

GEOSPATIAL INFORMATION BROKER. A NEW ROLE OF NATIONAL MAPPING AGENCIES

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ABSTRACT

The purpose of this paper is to better understand the meaning of the role of geospatial information broker for national mapping agencies and to stimulate discussion about the changing role of the national mapping agencies. The concept of geospatial information broker is introduced, defined and explained followed by a compilation of existing geospatial information broker examples and applications facilitating the broker role. The paper ends with a shortlist of issues for discussion on the way to move forward.

Key words: Geospatial information broker, National Mapping Agency

INTRODUCTION

National mapping agencies around the world have a key role in the provision of geospatial information and be substantial users of geospatial data; however, their role may well change in the coming years. Nevertheless they will continue to be vital. Building bridges between other public organisations, collaborating with other areas of the geospatial information community and, most importantly, providing complete geospatial frameworks with trusted, authoritative and maintained geospatial information, will be crucial to ensuring that users have access to reliable and trusted geospatial information and have confidence when using it (United Nations Committee of Experts on Global Geospatial Information Management, 2013). This information is vital to inform decision-making, from long-term planning to emergency response, and to ensure that the

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potential benefits of a fully spatially-enabled society are realised (Rajabifard et al., 2010).

As such, national mapping agencies remain in a unique position to consider the requirements for geospatial information for society as a whole and continue to play a key role in providing a reliable, trusted and maintained geospatial base. Additional data from multiple sources offer a significant opportunity to enrich existing and future databases. As such, and combined with pressures to reduce costs, it will be increasingly important in the years to come to facilitate collaboration between all sources of information. This may include actively encouraging the collection of additional information and providing frameworks to incorporate the data in a structured way (Crompvoets and Kruk, 2014; Vanden Berghe, 2014; Masser and Crompvoets, 2015).

As more organisations are involved in the collection and distribution of geospatial information, the geospatial marketplace also likely witnesses change. As well as having a vital role in ensuring the availability of a trusted geospatial information base, public geospatial bodies may need to grow their awareness and understanding of the geospatial marketplace to ensure that competition and practices continue to remain fair (United Nations Committee of Experts on Global Geospatial Information Management, 2013).

Given the proliferation of additional sources of data and potential competition between stakeholders, however, we may see national mapping agencies taking on a role that shifts towards a broker role. In a trend that has already started to emerge, mapping agencies may increasingly no longer see it necessary to collect all geospatial information required themselves, but may instead commission the data from the most appropriate and suitable source, be that local government, the private sector or, potentially, a citizen. (Lovell and Crompvoets, 2014). Moreover, national mapping agencies are taking on a role that shifts more towards a policy, advisory and procurement role (United Nations Committee of Experts on Global Geospatial Information Management, 2013).

National mapping that have previously primarily played the role of data collector are moving towards a role of commissioning and managing the delivery of a complete geospatial framework. In this role, national mapping agencies are likely to continue to be relied on to ensure that data is captured and integrated from multiple sources, and to provide a trusted geospatial

framework that can be relied on by users in their decision-making processes (Lovel and Cromptoets, 2014; Vanden Berghe, 2014).

The increasing use of authoritative, trusted geospatial information drives the adoption of geospatial information and ensures that it reaches ubiquity in the government and business decision-making process, as well as in the consumer sphere. Increasing recognition of the value inherent in the data means that national mapping agencies are likely to become more closely aligned with other ‘official’ bodies in government who look after, for example, statistics, the economy or land. National mapping agencies as part of governments will have a vital role in ensuring that frameworks are in place that enable the effective cooperation and collaboration between the plurality of actors that will increasingly be involved in the provision, management and/or use of geospatial information, and in ensuring that the benefits that a spatially-enabled society has the potential to offer, are realised (United Nations Committee of Experts on Global Geospatial Information Management, 2013; Cromptoets and Kruk, 2014).

This all challenges the role of the national mapping agencies as the sole supplier of, and authority on national geospatial information. Considerable public funds are currently channeled into the collection by public authorities of data that may already exist in the private sector or other parts of government, or may be better collected by means other than the traditional methods of national mapping agencies.

In the face of this challenge, the national mapping agencies must acknowledge the changing marketplace and view the proliferation of data, not as direct competition, but as an opportunity to improve the overall quality, coverage and richness of geospatial datasets. They must: relinquish their self-image as the sole and natural collector and distributor of geospatial data; give up the insistence on the centralised collection of all data in their territory where cheaper, more efficient, higher quality alternatives exist; and seek new opportunities to capitalise on their uniquely strong position as trusted arbiters in the geospatial field. The improved visibility and quality of geospatial information will in turn drive greater adoption of Geographic Information Systems (GIS). The national mapping agencies’ opportunity to remain a vital part of society depends on their willingness for mutually beneficial collaboration with the broader geospatial society and to align more closely with other government organisations to promote and coordinate the wider use and perceived value of geospatial data. One response to the change in market dynamic might be to take on the role of geospatial information broker.

This paper aims to better understand the meaning of the role of geospatial information broker for national mapping agencies and to stimulate discussion about the changing role of the national mapping agencies.

In the next section the role of geospatial information broker will be defined followed by a compilation of existing geospatial broker examples and applications facilitating the broker role. The paper ends with a shortlist of issues for discussion on the way to move forward.

GEOSPATIAL INFORMATION BROKER

A broker provides a service that brings buyers and sellers together and facilitates a transaction, either on behalf of a buyer or of a seller (Lovell and Cromptoets, 2014). In general a broker is an independent agent. A broker's prime responsibility is to bring sellers and buyers together and thus a broker is the third-person facilitator between a buyer and a seller. An example would be a real estate broker who facilitates the sale of a property.

Brokers also can furnish market information regarding prices, products, and market conditions. Brokers may represent either the seller or buyer but not both at the same time. An example would be a stockbroker who makes the sale or purchase of securities on behalf of his client (Spiro et al., 2003).

There are advantages to using a broker. First, they know their market and have already established relations with prospective accounts. Brokers have the tools and resources to reach the largest possible base of buyers. They then screen these potential buyers for revenue that would support the potential acquisition. An individual producer, on the other hand, especially one new in the market, probably will not have the same access to customers as a broker. Another benefit of using a broker is cost – they might be cheaper in smaller markets, with smaller accounts, or with a limited line of products (Wikipedia, 2015).

The word 'broker' derives likely from the Old French *brocheor*, from *brochier* meaning to broach, tap, pierce (a keg), or *broche* meaning pointed tool giving original sense of wine dealer, hence retailer, middleman, agent (Harper, 2015).

In the geospatial field, a broker would bring owners of data and services providers together with end-users as an intermediary and facilitate a

transaction between the two (including the arrangements of relevant contracts and user conditions). The geospatial information broker might undertake more than simply carrying out a transaction. This broker could also facilitate the user access to the necessary geospatial data and enhances the re-use and dissemination of existing geospatial data and services supplied by the providers. Moreover, the geospatial information broker is entrusted with the responsibility of researching the market to provide appropriate recommendations and in so doing they direct the actions of geospatial data and service managers (Crompvoets and Kruk, 2014; Lovell and Crompvoets, 2014). In addition, they could also do additional services such as geospatial data analyses and/or product(s) value adding, on demand.

The following terms are applied alternatives for the term ‘Geospatial information broker’: Geobroker, Spatial Data Broker, and Spatial Data Intermediary. Although the terms are different, their roles are the same.

Figure 1 visualises the ‘intermediary’ broker role between the geospatial data and service providers and users.

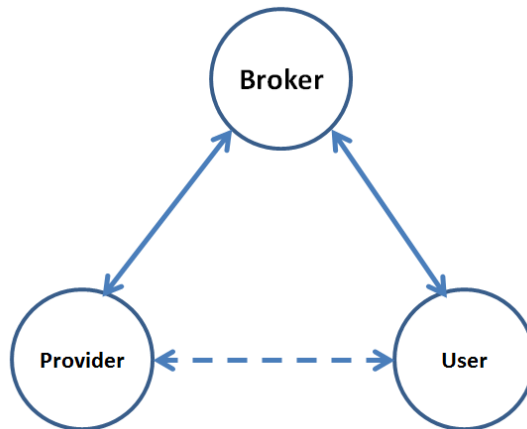


Figure 1: Broker role between geospatial data and service providers and users

The national mapping agencies are in a good position to consider the overall geospatial data requirements of society and act as geospatial information brokers because:

- they know the geospatial market;
- in general, they have good contacts and relationships with end-users of geospatial data (and in some cases, with external data collectors);
- they are able to reach a great number of potential users of data; and

- they are trusted sources of data and respected authorities in the field.

It might be good if the national mapping agencies continue to work to maximise their abilities in these areas.

In addition to a brokerage role, the national mapping agencies can also provide services such as verification, data analysis and value-added products and services, amongst others.

The role involves both an Inside-Out and an Outside-In transfer of data (and services). The Inside-Out model refers to the obtaining of geospatial data from across the (relevant) public sector and sold or distributed externally. The Outside-In model procured from external sources and distributed across different (relevant) levels and agencies of government. The resultant Inside-In (in which geospatial data is centralised by the national mapping agencies from across government and redistributed) and Outside-Out (externally procured geospatial data that is integrated and subsequently redistributed externally) models must be explored from the perspectives of governance, finance, legality and implementation.

EXAMPLES

A number of national mapping agencies and other institutions at different administrative levels have taken initiatives to move towards a geospatial brokerage role:

- The Geodatenportal Niedersachsen (www.geodaten.niedersachsen.de) of the mapping agency of Lower Saxony (Landesamt für Geoinformation und Landentwicklung Niedersachsen, Germany) - a portal providing central access to the integrated use of geospatial data distributed by state administration, local authorities and other sources;
- Geobroker Brandenburg (<http://geobroker.geobasis-bb.de>) of the mapping agency of Brandenburg (Landesvermessung und Geobasisinformation Brandenburg, Germany) - an online shop bringing geospatial products from a variety of providers to users/buyers;
- FIS-Broker Geodata Management of the Berlin Senate Department for Urban Development and Environment (<http://www.stadtentwicklung.berlin.de/geoinformation/fis-broker>). The FIS-Broker provides online access to maps, plans and other data. Central components are the metadata information system and a viewer;

- Torino Geospatial Data Service Centre - an intermediary between geospatial data users and providers of Turin (Italy);
- The National Land Survey of Iceland have begun to explore the brokerage model by:
 - distributing information from external partners (including satellite imagery from the Environment Agency);
 - integrating data from partners into their own data sets (including from transport authorities);
 - buying data from external sources;
 - collectively purchasing imagery in cooperation with other partners;
 - collaborating with the Icelandic Institute of Natural History to provide a geospatial website back-end;
 - consulting in the field of an Icelandic spatial data infrastructure; and
 - crowd-sourcing place names;
- Through the Norway Digital project of Statens Kartverk, public sector bodies pay an annual subscription to receive geographic information from across government;
- Through the Geovekst project, the Norwegian government subcontracts, quality-checks, interprets and standardises data collection for new infrastructure projects, as well as creating derivative services and disseminating the data;

Currently in the European context, the website of EuroGeoInfo (<http://www.eurogeoinfo.eu/>) performs half of the brokerage service by aggregating the products of the national mapping and cadastral agencies of Europe, and providing a means for end-users to quickly locate the products they require. EuroGeoInfo does not, however, facilitate a transaction (instead, simply directing the user to the seller). In the future, the <http://www.locationframework.eu> website (developed by the European Location Framework project (ELF)(Jakobsson et al, 2013)), performs the brokerage service by aggregating the products of the national mapping and cadastral authorities of Europe, and providing a means for end-users to quickly locate the products they require, license and use them.

On the basis of the experiences of the brokerage role existing within national mapping agencies, seven recurring activities can 'preliminarily' be identified: 1) Consulting on national spatial data infrastructures; 2) Procurement of data; 3) Integration of data into own products; 4) Sale and distribution of integrated products; 5) Sale and delivery of derivative services; 6) Provision of back-end services to third-parties; and 7) Provision

of services on behalf of external partners (Crompvoets and Kruk, 2014). These identified activities need to be further investigated in the (near) future.

Other examples are: the Geospatial Portal of Abu Dhabi Spatial Information Centre (<http://geoportal.abudhabi.ae/geoportal/>), GeoBase of the Canadian Council on Geomatics (www.geobase.ca), MetroGIS Geospatial Services Broker of the Land Management Information Centre of Minnesota Department of Administration (USA), and NTLIS Spatial Data Broker of the Northern Territory Government (Australia) (<http://www.ntlis.nt.gov.au/>).

APPLICATIONS FACILITATING THE GEOSPATIAL INFORMATION BROKER ROLE

Several applications have recently been developed in order to facilitate the implementation of the broker role. In this context, a broker application can be considered as a service component that might include the following modules (Nativi et al., 2011):

- User's request distribution (e.g. searches and composition of services) in an asynchronous way (providing consistent feedbacks to users);
- Mediation (e.g. translation from the many provider and users service models to the broker internal model, and vice-versa);
- Adaptation (e.g. between the many provider service protocols and the users' ones, and vice-versa);
- Specific added-value functionalities to enrich the basic brokering functionalities.

Examples of developed applications are:

- EUROGEOSS Broker (<http://www.eurogeoss.eu/broker>) - a multi-disciplinary interoperability brokering framework on three levels (Nativi et al., 2011; Gammon, 2012):
 - Discovery Broker - able to read and mediate among the many standards and specifications used by different scientific communities;
 - Access Broker - facilitating multi-disciplinary data access; and
 - Semantic Discovery Broker - translates concepts across different disciplines;
- Web 2.0 Broker11 of the Universitat Jaume (Spain) (<http://www.geotec.uji.es/web-2-0-browker/>) - a development-stage service for searching crowd-sourced (user/citizen generated) geospatial information (Diaz et al., 2012);

- The ESRI Geoportal Server (<http://www.esri.com/software/arcgis/geoportal>) - a free, open source server for connecting geospatial users with resources from multiple organisations (ESRI, 2012); and
- Geobroker ® of ESG Elektroniksystem- und Logistik – GmbH (ESG, 2013) – A geospatial data management service.

MOVING FORWARD – ISSUES FOR DISCUSSION

This final section briefly presents issues for the way to move forward.

The brokerage model involves a substantial cultural and paradigm shift within individual national mapping agencies and the geospatial community at large. More further work is required to implement this shift while maintaining the role of the national mapping agencies as the focal point of the geospatial community, to:

- develop business models under which the brokerage model can be made financially viable and competition kept fair;
- prepare institutions and the workforce for the changing role and new dynamic;
- move toward procuring data from external sources and integrating this data with existing frameworks;
- build technical and relational bridges between government agencies to promote and implement the exchange of geospatial information and explore the position of national mapping agencies as coordinator;
- take steps to encourage collaboration between government mapping agencies and the wider geospatial community;
- develop the technical means of integrating the proliferation of data sources and new procurement possibilities while ensuring the authority, quality and integrity of the spatial data infrastructure;
- promote the possible role of national mapping agencies as coordinators of and advisors on geospatial community collaboration and use of geospatial data within government; and
- explore the legal ramifications of the change in market dynamic.

This all is in line with the continuing adaptation of national mapping agencies to the needs of society, as they have done for many years. The geospatial information broker role is just one opportunity worthy of consideration.

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