduced, again to provide continued capacity for documentation updates. The main basis for online charging remained the elapsed time online plus the amount of the Central Processing Unit (CPU) used—a surrogate for the volume of information being processed. Two user levels were assigned—academic and nonacademic. On top of the computing charge, a surcharge was imposed, for example, 20 percent for local authorities, 40 percent for academics, and 50 percent for commerce. This surcharge was used partially to recover the staff costs.

There was no “prior knowledge” on which to construct these charging bands. It was largely influenced by MSC’s perception of user groups (it was felt possible to substantively differentiate between commercial, government, and research), coupled with a strong belief by the Agency that maximizing the dissemination and use of local labor market statistics was desirable. There was never any contractual demand that this charging strategy would recover the entire costs of Nomis, but more an expectation that an increasing absolute surcharge income would arise from increased

usage, thus offsetting increasing proportions of staff salaries and also providing capacity to employ staff whose core tasks were not directed at MSC user requirements and who could not therefore be funded from the core contract.

The justification for not pursuing full-cost recovery was written within the Business Case that MSC produced for HM Treasury to justify the funding for Nomis. To the mid-1980s, it was based on a comparison of the costs that would be incurred at the MSC Head Office and at Regional Intelligence Units. What would the costs be if the data preparation was undertaken manually by clerical staff, balanced against the cost of Nomis being developed and run by an internal or external contractor? From 1986 onwards, the awarding of the Nomis contract was also subject to full competitive tender and Durham had to compete for the contract every four to five years, and the Government Department IT services were able to compete for the contract.

Three processes influenced the development of charging over the next ten years: confusion over user groupings; new IT infrastructures at the University of Durham, and the differential imposition of data charging by parts of the Government Statistical Service. Confusion over user groupings emerged quickly over how academic users could operationally discriminate over data extracted for bona fide academic research projects or for consultancy use that would generate fees and profits. The response was to ask them to take out supplementary commercial accounts for consultancy use, with the full knowledge that every Nomis user session was fully logged and could be audited retrospectively in detail.

The second area of confusion was created when local authorities started to engage in commercial or bureau activities. This was a way local government research sections gained extra income and increased their research capacity. The lower surcharge level for local authorities (20 percent as opposed to 50 percent for commerce) then created unfair competition with commercial companies. The solution was to adopt a goal of ideally bringing all charging down to the lowest level. This ideal was tempered by the pragmatic assumption that lower charges would encourage more users and more usage, thus resulting in greater gross revenue. Early in the 1990s, commercial charges were reduced to those of the local government. Another revision to charging strategies was encouraged by further confusion over commercial activities by government agencies, or for work undertaken on behalf of government agencies by commercial companies. This led to the simplification of the charging policy to a joining fee (plus yearly renewal), computing costs based on academic research or non-academic (with two subgroups of Central Government and other users), and surcharges of 40 percent on academic costs and 20 percent on commercial. The ratio of academic to commercial computing costs was maintained as before at approximately 1:3.

## Mainframe to Distributed Network

From 1992 onwards, a new IT infrastructure at the University of Durham mandated further radical attention to charging. The existing CPU charge had for long been a deterrent to users

processing large time series of data: the software architecture of Nomis was predicated on complex geographical selection of data rather than time series. A migration from MTS and mainframe to a Unix server in 1992 was an opportunity to revisit CPU. However, it was considered too risky to address CPU immediately, because the software transition during 1992 had to focus mainly on ensuring a transparent implementation of Nomis functionality onto Unix, retaining the interface and characteristics familiar to the users at about 300 sites at that stage. The challenge of transferring users, their files, and their usage characteristics from one IT infrastructure to another was a major challenge in itself. With Nomis there was no possibility of “freezing” the system, because monthly unemployment and job vacancy statistics had to be released on time each month on the published day of national release (known as “Press Notice”). Once the transfer was complete, user consultation indicated a willingness to move to a single elapsed time charge that was the norm in a growing number of commercial database systems.

There was also, it must be admitted, a real financial disincentive to risk too much at that stage. First, those funding Nomis expected increasing cost-recovery levels each year, so the University would be forced to underwrite any shortfall. Second, the nature of the user sectors indicated that only one sector would have flexibility to increase income, and that was commerce, although its usage was not strategic but was more reactive, based on projects and tasks at hand. All other user sectors were budget-driven in their use of Nomis. Research units in local government had preset data budgets that were calculated long ahead. Their only actual “capacity management” was to ensure that if their current yearly budget was being underspent, that they pay in advance for usage in the next financial year. A separate escrow process was operated for payment-in-advance using underspend from a current budget, but in general the user base has little financial flexibility.

In 1996, a full review of charging options was undertaken with the view of developing a new, simple, elapsed-time charge for implementation in 1997. Two key considerations were addressed in setting the costing levels of a price-per-minute online. First, the level had to be set so that a “broad basket” of user extractions did not cost more than before. A target was set at 10 percent below the existing aggregate price within a principle of delivering price reductions through IT innovation and efficiency. Second, Durham still had to accept the business risk that even if gross income declined, the net offset of costs to the Employment Department would not go below existing levels. In fact, the fear was unfounded and gross revenue rose as users felt more at ease with elapsed time charges.

During the following years, the revised elapsed-time charge was reviewed in the light of usage patterns. It became apparent that the revenue distribution by user was rather skewed. There were a number of users who never actually used their account online, but who seemed willing to pay the £75 joining fee and £40 yearly renewal for subscription to Nomis. In return, they received detailed manuals containing metadata and technical documentation, with updates and newsletters. Even with proactive reminders

**Table 1.** Nomis income per sector in 1995

Nomis Computing Income 1995				
User Accounts	Total	Average use	Median	Standard deviation
Head Office Core Accounts	£36,075	£1,127	£464	£1,453
Employment Service	£48,702	£3,247	£3,021	£2,025
Employment Service Secondary use	£2,841	£284	£127	£277
Central Government	£15,282	£804	£344	£975
Enterprise Companies	£44,148	£496	£390	£453
Other Government Agencies	£13,345	£1,027	£306	£1,150
Local Government	£52,959	£411	£292	£388
Commerce	£66,533	£559	£137	£1,095
Academic Researchers	£10,925	£98	£29	£212
Postgraduate academic researchers	£128	£18	£16	£18

**Table 2.** Nomis price simulation for 1996

Nomis Charging Simulations 1996					
User Accounts	Users	Original	Estimates	Difference	% change
Employment Department Group	29	£48,046.50	£55,775.45	£7,729	16.09%
Employment Service	14	£52,961.52	£56,962.00	£4,000	7.55%
Central Government	19	£16,122.50	£16,956.55	£834	5.17%
Enterprise Companies	88	£60,188.82	£63,987.25	£3,798	6.31%
Other Government Agencies	21	£13,127.72	£15,762.40	£2,635	20.07%
Local Government	152	£64,371.49	£64,839.40	£468	0.73%
Commerce	129	£66,144.24	£46,912.90	-£19,231	-29.07%
Academic Researchers	107	£8,084.16	£7,669.20	-£415	-5.13%
<b>TOTAL USERS</b>	<b>559</b>	<b>£329,046.94</b>	<b>£328,865.15</b>	<b>-£182</b>	<b>-0.06%</b>

to users that they had not used the system, a number continued to renew subscriptions, presumably regarding it as worthwhile just to acquire the documentation.

At the other end of the spectrum, a small number of business users were high volume–usage customers, often carrying out complex data extractions that were just the types of processes penalized by the CPU charge. Usage also differed according to user sector, with the summary statistics in £UK (Table 1) showing the dispersion:

The setting of a new “elapsed time”–only price involved simulations of levels using one year’s total usage online for all 559 existing Nomis accounts. The objective was to reach a level that 1) was below the important perceptual level of £1 per minute; 2) would deliver cost savings to high-volume users; and 3) would result in an overall impact of zero on revenue. This was still in line with a policy of delivering efficiency gains to users, but this time favoring the most important customers. Also taken

into account was the unknown “chaos” elements that exist in the introduction of a new charging regime. Usage may change in unpredictable ways, because user perception of new charges can be very different from supplier perception. For that reason, the process of change was undertaken in close consultation with a broad group of users, and the principle of changing to elapsed time only has been accepted by the majority of users following a general request for views.

The overall simulation identified a potential level of £0.95 per minute, which on the basis of 559 usage profiles resulted in an income projection decline of a mere -0.0552 percent. The overall summary table (Table 2) by users showed the differential impacts that would occur if broad usage patterns did not change.

One clear concern with this simulation was that the core Office for National Statistics user group, the group that funds the system development, was showing a predicted increase of just over 16 percent. However, the move to elapsed-only charges also

coincided with a new contract agreement to provide usage to the core group at no cost. The projected variations in individual use were considerable. One academic customer was showing a predicted cost saving of 96.6 percent on a previous payment of £221,34. The top 12 commercial users would see costs varying between -11 percent and -70 percent, the top 12 local authorities would be plus to -36 percent, and academic users +73 percent to -96 percent.

Broadly speaking, the top local authority and commercial users could expect to obtain big cost savings by moving to a more predictable cost base. These two groups were expected to increase their gross usage overall in the future, and also a wider range of users would be recruited from the sectors. The key elements of future income streams were now strongly concentrated in the enterprise company, local government, and commercial sectors. Even here, potential instabilities were emerging. The local government sector was undergoing significant realignment with the move to unitary authorities in Britain. There would be a finite number of local authorities and enterprise companies, while there was considerable opportunity to expand the commercial sector user base.

Even following the implementation of the new charges, it was felt that more was needed to reward highly active customers for their volume of use. This led to the introduction of subscription bands. By subscribing at the beginning of a year for a set price, the net cost per minute for usage would be reduced. The advantage for Nomis would be a much more predictable income stream. As before, the Office for National Statistics was concerned that offset costs would not be reduced. Durham accepted the business risk, and the overall impact was neutral.

## Embedding Relationships with Core Users, and onto the Web

Throughout these charging revisions we also had to cope with the imposition of data-charging regimes by areas of the Statistical Service (the Government Statistical Service, GSS, includes ONS). The Chief Executive of ONS, now the “National Statistician,” is also the Registrar General for England and Wales (Scotland and Northern Ireland are autonomous), and is also “Head of Profession” for all Government statisticians. Each government department has a Director of Statistics and staff who have a high degree of autonomy in decisions they have been able to make on the interpretation of confidentiality rules, dissemination, and pricing strategies.

Most data-charging regimes were loosely based on a cell-charging matrix established for the 1981 and 1991 Censuses of Population. In 1981, the data charges for the census were set and not changed. The 1991 census charges differed from 1981 on the basis that the Census Agency made a decision to revise prices upwards each year following publication of data by the retail price index. That policy argued that even though the data “decay” continuously away from the April 1991 count date, they still are as “valuable” as when they were first released. Where applicable, users incur data charges in addition to the elapsed-time

cost online. The Nomis approach to the Census of Population, with online availability of some 20,000 variables by 13,000 geographies, was to design special software to advise users of the data costs per extraction, requesting that they confirm the cost before the query is executed. This positive confirmation of costs was to prove a useful procedure when a Web interface was developed.

By 1998, it was clear that the Web was the dissemination platform of the future. The Web had started to mature well beyond the domain of academia, and connectivity was increasing in government and commercial sectors. Early in 1998, some other factors would also influence the move to the Web. First, there was a need to overcome the relative inefficiency of time-series extraction versus geographical extraction. Second, some proposed new data series broke the database design model, particularly an analysis of unemployment by ward, by gender, by age, and by occupation. Therefore, a complete redesign of the system was undertaken.

The Web was the main stimulus for a major reconsideration of charging. “Old Nomis”—as the original system became known—on a Unix server could charge by the minute. With the Web, however, there is no concept of elapsed time. A user may think that he or she is fully online and connected when his or her browser displays a page, but that is not the case. The Web interface to Nomis constructs a query in the URL line and then transmits it to the database, receiving output once the query is processed. There was no problem retaining elapsed-time charging for the “New Nomis” command-driven interface because the new database was still on a Unix server. Testing during development showed that there were dramatic cost savings for time-series processing. Overall, there was likely to be a small increase in net costs for users, however, because the new interface contained a lot more intelligence and metadata to guide users through data selection and extraction. This concern was actually unfounded, because a new, more powerful server was purchased and there was a real reduction in user costs, as before compensated by increased use.

The issue of Web “timelessness” was a real challenge. No matter what metric was evaluated, we were increasingly forced towards one of two unpalatable options. First was to make it all free, which is wonderful in principle and a good democratic statement, but nothing in the Nomis contract would permit this move, and those responsible for Nomis in ONS were not in a position to make Nomis free. The other option was to go back to charging by data volume. As a result, the charging matrix would have to be a lot more sophisticated than the cell regimes for some data, and it would need to be carefully calibrated against known costs for a large series of trial runs.

In the end, the cell-based charge was tried out with test users, with the session cost being displayed to users for confirmation before data were extracted. We were uneasy about this, but user feedback was positive and it did seem that varying charging regimes can be implemented so long as users understand the basis of the charges and they have the opportunity to abandon the session if the charge is too high. Furthermore, the Web proved to be a very useful tool for self-training and experimentation.

## From Fee to Free

“The Internet is transforming almost every aspect of the way we live and work today. It’s central to the development of our economy and our society. That’s why I announced at the launch of National Statistics that 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).

This statement, by the new National Statistician, Len Cook, marked a fundamental shift in UK statistical policy away from commodification to a more marked concept of an information commons. Having worked since 1986 on building a charging base to expand capacity, the contractual focus changed dramatically to a single core contract to develop and run a free service for all users.

From July of 2001, Nomis became a free service. The literature on charging would indicate that a significant rise should then occur in both users and overall usage, but the cautionary context would also be provided by the concern over how financial flexibility could be maintained to manage capacity (Longhorn and Blakemore 2004) and to meet the new and diverse demands of the users. The move to a free service had a dramatic effect on both the number of persons using the service and the level of use. The most immediate effect was that existing users tended to download larger amounts of data. The average number of data cells downloaded per query in the year prior to the system becoming free was approximately 450, which doubled to 900 in the year following the move to a free service.

The number of users joining the system also rose rapidly. During the charged service, five to ten new accounts joined per month. Once the service was free, this figure rose to approximately 500 per month. Several factors contributed to this. First, there were shifts in organizational behavior and moves to disintermediating data from users. Some County Council users who had previously supplied data to customers changed their policy. As Nomis was now free, they ceased using their own staff resources to provide Nomis data and instead told District Councils they should now access the data for themselves; quite perversely, the move to a free service resulted in behavior changes by users where they saw their own activities as costs that could be reallocated. Second, customers in sectors previously cut off because of the charges no longer had this deterrent. Over the first year, more than 1,000 new customers signed up as “personal” users. Prior to the free service, there were no customers of this type.

It became apparent, however, that many of these users were casual users who only wanted to obtain data from Nomis on a one-time basis. Of the 5,000 accounts who joined during the first year, 700 had used Nomis to download data on only one occasion. Based on this, a “guest” log-in facility was introduced in December of 2002 that allowed users to access the data without having to first register. Although it is still early to fully evaluate the success of this, initial results were very positive. The new account sign-up rate was reduced by half, from nearly 500 per month to under 250 per month, and the guest account has been responsible for about 10 percent of all queries.

## Discussion and Conclusion

The Nomis charging strategies developed over nearly 20 years have been interplays of strategy types (Mintzberg and Waters 1998). There was no exclusively “deliberate” strategy, which requires control over three key elements: clear organizational intentions, a common acceptance of the intentions throughout the organization, and a lack of external forces that could interfere with the execution of the strategy (Mintzberg and Waters 1998, 21). The owners of Nomis (MSC, DE, ONS) set the targets for cost recovery, but they also had control over the supply chain of statistics for Nomis. Furthermore, the changes in IT infrastructure were planned not by the Nomis team, but were driven by the IT strategy of the University of Durham, thus ruling out a “planned” strategy [Mintzberg, 1998, #714, 22].

The strategy became “ideological” in 2000 when the charging philosophy of National Statistics changed to one of free access, but before that Nomis exhibited several strategic patterns. It has been partly “imposed” by the policy of the agencies that have owned the system. It was partly a “process” strategy in that the role of the project management at Durham was to negotiate conditions that were mutually advantageous both to the contract awardee and to the University, while the actual design of the software was left to the development team with the condition that the resulting system had to perform to agreed criteria. It was partly a “consensus” strategy, because developments in the system had to meet strategic statistical needs of government agencies, while also appealing to local government, academia, and private sector users. It also was an “entrepreneurial” strategy, where the Durham management needed to develop charging strategies that met three key conditions: to maintain the overall contractual requirements in statistical dissemination; to maintain the University income stream; and, most important, to maintain the confidence of the user base by not imposing new charging regimes that destabilized their use by radically modifying their costs—many users needed to estimate usage costs over a year ahead for planning and budgeting reasons.

Overall, then, Nomis charging has been an “emergent” strategy where:

strategy formation walks on two feet, one deliberate, the other emergent. As noted earlier, managing requires a deft touch—to direct in order to realize intentions while at the same time responding to an unfolding pattern of action (Mintzberg and Waters 1998, 33).

The strategy has been a complex balance of charges imposed by data owners, policy mandates from Government, understanding organizational behavior within user groups and watching user groups fracture over time, and in monitoring budgeting trends in government. Also strongly influencing the strategy was the extent to which software innovation and new hardware could deliver a more efficient service, and modeling the resulting cost savings to users against possible overall increase in usage.

The experience between 1983 (when the system became available to nongovernment users on a charging basis) and 2000

(when the system became free at the point of access) demonstrates that it is possible to develop charging strategies that as far as possible meet requirements of statistical dissemination goals, contractor income, and user expenditure. However, a crucial element in all of the charging changes was a combination of reflexivity and dialogue. Reflexivity was evident in continual internal review and criticism of the charging regimes where the development team was constantly challenged to take a user viewpoint. Indeed, it was policy that all members of the team, from management to programmers, had to work the telephone help desk each week, because it is dangerous for developers to be remote from customers. Dialogue was a crucial component in negotiating charging changes with users, often in a process exceeding 12 months in which their individual spending profiles were modeled against new scenarios. That meant the level of user attrition was very low, indeed, once the new regime was operational.

The most interesting outcome has been the move from “fee to free.” While there was a dramatic increase in the number of registered users in the first year (tenfold from 800 to 5,900), the actual levels of use did not increase commensurately, and the numbers of active regular users of Nomis did not markedly increase. A glib observation could be that making something free does not necessarily increase overall use, but the picture is not that simple. The success of Nomis between 1983 and 2000 had covered the potential market well, and the potential to service significant new areas of use was limited. However, some 5,000 new accounts were registered in the first year after the abolition of charges. Usage patterns may also be linked to the decline in data usage within UK Social Science. Quantitative research has been substantially replaced by qualitative and theoretical approaches in the social sciences, and “There is a further apparent rejection of the fundamental role of metrics in contemporary mass society, of which by far the most important is the financial metric” (Johnston 2000, 132). Therefore, the data delivered by Nomis do not service many of the recent research priorities in UK higher education.

Lastly, the needs in the commercial sector have changed fundamentally over the past decade. For many years, the legal liability law sector purchased detailed job vacancy statistics to help build legal arguments for loss-of-earnings cases. Degradation of the quality of the vacancy series in the late 1990s, with a cessation of the supply of the statistics for nearly a year, encouraged the sector to use other information with a more reliable supply chain. The geodemographics sector, historically grounded on Census of Population small area data, has been enriched with new flows of detailed customer loyalty-card data and is moving away from a spatial base to a behavioral basis (Kempiak and Fox 2002). Furthermore, there is increasing sophistication in geodemographics, ranging from user access to users’ own confidential information (a form of proactive audit) (BBC 2004) to de facto creation of pan-national information infrastructures through strategic acquisition (Anon. 2004). There is, therefore, a final paradox in the dissemination of official geostatistics in the turbulent environment of the global information society. Lessons from commerce

show that nearness to customers is critical in ensuring that use value translates back into product development, and users who pay money are generally listened to more intently by suppliers. However, the move to free information leads to a larger, but more extended user community, and it becomes difficult and costly both to listen to them and to respond to their needs. Such a paradox is worthy of further research.

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## About the Authors

**Michael Blakemore** is Emeritus Professor of Geography, Department of Geography, Science Laboratories, University of Durham.

Corresponding Address:  
Department of Geography  
Science Laboratories  
University of Durham  
Durham DH1 3LE, UK  
michael.blakemore@durham.ac.uk

**Sinclair Sutherland** is Project Manager, Nomis, Unit 1L, Mountjoy Research Center, University of Durham.

Corresponding Address:  
Nomis  
Unit 1L  
Mountjoy Research Center  
University of Durham  
Durham DH1 3SW, UK  
sinclair.sutherland@durham.ac.uk

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## Footnotes

- 1 Nomis is the trademark of the Office for National Statistics, <http://www.statistics.gov.uk>.
- 2 See <http://www.nomisweb.co.uk>.
- 3 See <http://www.data-archive.ac.uk/>.