GZ#4207

Economics of Geographic Information

In general it is difficult to understand the economic value of information; in classical economic theory only land, labor, and physical goods have values. In this case, the participants in the market have complete knowledge, and knowledge is a free good with no value. This does not correspond to our daily experience and economic theory has been extended. The new institutional economics information is valuable as it contributes to improvements in economic processes. Information is a special economic good, as it can be given away and kept at the same time (possibly changing its value); information products are costly to create for a first time, but can be multiplied at very low cost without losing content. Nevertheless, understanding the economic importance of Geographic Information (GI) and organizing profitable businesses around GI seems to be difficult; only a few successful examples of applications and businesses survive despite unanimous agreement that GI is very important.

It is generally accepted that 80% of all decisions are influenced by spatial information and influence our spatial environment. This points to the enormous role that spatial information plays in our everyday lives and also in decisions by companies or governments. Very different estimates of the total value of GI exist, but the figures depend more on what is counted then what is there: free GI obtained from a street sign is not included, but car navigation systems are counted; GI created and held within a company is not included while the same GI obtained as a service from a third party is included.

The military was among the first enterprise that systematically collected geographic knowledge to be used in their (warfare) operations. As a consequence, most governmental organizations that now build and maintain national geographic information infrastructures (the national mapping agencies) have a military background and often are still included in a Ministry of Defense. In the 1990’s, however, with globalization and the avalanche of new information technologies, the need for and use of geographic information has rapidly expanded to many other enterprises. Business processes have changed in such a way that GI that was previously available implicitly—the decision makers knew their spatial

environment—is now required in an explicit form to be used through analytical processes in globalized business planning.

To assess the value of GI, one must analyze a specific decision situation—which may be mundane (on my way to a friends home: should I turn left here?) or of utmost importance (decision in a national government: where to construct the new nuclear plant?)—and investigate what improvement in the decision is achieved when a specific piece of information is available. Can we achieve the same result with less resource utilization? Does the information reduce the risk associated with the decision? How much can we make the decision? The value of information is in its use for decision making and decisions typically need combinations of different types of information, spatial and non-spatial.

The market for GI can be divided into two kinds, each with distinct structures: the mass market and specialized markets.

The mass market uses mostly only a few common geographic datasets that are used by nearly everybody sometimes. Most important and widely used are: street addresses and the road network, political boundaries, postcode zones, digital elevation models, and socio-economic (statistical) data. Recently, a number of services on the web such as Google Maps and Local Live have also popularized image data. The value of GI by itself is often small and it becomes useful and valuable only when combined with other data; this is a market with very many customers, many uses and the individual value of the use of GI is very low (a few cents or less per use). In this market, collecting fees is impossible and it is often paid for by advertisement. The cost for maintenance of these data is a few Euros per person and year.

The other market is entirely different: few decisions are made, the decisions are important (e.g., building a power line, establishing a nature preserve) and the value of GI is high. In this market, only a few organizations participate (e.g., the power companies, both as producers and consumers of spatial data). In this market, specialized data sets are required (e.g., ownership records) and their maintenance is financed by the organizations directly interested; for example, the maintenance of data of a power company may cost tens of Euros per customer and year.

The cost of collecting and managing GI is substantial because collections of GI are only usable if they cover a certain area completely and reliably. If data are sometimes available and sometimes absent, the cost of discovery of the data increases and eclipses the value of the information; if the data are not reliable, they will not improve the decision and are better ignored. Collecting GI for a region gives a natural monopoly to the first organization that has the collection: every competitor must first invest the cost of complete data collection and the first organization can undersell the new competitor always; its investment is 'sunk' and irrelevant for a forward looking pricing strategy.

Many national mapping agencies (NMA) have entered the GI market with a complete cartographic collection of road and river networks, topology, terrain models, etc. and a mandate to maintain GI for the military and all other governmental functions. In addition, they often have monopolies created by national law. In many cases the mandate of the national mapping agencies has changed from producing topographic maps (sometimes also cadastral maps) to being the responsible agency for the National Spatial Data Infrastructure.

Due to constitutional requirements, national data became available in the USA in digital form free of copyright in the 1980s. This allowed a number of private companies to commercialize the data and offer different kinds of value-added information products to their clients. In contrast in Europe, the NMAs controlled access to data and used a pricing strategy that took into account the previous investments in data collection. They have also envisioned a market organization in which the NMA delivers to end-users whatever spatial information required. However, this did not take into account that GI products are valuable only when adapted to serve particular decision situations ; for example, real-estate services, where listings of properties for sale or rent are combined with street maps, point-of-interest and socio-economic data to construct a valuable service to end-users. With much delay, private companies have now obtained or accumulated sufficient coverage of the economically important data sets to allow a European GI business to emerge. This was mostly driven by data collection for car navigation systems and to a lesser degree collection of non-census socio-economic data for "Business Geography". Studies have recently ascertained that the government income from taxes on newly

created GI businesses would be larger than what could ever be obtained from licensing the widely used data sets.

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See also National Mapping Agencies, spatial data infrastructure

Further Readings

(Eggertsson 1990; Shapiro et al. 1999; Frank 2003; North 2005; Stubkjaer 2005)

Eggertsson, T. (1990). Economic Behavior and Institutions. Cambridge, Cambridge University Press.

Frank, A. U. (2003). "Volkswirtschaftliche Studie zu den Leistungen des BEV." Newsletter e-geo.ch: 2.

North, D. C. (2005). Understanding the Process of Economic Change. Princeton Oxford, Princeton University Press.

Shapiro, C. and H. R. Varian (1999). Information Rules: A Strategic Guide to the Network Economy. Boston, MA, Harvard Business School Press.

Stubkjaer, E. (2005). "Accounting Costs of Transactions in Real Estate – The Case of Denmark." Nordic Journal of Surveying and Real Estate Research **2**(1): 11-36.