The Impact of Access Policies on the Development of a National GDI

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ABSTRACT

Within the context of Geodata- and Service Infrastructures (GDI) access-to-government-data policies are important the existence and successful use of the data, and the success of the GDI itself. Two access doctrines are dominant in the literature: open access policies and cost recovery policies. Many researches have attempted to compare open access policies with the cost recovery model. Most compare the open access approach of the United States (US) federal government with the cost recovery models in other countries, and conclude that the open access policy is more successful. As a consequence most research recommend nations to convert cost recovery policies into open access policies. Although at first sight the accomplished researches provide convincing evidence for the success of the open access model, they appear to have some significant deficiencies. This paper will provide the foundation of a research project to investigate the impact of access policies on the development of national GDIs from a user point of view. The research framework uses the technical and non-technical value of four framework spatial datasets as a measure of success. Together, the non-technical and technical value of a dataset may decide whether a potential user is going to use a dataset. Together with the user satisfaction with the characteristics of the dataset, and the number and variety of products on the spatial market, it is believed that the use value of a dataset results in more reliable research results than current research has provided.

INTRODUCTION

Within the context of Geodata- and Service Infrastructures (GDI) access-to-government-data policies are important for the existence and successful use of the data, and the success of the GDI itself.

Two access doctrines are dominant in the literature: open access policies and cost recovery policies. The open access approach assumes that government data are available for a price not exceeding the cost of reproduction and distribution, with as few restrictions in the use as possible. In the cost recovery approach, the price of government data covers the cost of creation and dissemination, and may include a return on investment. The use of the data is restricted and government may even choose to have exclusive arrangements.

There is still discussion on the best model for the advancement of the national GDI. Many researches have attempted to compare open access policies with the cost recovery model. Most conclude that the open access policies of the federal United States should be implemented in other countries (see Pluijmers and Weiss 2001, KPMG 2001, Pira 2000, Lopez 1998). Partly based on these research results, the European Commission recently proposed to stimulate Member States public sector bodies to adopt open access principles (Commision EU 2002, 6). Although at first sight the accomplished researches provide convincing evidence for the success of the open access model, they appear to have some deficiencies.

This paper will provide the foundation of a PhD research project to research the impact of access policies on the development of national GDIs from a user point of view. The research will compare the impact of open and cost recovery policies on the development of four national GDIs. The framework will address the flaws of the studies already accomplished and propose a means to assess the success of access policies correctly.

ACCESS POLICIES

The funding mechanism sets the conditions for pricing (public sector) information. Throughout the world a wide variety of access policies exist. Their fundamental difference is in the funding mechanism, and as a result the way access and use of the data is restricted. This may be explained by the variety of choices policy makers have. Choices should be made about the price of the data, the type of data to be collected (scale, quality), the coverage of the data (ubiquitous versus limited area), the user category, the use of the data (public inspection versus commercial re-use), and the limitations in the use (intellectual property, liability, no pass on, royalties from value added products). Further the answer to the principal question: "is government allowed to compete with the private sector?" is part of the access policy. Which funding model allows ready access to high-quality data, low cost spatial information that is necessary to advance SDI development? (after Lopez, 1998, 97). The underlying argument for opting for a specific choice is the funding mechanism: who should pay for the collection, use, and distribution of spatial data? Two doctrines are dominant in the literature: open access policies and cost recovery policies.

Open access policies

The open access approach assumes that government agencies, responsible for the collection and creation of government spatial data, are fully funded with public funds to accomplish their public tasks. Data within government are accessible for a price not exceeding the cost of reproduction and distribution (marginal cost of dissemination), with as few as restrictions in the use as possible. The data are available to all (non-exclusive) on a non-discriminatory basis (see also NRC 1997, 15). Accepted restrictions include data concerning national security, trade secrets, and data relating to an individual's privacy. Under the open access principles government does not compete with the private sector. If it is considered a task of government to add value to their data to respond to specific demands of users, they will add value on a level playing field basis (fair competition).

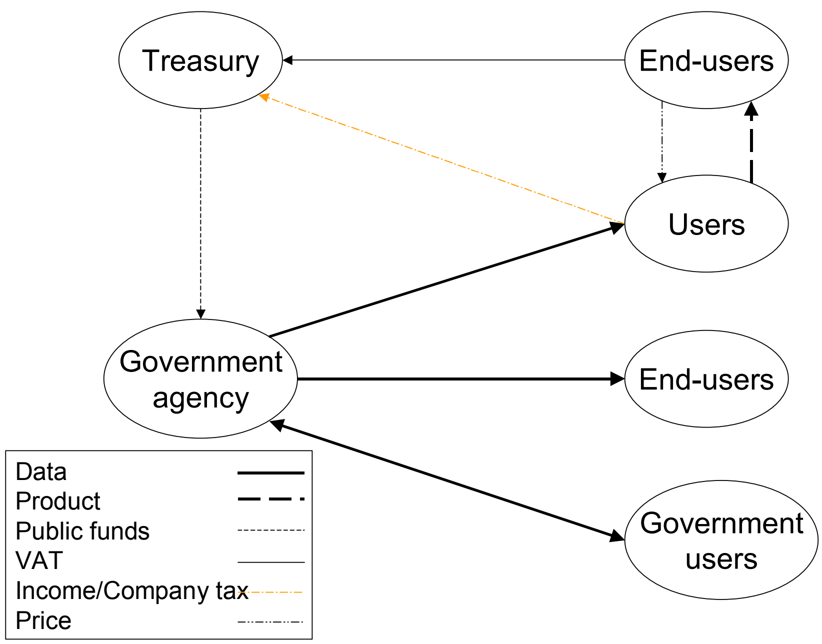

Fig. 1: The open access model

Restrictive policies

Cost recovery approaches seek profits from the sale of data to support the development and maintenance of the datasets (Lopez, 1998, Onsrud 1992). The data collection, maintenance and dissemination are not fully provided for by public funds, and the costs must be recovered through other means. The agency is forced to generate income from the sale of data, or products, or from service providing activities. As a consequence, access to data may be restricted in order to cope with the financial conditions set by the level of central funding. In practice this implies a charge for the data higher than the marginal costs of dissemination, and restrictions in the use through copyright, and database rights. Further use restrictions may be imposed through contractual or licensing provisions. The cost recovery approach may also have government agencies compete with private sector entities, either on a level playing field basis, or not. The expertise within government should be used to respond to private requests for specific spatial products.

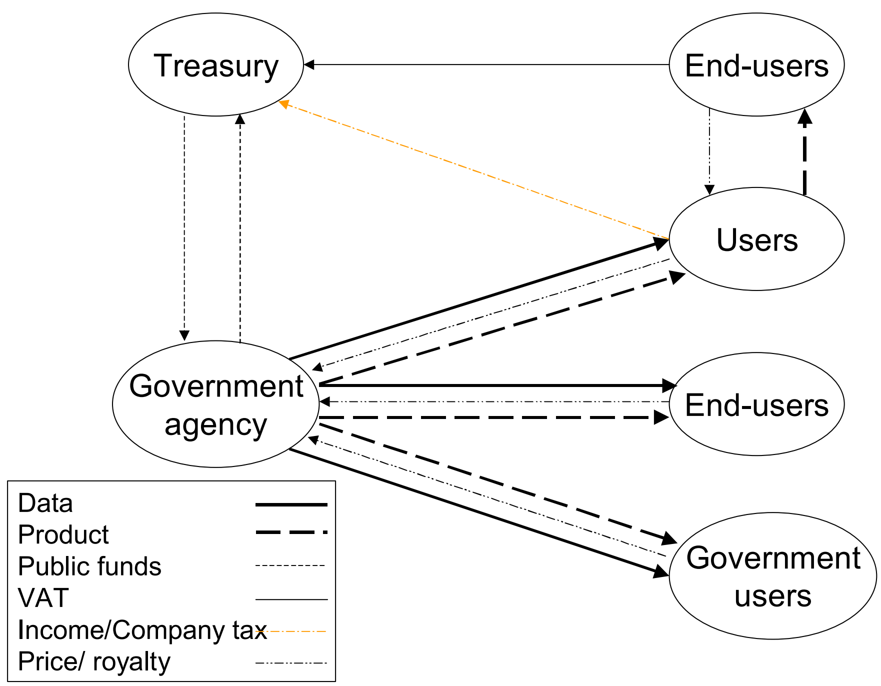

Fig. 2: The restrictive access model

User groups

This section provided a general access model classification. Both models, however, might exist at the same time in one legal system, due to the variety of users. A user may be government employee, working in private, non-profit sector, or at an academic institution, or someone requesting information as a citizen. We identify three groups of users: professional users (users in Fig. 1 and 2), policy and decision makers (end-users in Fig. 1 and 2), and citizens (end-users in Fig. 1 and 2). It may well be that academic professional users have to cope with open policies for raw data while citizens are confronted with more restricted policies. In this context also the nature of the user's request may be of importance. The access model may differentiate between these groups. In Sweden, for example, the model that applies to citizens would be categorised as open, as the model for private sector users would be restrictive. Therefore the user groups must be specified in order to put the research results in the correct perspective.

GEO-SPATIAL DATA ARE SPECIAL

Coopers Lybrand (1996) found that the provision of government spatial data in the United Kingdom is differently funded than other government data. Two special characteristics of spatial data may be used to explain the differences: linking data to the surface of the Earth, and the cost of the creation of spatial datasets.

Linking data to the Earth

Geospatial data implies a subset of spatial data applied specifically to the Earth's surface and near surface (Longley 2001, 5). It is this reference to the Earth that makes spatial data special. "Geographic data link place, time, and attributes. Some attributes are physical or environmental in nature, while others are social or economic" (Longley 2001, 64-65). The attributes may exist as normal data, but as soon as they are linked to the surface of the earth, they become spatial data. We can only map an attribute if framework (basic) data is available with the appropriate geo-attributes; for instance topography (buildings, roads, water), and the linking data (e.g. address) of the selected area. Further, we have to decide which visualisation model to use for the visual representation of the data: which scale, which colours for what attribute, and which features to show. The value of data increases when they are linked to the Earth. It makes the object or subject easy to identify, and easy to reach. The data can now be searched and analysed by geographic unit, making it extremely useful for most spatial management and planning activities, for example disaster management purposes. In addition, both public (execution of policies) and private sector (profiling) linking of a spatial element to the attribute may address the specific needs of the people in a geographic area more properly. It is not surprising that a Dutch study found that of all government data, spatial data are commercially the most interesting (BDO 1998, x).

Cost involved in the creation of spatial datasets

For many aspects, digital spatial data are like most other digital data: they are non-rival, their dissemination is inexpensive, it is difficult to exclude others from using them once they are disclosed, and they are highly price elastic: double the price and people tend to do without it (Onsrud, 2002) or use inferior data. However, unlike most other types of data, the collection and maintenance of spatial data requires (highly) qualified human expertise and equipment, and is thus expensive. Moreover, the creation of geographic information or a geographic product out of geographic data requires advanced skills. In this respect, geographic data are special (Van Loenen 2003, see also Longley 2001, 6). Especially the technical aspects involved in the creation of a map require advanced expertise. For instance, geographic data are multidimensional (x, y, z), voluminous (large databases), represent a 3D world on a flat (2D) surface, the integration and analysis of the many varied types may be time-consuming, and the process of updating is complex (Longley 2001, 6). Government is able and willing to collect and maintain ubiquitous and uniform framework geo-data because it needs it: for example for the execution of legislated or public tasks. Private sector enterprises may value the risk of the investment in framework geo-data as too high. They rather acquire the data from government and add value to it. Thus, in practice there is only one government producer of a specific type of framework geo-data (land administration data, topography, etc.) and therefore general marketing theory (the more providers of the same product the lower the price) fails for framework geo-data.

Longley (2001, 6) argues that “almost all human activities and decisions involve a geographic component, and the geographic component is important”. However, spatial data are “highly disparate and often inextricably linked to the provision of other public goods” (Coopers Lybrand, 1996). The real value of spatial data for society is difficult to assess, and therefore their economic value is often underestimated (OXERA, 1999, 3). Especially the (lack of) awareness of the value of spatial data for society seems to be decisive for the choice of the most appropriate funding model for government spatial data provision.

Researching Geo-spatial Data Access Policies

When one wants to compare the impact of two different geo-spatial data access policies, one should select environments in which these different policies exist. At least two legal systems (e.g. countries) are necessary for the research. How to select legal systems? One should be aware of the importance of the characteristics of the legal system: for instance, the population in the legal system, the population density, the level of economic development and type of government. The legal systems should have similar systems of government. Comparing the situation in a dictatorial economically poorly developed regime with a democratic and economically advanced society would result in useless recommendations. Further, the population density of a system is directly linked to the level of spatial detail necessary for the maintenance and development of the system. The higher the population density, the larger the needed scale, the higher the needed quality in order to execute public tasks sufficiently.

Most studies in this field compare the policies of the federal US with the policies of individual European countries. At, at least, two points the selction of these legal systems is difficult to justify. First, data collected in a uniform way by the US federal agencies is mostly small or middle-scale data, attracting other users or private sector value adding companies than providers of large-scale data in the US and Europe would. United States Geological Survey collects and creates data of different scale and quality than its counterparts in Europe (for example Ordnance Survey, or Institut Géographique National), and therefore attracts different types of use(r)s.

In addition, the US has a potential national market size of another magnitude than any European country, or even the complete European Union. Federal US agencies may have a mandate to uniformly collect and create data for the US. Europe is more fragmented in this respect. Even if the data were freely available in Europe, it would still be very costly to create a homogeneous spatial database for a comparable market. As a result, the federal US cannot compare with European countries with respect to market size, level of detail of data, and user groups.

Moreover, the Pira study notes: "while easier access and lower prices are-certainly true of federal data in the USA, it is not automatically true of the considerable volume of public sector information held by states and counties" (Pira, 2000, 53). A recent study confirms that the policies of state and local government agencies in the US seem to be less open than expected (Van Loenen, 2002). Since state and local government are producing large-scale data, this might be an indication for a direct link between the level of detail of the data, and the most successful access policy, not necessarily being open access. In the comparison of different access policies in different legal systems one should compare like with like in order to arrive at usable and fair conclusions.

The research Framework

This paper introduces a research framework that involves the technical and non-technical value of four framework spatial datasets as a measure of success of an access policy. The value of spatial data relies upon its "coverage and on the strengths of its representation of diversity, on its truth within a constrained definition of that word, and on its availability" (Longley 2001, vii). The combination of technical and non-technical characteristics of a dataset makes a user decide to use the dataset or to forego the opportunity. The technical value of a dataset may be a function of scale, quality and type of data. The non-technical value of a dataset may be related to its price, the restrictions in its use, the ease to access the data, and the existence of extra services. Together, the non-technical and technical value of a dataset may decide whether a potential user is going to use a dataset. Users' satisfaction with the dataset, or calculation of the contribution made by public spatial data to the economy of a legal system may be additional success measures.

This section introduces a research framework that provides for the assessment of the value of spatial data. We distinguish the creators' side of the spatial data and the users' side in order to come to a model for the measurement of the use value of spatial datasets.

Assessing the value of spatial data through its technical and non-technical characteristics

The willingness of consumers to pay for a product is determined by the value of the product (Gopal and Sanders 2000, 88). The value of a product may be a sum of its characteristics. A dataset consists of one or more types of data, and is limited in some ways. The qualities or characteristics of these data add up to the characteristics of the dataset. Characteristics are said to be relevant for a buyer if the information required from a dataset contributes to the improvements of a particular decision making process in which it is used (Krek 2002). Quality is separable (every aspect of a dataset has its own unique characteristics), and quality is additional (two separate characteristics may add up to another) (Krek 2002). We distinguish two main categories of characteristics that make users decide to use a dataset:

- Technical characteristics
- Non-technical characteristics

Technical characteristics

Technical characteristics are characteristics of the dataset itself. These characteristics are not related to external factors, like access policies. These characteristics may help the user in finding answers in his decision making process. This study hypothesizes that the technical value of a dataset consists of the scale of the data, the quality of data, and on the type of data.

Scale of the data

The costs of spatial data collection varies heavily with a variety of factors, scale being one of them. Scale can be defined as “the ratio of distance on the map to distance on the Earth’s surface” (Longley 2001, 75). The collection of spatial data at a large-scale, i.e. 1:500 – 1:10000, offers a detailed overview of a certain area for a variety of objects or items. Data at these scales are primarily used for local purposes like town planning, public work activities, park management, and similar activities. At a small-scale a more general overview is provided. Geographic data at these scales are used for regional and national (policy) purposes, like the planning of highways, or national water management, among other uses. In addition, large-scale data needs a higher update frequency to be of use than small-scale data due to the frequency of changes at this scale. In general one can say: the larger the scale of the spatial data, the higher the costs of collection, and maintenance.

Scale, however, is rarely addressed in the discussions of access to government spatial data. Much research in this area compares the small or middle-scale spatial data of the federal United States’ government with large-scale spatial data of governments in individual countries in Europe, without addressing the differences in costs (see Lopez 1998, Pira 2000). Their conclusions are used as general statements on the success of a policy. Successful policies for one range of scales, however, do not necessarily apply to other ranges of scale.

Quality of data

The costs of spatial data collection and maintenance also rely on the requirements of the quality of the data. Quality of data may be defined as: the level of truthful and objective representation of reality. Quality may be decided for by the integrity, accuracy, completeness (comprehensiveness, up-to-date-ness), (metadata) documentation, correctness (e.g. topological relations or representation of reality), standards and format (compatibility), and documentation of the history of the data. Other aspects directly linked to the quality of the data are the quality of the software and hardware processing the data. Also for quality the following applies: the higher the quality, the higher the cost. Much research does not, or does only briefly address, the quality issue (see Lopez, 1998, Weiss and Pluijmers 2001, Pira 2000).

Type of data

The Coopers Lybrand study (1996) showed that different funding models accompany different types of data. In this respect two types of spatial data can be summarised: framework data and thematic data.

Framework data are data that are commonly used as a base dataset upon which other data can be placed (Phillips et al, 1999), or data commonly referred to, or a sufficient reference for most geo-located data (Luzet, 2000). Luzet (2000) provides a practical definition: framework data are "a set of geographic information that is necessary for optimal use of most GIS applications, i.e. that is a sufficient reference for most geo-located data". "Framework data may refer to the fewest number of features and characteristics required to represent a given data theme" (Luzet, 2000).

Framework data are costly to collect and to maintain, but its existence benefits many. Therefore, framework data are the fundament of the GDI and need to be treated differently than the other data types. The GSDI Cookbook specifies cadastral information, geodetic control, geographic feature names, ortho-imagery, elevation, transportation, hydrography, and governmental units as framework data (Nebert, 2000).

Thematic datasets use the framework dataset for reference purposes. They are not as expensive to create as framework data but they benefit relatively few. They generally built on framework data, without reference to framework data their use is limited. Specific thematic data are added to the framework dataset. The resulting dataset is primarily created for one or limited time use on a project basis or for multiple uses for a limited group of users. Thematic data may also be known as value added datasets, indicating that the framework dataset is used and built on to create something useful for the (commercial) market. Many government agencies use thematic data provided by private sector businesses.

The distinction between framework datasets and thematic datasets is critical for the outcome of the decision on the most beneficial access policy.

Non-technical characteristics

Non-technical characteristics are characteristics that do not directly relate to the technical functionality of the dataset, but to the legal, financial, physical, and intellectual accessibility of the dataset (see Bovens 1999).

Legal access

Legal access relates to legislation that provides means to enforce access to data (e.g. freedom of information legislation) or to restrict its use (privacy legislation, or intellectual property legislation). Further use restrictions may be imposed through contractual or licensing provisions. Legal access provides the bandwidth of the potential uses, and as a result the economic value of a dataset. Lack of legislation widens the bandwidth, while strict legislation may narrow it. If it is impossible to control the use of intellectual works of government, all works created by government would relegate into the public domain. A cost recovery policy would be almost impossible to maintain.

In addition, privacy legislation is likely to hamper the economic value of a spatial dataset. Lack of privacy protection would allow the provision of datasets that are commercially very attractive (see Ravi, 2000, 24), but limit the privacy of individuals. Thus, in countries where strong data privacy legislation is lacking, it is likely to find more economic activity in the spatial sector than in those legal systems where strong privacy protection exists. Moreover, sometimes government agencies create datasets, including personal data, for specific public purposes. If these records are subject to freedom of information law, then the personal data in these datasets need to be subtracted in order to fulfil requirements of privacy legislation. This value subtracting may be a costly operation, resulting in expensive information creation, and less potential users. Accomplished research only partly addresses the legal access component. Most focus on freedom of information acts, and intellectual property rights, but forgot to include privacy considerations.

Further, it should be noted that it may well be that different government agencies have different funding models and access policies. Research has indicated that it is this lack of consistency in the access policies throughout government in a legal system that blocks users from using the data (see KPMG 2001, 16, Ravi 2000, 11, Pira 2000, 76). Further, the lack of transparency of available data may be a major impediment to the efficient collection of spatial data (Ravi 2000, 13).

Financial access

Financial accessibility concerns the balance between price and potential benefits resulting from using the data. If the expected benefits are outweighing the costs, then it is likely that the dataset will be used. If, however, the costs for acquiring and using the dataset are outweighing the potential benefits then it is likely that the dataset will not be bought and used. Alternatives will then be searched. One alternative may be the collection of identical data by the requester himself, another may be to use data of another provider, or data with a lower price.

Physical access

Physical access involves the physical accessibility of data. In order to promote the use of data, it should be available in a user-friendly way without difficulties in finding the data or acquiring them through bureaucratic procedures. Further the use conditions should be transparent and easily accessible, and preferably adhere to a standard. The price and use conditions of different government data should be based on the same principles, promoting consistency. Data accessible online are likely to promote their use, while data behind bureaucratic doors are not. The existence of a clearinghouse and a clearing rights system[1] are likely to promote the use of datasets as the lack of them may result in duplicate data collection efforts.

Intellectual access

Intellectual access concerns the clarity of the data. Does the user understand the data presented?

Extra's: services

A dataset may acquire extra value when the use is supported. Optional services may be an available help desk for, for example, technical assistance, the notification of updates, a (online) manual, help for the interpretation of the data, free software, courses on spatial data use, etcetera.

Value of a dataset

In summary the value of a dataset is determined by the technical and non-technical characteristics of a dataset. The technical characteristics are type of data, scale of data, and quality of data. The non-technical characteristics are determined by the legal, financial, intellectual, physical access characteristics of the dataset and by the extra's that come with the use of the dataset.

Assessing the use value of spatial data

The technical and non-technical characteristics of the datasets are important for the users' decision to access and ultimately use a dataset. By measuring the actual use of the dataset and the satisfaction with the dataset a use value may be acquired. The use value will also include the variety of products on the spatial data market, either provided by government or pri-

[1] A clearing rights system provides an overview of data that is subject ot the provisions of public record (or freedom of information) acts, and provides the price, and other contractual provisions of data.

vate sector and the existence of sharing arrangements between government and other organisations.

The research model assumes that in a given setting the more, and more satisfied uses of the dataset, the higher the use value as a percentage of the people in the area covered. High use and satisfaction results in a high overall VALUE of the dataset. This VALUE is an *indication* for the contribution of the framework data to the development of the NSDI.

The research model

The above adds up to the research model as shown in Fig 3.

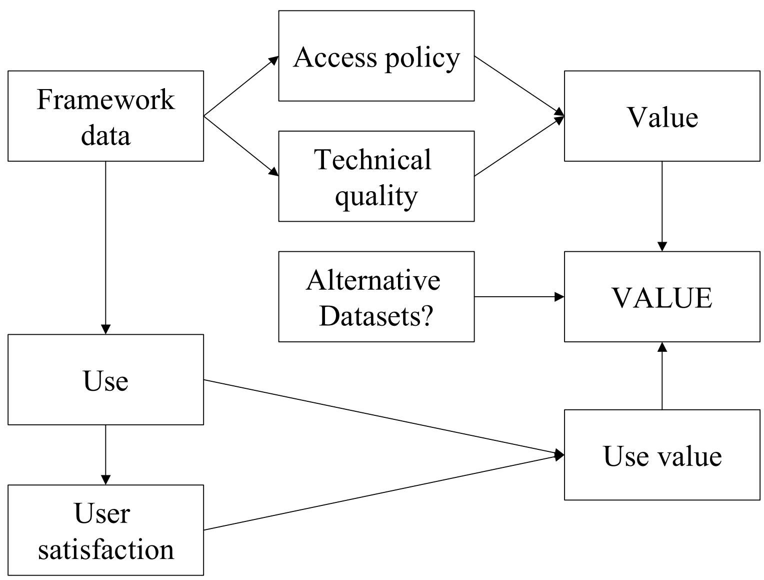

Fig. 3: Assessing the VALUE of a dataset

CONCLUSION

This paper aimed to provide a research framework for the assessment of the success of access policies. The willingness of users to pay for and use a product is determined by the value of the spatial data. The technical and non-technical value make users decide to use a dataset. The technical characteristics are characteristics of the dataset itself. This study hypothesizes that the technical value of a dataset consists of the scale of the data, the quality of data, and of the type of data. Non-technical characteristics relate to the legal, financial, physical, and intellectual accessibility of the dataset. Together with the use and the satisfaction of a variety of user groups the use value can be assessed. The model will be used for the comparison of the practices in one state in the United States with the situation in three legal systems in Europe.

It should be noted, however, that the (lack of) awareness of the value of spatial data for society seems to be decisive for the choice of the most appropriate funding model for government spatial data provision. Therefore, the current level of awareness of the value of spatial data within Europe at a decision making level justifies the choice of the European Commission (2002) for harmonisation of current access policies instead of impetuously enforcing open access policies based on existing research results that insufficiently take the different contexts of compared legal systems into account.

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