Relationality in Geo-Information value. Price as product of socio-technical networks

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Abstract

Already for more than a decade there has been a discussion on how to define prices of geo-information. We pose that rather than focusing this discussion on the geo-information itself, it is important to consider the contextual conditions which contribute to price establishment and their acceptance by involved individuals and organizations. As geo-information is usually embedded into inter-organizational relations (IORs), the geo-information use is affected by the ‘relationality’ of the internal and the external context in which the organizations operate. Both these influences justify using infrastructural aspects as conceptual lenses to examine when prices are established and when they are consolidated. We explored these infrastructural aspects in three cases of IORs in the Netherlands. The cases show that the dynamics across IORs can reveal relevant aspects of price development and price setting of geo-information. We conclude therefore that the IORs act as anchoring mechanism for prices.

Keywords: geo-information, spatial data infrastructure, value, price

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1. INTRODUCTION

Currently the approaches towards defining and evaluating the value of geo-information are dichotomous: one side of the dichotomy views the value of geo-information in its entirety, such as the value of a national Spatial Data infrastructure (SDI), and one side looks at price setting and conditions surrounding specific, individual geo-information products and services (like maps or images). The articles by de Vries and Beerens (2002) and Lance et al. (2009), the INSPIRE state of play reports*, the comparative study by Craglia and Campagna (2009) and the advisory policy reports by Pricewaterhouse (1995) and Ordnance Survey (1996) are examples of the former. The discussions by Blakemore and Sutherland (2005) and Groot (2001) are examples of the latter. In addition, the polemics on “fee or free” access to spatial information, originally a divide between European and North American access policies (Masser, 1999), and later brought into a broader discussion of access (van Loenen, 2009) are also part of this latter discussion, because they focus on (single or bulk) prices of individual products. The question whether there exists a relation between the national accounts of geo-information and the price setting for specific, individual geo-information products or services is however a dilemma in the debates about the value of geo-information. This dilemma is twofold:

1) Can we measure the actual value of individual geo-information products with price, knowing that the users of such products value the same product differently over time? (Rhind, 1992) noted: Perhaps the single most vital issue with respect to digital spatial data at present time is that its utility and value are often most highly related to the expertise, knowledge and imagination of the purchaser and the exploiter. In such cases, "normal" relationships between supply, demand and pricing may be well distorted. (Rhind, 1992). Not surprisingly, this has resulted in a wide variety of pricing models and contexts (see (Longhorn and Blakemore, 2008)).

2) Can we decompose or aggregate such changing values to an extent that one can generate patterns relating to the overall value of geo-information? In other words, is there a national value of geo-information?

Both dilemmas show that measuring the value directly is difficult, if not impossible. On the one hand individual prices are not consistent; on the other hand, the aggregate value is not tangible, and can therefore not be decomposed. Our research started from this dilemma. During the AGILE 2009 conference session on geo-information value where an early version of this paper was presented, * http://inspire.jrc.ec.europa.eu/state_of_play.cfm
Actor-Network Theory (ANT) was discussed to highlight that value depends on existing relations among actors, and that different relations may construct different values for the same product. As an example for discussion, one of the discussants proposed to compare geo-information value to the seat price on air flights. The point was that the prices of air tickets for the same seat change over time, and that different people are willing to pay different prices for a number of reasons (like special offers, miles credits, travel agencies’ suggestions and fees, safety perceptions, language(s) spoken onboard, alternative routes, etc.). Also, a same person is likely to opt for different tickets, or even different prices for the same seat, at different moments. Apparently, air ticket price setting requires more than focusing on the seats themselves (although comfort and space can be considered in customers’ choice). From this discussion we realized that geo-information price setting would require the consideration of the wider organizational contexts affecting and creating those prices. On the same line of highlighting the organizational dimension, Latour (2005) stated that from the artifacts of refund schemes, supply prices, supply chain, market level, season, offers, etc. it is clear that air companies fly, not planes alone without the organizational setting. So, we propose that in order to understand the behavior of buyers and sellers in price setting one needs to look at the broad inter-organizational relations (IORs) within which they act. The importance of this ‘relationality’ in organizational studies has been mentioned by Bradbury and Lichtenstein (2000), especially in situations when looking at the discrete objects or phenomena, such as the price of one organization, or the value of the entire SDI, does not provide a direct insight into a phenomenon beyond a single organization, such as the value creation or the origin of prices.

From acknowledging the importance of relationality, at this point we can add a note about the disputed non-rivalry nature of geo-data. On one side we accept that geo-data, as all data -not only in digital formats - is not a mutual exclusive resource, which means that its use does not impede others to do the same. On the other side, empirical understanding of the field of geo-information shows that rivalry is artificially introduced by means of contracts. In fact nearly all geo-data providers, for example, restrict the degree of freedom that buyers have on the geo-data they pay for. Most commonly, buyers are forbidden to share data with other potential buyers. This actual condition, challenged by voluntary geographic information (VGI), not discussed here, explains why common pool resources are not central in our argument.

This paper therefore aims at placing the cornerstones to conceptualize geo-information value as price setting looking at IORs. It is not our aim to define univocal price-setting mechanisms, but to suggest how to (re-) conceptualize the issue of price setting, with a primary focus on the early stages of product definitions and associated pricing definitions. For sectors which are at the early stages of development, the value chains are not yet stable. As a result, prices are
established and accepted through anchoring mechanisms (Ariely, 2009). Anchoring mechanisms consist of practices whereby people link the value of a new product to other products which have accepted prices, usually within relatively stable value chains. The resulting price of such a new product may however therefore not reflect the actual value, but the initial price determines to a large extent how buyers and sellers start to value the product. A similar problem was noted by Déjean et al. (2008), when unraveling the mechanism for value establishment and measurement of ‘corporate responsibility’. Déjean et al. (2008) found that the introduction of measurement tools on corporate social performance was in fact not answering the needs of performance measuring and enhancement of the industry stakeholders, but the needs for such companies’ legitimacy increase in the financial sector. “Actors in the financial field are deeply embedded in a cognitive frame in which quantitative measurement tools matter a lot” (Déjean et al., 2008). Thus, the inter-organizational relations across which price setting takes place, affects the prices being accepted and used. Therefore price setting is an inter-organizational artifact, which needs to be researched by considering how and when prices are (or can be) formed, and along which relational lines what prices are actually accepted.

We will argue in this paper that the dynamics of IORs in early stages of price setting largely define the value, and as a result reframe the dilemma of geo-information value to a problem of IORs. This perspective helps to generate new questions and some answers. To position the discussion more thoroughly, we confine our research to two major questions:

1) Which inter-organizational conditions can define or affect the process of geo-information price setting?

2) When are prices set and inscribed into the IORs?

The article is structured as follows: First, we discuss the theoretical concepts by which we look at price, followed by the operationalization strategy through descriptive data collection and interpretative analysis of cases. If price setting takes place along the IORs, then an information infrastructure perspective (Bowker and Star, 1999) to investigate how that is taking place in reality is useful. Next, we present the findings in each of the cases and discuss how each of the analytical aspects of the theoretical concepts is reflected in the cases. We conclude with a number of recommendations for further research.

2. THEORETICAL FRAMEWORK

We propose to tackle our research questions from the perspective of contextual inter-organizational conditions within which prices are agreed upon. We start by two archetypical stable conditions, the market perspective and the hierarchy
perspective, in which the process of price setting and value creation is largely known and extensively described. These two are based on the traditional Max Weber dichotomy, but revitalized by Stone (2002) in more recent years, amongst others:

- a market perspective (geo-information as object of trade, which implies value uncertainty at the bottom of the organization, where customers stay and choose), and

- a hierarchy/bureaucratic perspective (geo-information as part of protocols/procedures, which implies value uncertainty at the top of the organization, where political/administrative decisions are taken in a directive manner).

In the market perspective, price is determined by the “invisible hand” of the market (introduced by Adam Smith) which pulls prices down to an accepted equilibrium between demand and supply. According to this (neo-) classical economic theory (Hicks, 1975 (reprint from 1939)), continuous bargaining of atomic actors reduces profit margins continuously, and pushes for innovation. No actor is assumed to be able to set prices independently from the market conditions. The market is completely decentralized. Actors can act independently and rationally, and choose among pricing alternatives which can be associated with value. Value is this created at the moment of market interaction.

The hierarchical perspective contrastingly draws on formal, procedural, relations (Thompson, 1991). The price is determined and managed by the top of the organization in a centralized manner. Actors cannot choose, but have to accept given prices. Prices equal value in this case, as there is no rivalry good. Value is thus created at the moment that the authority determines the price.

Empirical reality does match either ideal-type, so the actual process of actual geo-information price setting or value creation does not follow either type. Given the bounded rationality in which actors have to make their choices, it is widely assumed that what counts is the perception of value of goods. In between the two models is a IORs model. In this model the product price is influenced by both central and decentralized levels. For example, state organizations, such as national mapping agencies legitimize the reliability of certain information products which have national importance, even through the distribution may be operated through commercial channels or private companies. The resulting price in such a dual system depends on what the state is willing to guarantee on the one hand, yet also on what customers are willing to pay on the other. Essentially, the price depends then on the changing conditions in which both providers and customers are interacting with each other.
Researching these processes empirically poses first of all the problem of what the most relevant empirical granularity could be. To tackle this problem we use three analytical aspects from information infrastructures studies (Bowker et al., 2007; Hanseth and Monteiro, 1998), which highlight crucial points of interrelation between information handling and organizations:

- accreditation, which actors can guarantee access, and what mechanisms can allow the use of information,
- interoperability/integration/coalition, refers to the possibilities of establishing couplings between data and related activities and organizations,
- standardization, refers both to data and to organizational processes compliance to common guidelines.

These aspects do not distinguish informational and organizational dimensions a priori. So, they are consistent with our initial aim of not looking only at the plane seats. They are also mutually dependent, and can help in describing inter-organizational processes. For example, a public body can decide what standards have to be used for geo-information. Nevertheless, existing systems in use in accredited organizations may require different strategies of data integration.

Table 1 provides a view on the archetypes, and in where the opportunities to investigate existing practices of value generation in IORs are. By reviewing the combined set of infrastructural aspects one can not only reveal the context in which value creation takes place, but also whose values are actually more or less dominant.

<table>
<thead>
<tr>
<th>Archetype (infrastructural perspective)</th>
<th>Analytical aspects (infrastructural perspective)</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hierarchy/bureaucracy (organizational uncertainty at the top)</td>
<td>Accreditation</td>
<td>Regulatory authorities; Centralized, independent body or regulation</td>
</tr>
<tr>
<td></td>
<td>Coalition</td>
<td>Joint ventures; Merging of organizational sub-parts for a negotiated task</td>
</tr>
<tr>
<td></td>
<td>Standardization</td>
<td>Franchising; Autonomy within the frame of controlling organization</td>
</tr>
<tr>
<td>Market (organizational uncertainty at the bottom)</td>
<td>Accreditation</td>
<td>Peer production; Community, distributed acceptance</td>
</tr>
<tr>
<td></td>
<td>Coalition</td>
<td>Networks of action (Braa et al., 2004) Scaling of dispersed collaboration</td>
</tr>
<tr>
<td></td>
<td>Standardization</td>
<td>Sector association; Body for negotiation and representation of interests</td>
</tr>
</tbody>
</table>
Similar to the example given by Déjean et al. (2008), in which the emerging cost for corporate responsibility consultants were an indicator of the constitution of corporate responsibility value, the cost and effort needed by the individual organizations for infrastructural activities undertaken are a proxy for the value of the spatial data outcome. More precisely, by investigating which price organizations are willing to pay or be paid (in terms of money or other forms of resources):

- to join an accredited arena, and/or
- to make their data interoperable and used in other settings, and/or to adopt information and procedures from other settings, and/or
- to embrace a standard,

we can identify an indirect and original entry point in understanding geo-information price setting. In addition, by evaluating how spin-off activities of IORs dealing with geo-information sharing create extra activities for individual organizations, we can derive a bigger picture of the value of the geo-information.

3. DATA COLLECTION METHOD AND CASES

We selected three geo-related IORs cases from the Netherlands where working with spatial data is among the prime objectives of establishing the IOR. All IORs represent relations of and between municipalities, and all IORs represent municipal spatial data which need to be exchanged and shared. This limitation in cases shows firstly that different IORs coexist in one location, and secondly that different value systems exist simultaneously.

The three analytical aspects of the infrastructure perspective were the elements to review in our cases. The approach to data collection was largely open-ended, and aimed at an explanatory account of geo-information use. More concretely, data sources included selected relevant documents, publications through the websites, newsletters and face-to-face interviews with municipal staff working in geo-information (related) departments, senior managers and geo-information managers of the National Cadastral organization, Dataland, and process managers of the national association of municipalities. The data related to DIMPACT were retrieved through interviews with staff from the DIMPACT coordination bureau and Dimpact member municipalities, and Dimpact related (hardcopy and digital copy) documentation.
Table 2 Cases of IORs with geo-information

<table>
<thead>
<tr>
<th>IOR</th>
<th>Parties involved</th>
<th>Main objective of cooperation</th>
<th>Geo-aspects</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Cadastre with 443 individual municipalities <a href="http://www.kadaster.nl">www.kadaster.nl</a></td>
<td>1 National Cadastre, 443 municipalities</td>
<td>Exchange of basic objects, including parcels</td>
<td>Standards of base data, including parcels, addresses, buildings</td>
</tr>
<tr>
<td>Dataland <a href="http://www.dataland.nl">www.dataland.nl</a></td>
<td>360 municipalities (July 2009)</td>
<td>Making object data of municipalities accessible to government, citizens and private parties</td>
<td>Distribution of Geodata of municipalities to third parties</td>
</tr>
<tr>
<td>DIMPACT <a href="http://www.dimpact.nl">www.dimpact.nl</a></td>
<td>14 municipalities (July 2009) – mostly in east of Netherlands</td>
<td>Joint Development of front/mid/back office for municipalities</td>
<td>Creation of joint geo-viewing solutions</td>
</tr>
</tbody>
</table>

The interpretation of these combined data was qualitative, because our intention was to seek qualitative categories and patterns in an analytical way, rather than testing hypotheses quantitatively. The main focus of the interpretation was on how the infrastructural dimensions introduced before can explain actual activities and organizational patterns in relation to geo-information, i.e. concepts of accreditation, coalition and standard were used as a common lens to look at the three cases discussed here.

4. FINDINGS

4.1. Cadastre-municipalities case

The relation of the Cadastre with municipalities is quite complex and has grown historically. As de Vries (2009) describes, data on geometry of parcels are collected by the Cadastre and provided to municipalities. Data on people are collected by municipalities and shared with the Cadastre for the purpose of ownerships, heritance, etc. Data on buildings are the responsibility of municipalities, but collected by the Cadastre on behalf of the municipalities. Data on addresses are collected by municipalities, but managed by the Cadastre. Data on public rights need to be registered by municipalities, but are in fact registered in the Cadastre. This intertwined set of relationships has made it confusing at times who is playing which strategic card on whose behalf. It was however noted regularly that the historically grown situation has been problematic at times, because each actor aimed at getting hold of the same geo-information.
In essence, we can say that the accreditation related to the data through a negotiated process with user groups and with the Ministry of Housing, Spatial Planning and Environment (‘VROM’ is the Dutch abbreviation). The accreditation consists of both the quality procedures on the data done by the national Cadastre organization, and of the prices of cadastral products, proposed by the Cadastre and approved by VROM. The aggregate of prices primarily reflect the total cost needed to produce and distribute the cadastral data. The data produced by the municipalities are not directly sold by the national Cadastre; yet, the Cadastre organization uses these data in the infrastructure and maintenance provisions. The rules which guide access and distribution are technically set by the National Cadastre. The accreditation can thus be largely contributed to the realm of activities and regulations of the National Cadastre.

The coalition between the National Cadastre with municipalities is made up by individual bilateral contracts, which are backed by national laws (Cadastral law, key registrations, INSPIRE Directive). This coalition is however subject to any change in the national legislation, not directly but indirectly. For example, any new legislation which devolves certain responsibilities to municipalities (such as the key registration act of buildings and addresses) immediately influences the coalition, and the space that individual parties have in the coalition. Yet, this regulatory environment does not prescribe how the respective parties define their individual agreements.

The standardization activities with regards to data and information processes along this set of coalitions are largely guided by the National Cadastre. This is not unexpected. The basic Cadastral law, and the associated organizational law Cadastre, and the law related to the Key registrations Cadastre, Topography and Geometry form the basis on which the organization carries out its activities. As a result, the Cadastre organization aims to streamline the form of data collection and the activities related to data provision. Even though individual municipalities would prefer other types of cadastral or topographic data formats and procedures, the Cadastre may use the argument of required harmonization, expressed in the laws, as key argument why they should lead the standardization process. Moreover, besides the formal (legal) channels between the Cadastre organization and the municipalities, there are various informal channels where the parties meet. One is through regular negotiations with the National association of municipalities (‘VNG’ is the Dutch abbreviation).

All in all, the three dimensions show a strong position of the Cadastre in relation to the individual municipalities. But, there are also several accounts of problems on the accreditation and standardization (Coumans, 2007), and in particular when it comes to the issue of prices, and the price sets. The main bottleneck hereby concerned the fee structure set by the Cadastre. Although the Cadastre is handling a public task it is doing so through a private company-like management
practice. The fees are set, be it in negotiation and after approval by VROM, yet the Cadastral organization changes its fees following economic conjunctures. Despite this private management-like practice one could argue that it is not consumers of the products and services through which prices are set, yet a top-down control mechanism of the Cadastre's expenses. In 2008 the total revenue of the Cadastral organization was €204 million, while the expenditure comprised 254 million. Over the years the Cadastre has made however a profit leaving the organization with an own equity of €8.4 million in 2008.† However with the rapid changes in the housing market and the global economic crisis, the equity of the Cadastre has become far below the required threshold, which forced the Cadastre to raise its prices. These conjuncture market differences thus influenced the price setting in addition to the hierarchical processes of price setting. Municipalities, on the other hand, have their own yearly budgets for cadastre related activities, although it is difficult to distinct cadastre related activities from other geo-information related activities. Moreover, the problem for many municipalities is that different trajectories are imposed from national authorities related to geo-information related registration. It is difficult to anticipate or cater for all those trajectories.

4.2. Dataland case

The cooperation Dataland comprises of joined municipalities, the foundation administration Dataland and the Corporation Dataland. Municipalities can join the coalition on a voluntary basis. As contributing member municipalities both constitute Dataland (set the rules) and also comply with Dataland (live by the rules). Once they become a member there are however implications of the membership. They have to submit their geo-data periodically to the Dataland office. Dataland in turn agrees to pay 5% of the revenue generated based on the data from the associated municipality, to cover for the cost made by the municipality to make the delivery in order. The minimal frequency of delivery is twice a year, but occasionally this happens more often, for example when there are many recent data mutations. The Dataland bureau is responsible for the accreditation. They check the data on completeness, accuracy and actuality (in total 41 criteria), and publish these validation results through a quality monitor. This quality monitor aims to serve two purposes:

1) It provides the individual municipalities with the possibility to correct or update their data and/or underlying work processes, if wanted.

2) It increases trust by third party customers, because of the existence of a quality process.

† Data from http://kadaster.nl/jaarverslag/2008/pdf/kort.pdf
The quality process also makes sure that the quality of all the distributed data is fairly harmonious, so the quality indicator is a measure for the standardization. Translated to activity costs, we can also say the both the activity of quality checking and quality publication of the Dataland bureau and the activities related to revision by the individual municipalities make up the total (voluntary) activities of standardization.

The governing board of Dataland is made up of six representatives of (mostly medium to larger sized) municipalities and a representative from the association of municipalities (VNG). In 2008 Dataland had made 300 million building data with address attributes available. The 2008 activa/passiva comprised €363,779.‡

4.3. DIMPACT case

DIMPACT is organized as a coalition of voluntary members. Similar as in Dataland the members can be active in the policy and setting of priorities of the cooperation, and they have influence in the operational management of the cooperation. Each participating municipality has an equal vote, regardless of the size of the municipality. The members coordinate the provision of services and systems to member municipalities. The cost structure is such that DIMPACT makes use of the staff and knowledge of municipalities themselves with the support of a small coordinating bureau. No external consultants are hired in. The idea is that management and development costs are shared by the members, in order to generate opportunities and advantages of scale, standardization of processes, operational efficiency and decrease of overall costs of individual members. The DIMPACT bureau works on a not-for-profit basis§ on the level of accreditation. Although the weights among members in the decisions of DIMPACT as a whole are equal, it is not surprising that the larger municipalities have a bigger role to play, simply because of their larger number of human resources. One could also raise the question whether cost reductions are made if people have to do the work internally anyway. The cost reduction comes through the sharing and trading off of experiences from one municipality to the other. The gain is in the fees generated for the electronic services, in the expectation that the presence of electronic services will increase the number of services provided on the one hand, but also the income generated by electronic services on the other hand.

‡ Data from http://www.dataland.nl/images/dataland/PDFS/Jaarverslagen/jaarverslag%202008.pdf
§ Generated revenue is invested in the cooperation.
4.4. In summary

Table 3 Findings of information infrastructural aspects per case

<table>
<thead>
<tr>
<th>IOR</th>
<th>Accreditation</th>
<th>Coalition</th>
<th>Standardization</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Cadastre with individual municipalities</td>
<td>The Cadastre Organization largely determines the quality and prices of all data, yet requires ministerial approval for their pricing policy for data distribution.</td>
<td>Coalitions are based on a large number of individual contracts between the Cadastre and individual municipalities. National legislation of key registers distributes responsibilities.</td>
<td>All operational standards are primarily determined by the Cadastral Organization. Most standards are formalized in national legislation. Price standards result from a negotiated process.</td>
</tr>
<tr>
<td>Dataland</td>
<td>Dataland accredits individual municipalities by a yearly quality price to a single municipality</td>
<td>Dataland is a cooperative of municipalities with Dataland foundation and Dataland corporation, and an executive Bureau Dataland. The Dataland central Bureau administers memberships, and coordinates cohesion among members.</td>
<td>The Dataland Bureau sets validation rules, and applies these rules to check data of individual municipalities. Prices are set by individual municipalities, yet Dataland gets funded through some of the revenue.</td>
</tr>
<tr>
<td>DIMPACT</td>
<td>Technical representatives of individual municipalities agree on technical solutions, including specific GIS solutions.</td>
<td>An executive bureau Dimpact coordinates the alignment at technical and policy level. Municipalities are voluntary members of the Dimpact association; Standards result from the technical solutions for problems within the e-service provision of individual members. Individual municipalities set their own fees for electronic services.</td>
<td></td>
</tr>
</tbody>
</table>
5. DISCUSSION

Through the empirical material presented, we identified a relevant area for the understanding of geo-data price setting, which is characterized by a non-crystallized value chain, therefore by high uncertainty among members in the chain in price setting. Possibly, the stabilization of the value chain would affect price uncertainty. At this early stage of development of the sector, we claim that prices are anchored to other activities along the existing inter-organizational relations.

The three cases are different for functioning, history, tradition, etc but they are empirically linked and analytically coherent, as they comprise related actors in different inter-organizational arrangements. Theoretically, they are presented through the same conceptual lens derived from information infrastructures research. This double overlapping allows seeing how Cadastre, Dataland and Dimpact are interlinked along three dimensions: accreditation, standard, coalition. So, rather than seeing individual organizations, we see a spatial data infrastructure developing along existing IORs. As it can be noted from the cases, municipalities play a crucial level in handling geo-information. Therefore, with the development of inter-organizational geo-information sharing, they tend to become hubs of an SDI, and the hubs contain the location where the validity of prices is mostly felt.

What does this mean in light of our first research question? “Which inter-organizational conditions can define or affect the process of geo-information price setting?” A first condition which seems determinant at first sight is the regulatory system in which prices relate to the inter-organizational agreements. The first case (Cadastre) shows that fees are used to balance organizational budgets, in particular those of the Cadastral organization. But this cost recovery condition cannot be labeled as a market-oriented process per se, because there is no competition on the cadastral prices, and as a result there is no clear benchmark against which one can label the resulting and actual prices as fair or unfair. One could say that the prices are decided in a quasi monopoly fashion. However, from the perspective of municipalities a considerable amount of activities are set aside to meet the requirements of the Cadastre, on the one hand to comply with national legislation, but on the other hand on a voluntary basis, because the data can immediately be used for other internal information processes and services. Thus, the willingness to allocate resources for this extra workload as a result of being involved in the cooperative effort is a direct indication of the value that these municipalities give to the data, even though it is difficult to quantify this value in money terms. However, the presence of this value influences the willingness to pay a certain fee.
The voluntary aspect of engaging in IORs is stronger in the other two cases. In the cases of Dataland and Dimpact, this implies that top-down strategy of coercing a certain price is not possible, because the membership of municipalities to either Dataland or Dimpact is voluntary. Even though the agreement states that once parties have joined they have to stick to the general rules; yet there is no hard enforcement instrument other than a civil court case. This downplays the relevance of conventional transaction cost theory as described by (North, 1990) amongst others, to explain the price setting conditions. It is not so much the extra effort to enable the transaction which determines the price. Nor is it the extra coercion effort to enforce a certain price. So, the institutional conditions in which the actors join up do not seem to determine the price setting. Instead there is a tendency towards voluntary compliance to certain prices which are set by the cooperative, or even by a single organization. Once this price is found reasonable by one, the others follow. This voluntary compliance process is what (Powell and DiMaggio, 1991) refer to as normative and or mimetic isomorphism as opposed to coercive isomorphism. Within the organizational field of geo-information use in the Netherlands, voluntary agreements, professional and peer relations work as regulatory artifacts. Indeed, the actual degree of voluntarism in the latter two cases may be questioned. Currently, 360 (out of 443) municipalities have joined Dataland, leaving still some 80 municipalities not part of such coalition. Most of the members and non-members are geographically clustered. It sustains the idea that location, historical cooperation and other path of informal cooperation influence to join or not join Dataland, therefore indirectly standardization. In addition, not all members are equally active and participative in Dataland. The Dataland bureau has installed a regular price for a member who delivers the highest quality ('Chapeau' price), as an incentive to maintain quality. The price also acts as an incentive to bond among members, and as a way to increase legitimacy. Also this aspect pinpoints the hypothesis that the value of geo-information is not to be found in the information itself, but through anchoring it in existing relations to which it takes part.

Our second research question is “When are prices set and inscribed into the IORs?” A first remark is that trying to understand the price setting mechanism by tracing where budgets came from does not seem to be a promising path. In fact, the actual amount of money that is made available for the organization of key registers at local level is none, while for other public sector innovation projects, e.g. “a different government” (in Dutch: ‘Andere Overheid’) is considerable. As one municipal staff put it:

*For the whole internal management Group ‘Andere Overheid’ our municipality reserved 1,2 million euros… that’s quite an amount. Especially, considering that we have to economize on our regular operational processes... So, if they tell me that I have to re-organize the geo-information processes, than I have to use this*
money. At the same time I receive new regulations from all sorts of ministries, but they don’t give me any additional funds. I am in a continuous split.

This quote shows that the price setting of geo-information cannot be directly traced back to the time when dedicated geo-information investments were made or regulations were set. It is almost coincidental that geo-information processes are re-organized to cater for municipal geo-information products which can be provided to third parties. Tracing the increase of prices leads in this case to tracing the internal and external networks in which the organization is willingly or unwillingly involved, or anchored.

Furthermore, the fact that a number of respondents from municipalities are highly critical of the prices set by the Cadastre does not influence the price setting. The prices are set though a negotiation process of the Cadastre with the Ministry. However, the time at which any price is fixed is not intrinsically related to any attribute of the geo-information itself, rather it relates to the IORs and dependencies in which the Cadastre is hooked.

Finally, in the cases of Dataland and Dimpact the criticism deals in particular with the limited degree of influence that individual members can exert in the cooperative agreements, including those involving prices and budgets. This makes the dimension of coalition, as one which could help in explaining price setting, the most uncertain one among the three infrastructure dimensions. Still, it is clear that the municipal staff form increasingly the nodes between such coalitions and these constitute the main contact points to experience the prices. The Dataland and Dimpact examples of organizational and decision structure show that lower level governments can join up and create their own decision and standardization processes. These processes may counterbalance nationally led processes of geo-information management. This would imply that local level values are incrementally inscribed in the system. Indeed, local officers ask for it explicitly, when complaining that there is no money for geo-information activities and they have to use other budgets. On the other hand, in most cases the actual implementation of ICT is conducted in close connection or even in subcontracts to the private sector. The actual implementation at national level is often conducted by the same private companies as at local levels or at cooperative local levels. The question therefore remains whether local public values truly find their way into the measurement system. The activities that this generates are worth to be explored further, empirically and theoretically. The hypotheses we pose for further research are:

- Some sort of price (in terms of fees or resources to be shared with the coalition) will consolidate over time to obtain accreditation.
- Positive or negative incentives (prices, fines, bonus/malus, etc.) will regulate compliance to geo-information standards (data quality, use of interoperable data models and technologies) within the infrastructure.

Empirically, municipalities are a crucial point of encounter of the sets of IORs considered. Looking at them as hubs of a SDI, explaining what tensions they are intertwined with, can shed new light on geo-information value. From this perspective 'street level' public sector officers offer a good viewpoint, being at the intersection of geo-information production and use.

6. CONCLUSION

Overall, examining the IOR cases in the Netherlands has shown that the infrastructural aspects provide original insights in how to evaluate value development. The cases have shown that many geo-related IORs are in fact inter-connected, which implies that examining value generation in individual cases or in individual organizations is likely to result in blurred results. Value exists throughout the network, and can therefore not be evaluated in isolation of the characteristics of the network. Value arises at the moment that these network relations emerge, or at the moment that these network relations are created. With changing network relations, prices may thus change over time. That is why we refer to the importance to study “relationality”, in terms of entanglement (Orlikowski and Scott, 2008) of information technology (spatial data infrastructures, in this case) and organizations.

In addition, this explorative analysis identified an interesting tension between the trend towards more autonomous cooperation among smaller public organizations and organizations which are lower in the administrative hierarchy. Contrastingly, the national and larger organizations still tend to take the lead in major top-down decision trajectories, because they have the human resource and financial capacity to do so. The resulting value generation by each of these trajectories is different, hence giving the intersection of these two processes, being the municipalities, difficulties in setting prices for their geo-related products and services. Looking at the individual value chains of the municipal geo-related products would not explain this difficulty, but linking this problem to the processes in two different networks would. That’s why linking value creation and price setting to IORs is useful.

Although this research has addressed a number of issues on how the IORs conditions shape value, the investigation led us to two general questions which we propose to the readers:

- What the most relevant empirical granularity (of IORs) to look at price setting would be?
- How the examples of the Netherlands would compare to examples in other developed countries, and whether similar examples from developing countries would resemble these findings?

REFERENCES


