Building Geoinformation-Infrastructures:
Utopian and Myopian storyboards regulating the narrative anchor

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Abstract

Implementation processes of geoinformation-infrastructures are generally seen as problematic and unsuccessful. Implementers are inclined to value organisational aspects of NGII development using design rules, borrowed from political science, economics and management science. A big gap exists between on the one hand the wish to implement SDIs using fashionable management models, and on the other hand the inability to accomplish that.

This article wants to shed light on implementation processes of geoinformation-infrastructures using a narratively inspired ethnographic method. Within the Dutch geoinformation sector two ethnographies are presented and analysed. It leads to the conclusion that a narrative anchor is a non-technological and non-tangible decisive element in a geoinformation infrastructure.

1. Introduction

The GSDI organization is an international body, meant to bring together and disseminate international research and practice in the Geo-spatial Data Infrastructure world. It organizes regular conferences attracting the upper crust of the international spatial data community. In June 2009, the annual conference was organized in Rotterdam, the Netherlands. The Dutch governmental organization Geonovum saw this conference as an opportunity to present itself as the main policymaker of Dutch geoinformation sector to an international audience. They were granted a plenary morning session, starting off with an opening speech by the mayor of Rotterdam. A few speakers highlighted the results of the innovation-boosting Space for Geoinformation program and it ended with the official launch of the National Geo Register of the Netherlands.

For this official moment on stage, a dummy book having empty pages laid open on a desk and was projected on an overhead screen. By hitting a knob the page suddenly was filled with a map, that is to say, only on the image on the overhead screen. It was explained that the actual book on the desk still contained empty pages, however the image presented on the overhead screen displayed book-pages filled with content, caused by the application of a novel technology called 'augmented reality': the view on the overhead screen was electronically enhanced with artificial images. It had an astounding effect on the audience.

My feeling was that this launching ceremony came more close to a high-tech juggling act: the use of something flashy to distract the audience from what ought not to be noticed, being essential to the performance. It felt like a symbol of what I had experienced studying recent geoinformation infrastructure projects: technology as distracting from what an infrastructure is about.

After leaving the session I asked several insiders about their opinion. Most of them were impressed by the presented new technology. However, informed participants who had knowledge about the National Geo Register felt this was yet another attempt to revitalise the Dutch geoinformation infrastructure, but doomed to fail. Being convinced that a spatial

infrastructure was essential, these insiders were quite certain that by putting technology again in the frontline, this attempt to establish a National Geo Register would also go into obscurity.

This little scene elegantly demonstrates the spirit of Dutch geo information professionals: trying to reconcile images of static infrastructures with dynamic cutting-edge technology to serve the domain of public administration (Hanseth, Monteiro et al. 1996; Bowker and Star 2000). Efforts to build a geoinformation infrastructure in the Netherlands using technological innovations have not always been successful; at times even problematic (Koerten and Veenswijk 2009). Not only have I witnessed how endeavours like this get redefined because they do not live up to their initial expectations, it has also been widely acknowledged internationally among geoinformation insiders that knowledge on establishing infrastructures is lacking, that is, on combining and disseminating map-related information among and between organisations (Budhathoki and Nedovic-Budic 2007; Georgiadou, Harvey et al. 2009; Homburg and Georgiadou 2009; Lance, Georgiadou et al. 2009; Grus 2010). The common denominator in related literature is that these Spatial Data Infrastructures (SDIs) should be more effectively guided by management models (Koerten 2008).

Therefore, implementers are inclined to value organisational aspects of NGII development using design rules, borrowed from political science, economics and management science (Koerten 2007). Accordingly, SDI-researchers focus on best practices, organization models and planning (Rajabifard and Williamson 2001; Warnest, McDougall et al. 2003; Masser 2005; Warnest, Rajabifard et al. 2005; Obermeyer and Pinto 2008; Box and Rajabifard 2009). However, some researchers want to focus on these non-technological aspects in a non-prescriptive way to get a better understanding of implementation processes, for which they think alternative ontology's and epistemologies are more appropriate (Harvey 2001; Georgiadou, Puri et al. 2005; Crompvoets, Rajabifard et al. 2008; Georgiadou, Harvey et al. 2009). Although some research has been conducted in this vein (Martin 2000; Harvey 2001; Georgiadou and Homburg 2008; Lance, Georgiadou et al. 2009), mainstream NGII research remains to be design oriented (Budhathoki and Nedovic-Budic 2007; Crompvoets, Rajabifard et al. 2008).

A big gap exists between on the one hand the wish to implement SDIs using fashionable management models, and on the other hand the inability to accomplish that. Establishing information infrastructures based on cutting-edge technologies seems to have more intricacies than ordinary management practices can handle. Therefore, I want to look into a few specific cases and focus on how SDIs are narrated in meetings, interviews and policy documents in order to develop our understanding about conceptualization and usage. I am going to use a method inspired by narrative analysis to guide my ethnographic research. The research question is: How can we understand SDI implementation using *narrative analysis*? Secondary questions are: How do technological and organisational aspects interact with each other? How are goals and results perceived over time? In order to accomplish that, I am going to present the Dutch situation in which two close related cases, *Nationaal Clearinghouse Geo Information* (NCGI) and *Geoloketten* (Geoportals), have been declared as unsuccessful, while another case, *Grootschalige Basiskaart Nederland* (large scale base map of the Netherlands - GBKN), has been there for over 35 years. These cases are going to be compared using a narrative framework guiding ethnographic research.

The remainder of this paper is as follows. First, I am going to develop a narrative theory which allows me to focus on technological aspects, discerning narrative conceptualisations about scene, actors and actions, termed as narrative setting, narrative space and narrative storyboard respectively. A narrative setting concerns notions about the narrated environment in time, territory and technology. Narrative spaces refer to configurations of actors and how they interact with each other and narrate their world, individually and collectively. Narrative

storyboards arise from reflection on practices and are transposed into relatively fixed patterns, which can be regarded as the outcome of the propensity of human beings to consider sense-making it self in terms of fixed concepts. These concepts are going to be used to analyse cases, followed by some concluding remarks.

2. A narrative approach for information-infrastructure research

The theory presented here originates from two perspectives. First, there is the notion of social interaction introduced by Goffman arguing that human beings are able to look at themselves from another point of view, using theatrical terms of 'front-stage' and a 'back-stage' (Goffman 1959; Blumer 1969). Second, the sociologist Bourdieu implicitly rejected the assumption of an objective truth, implying that structures like they are envisioned by sociologists are in fact socially constructed. He attempted to take a middle position which he labelled as both 'constructivist structuralism' and 'structuralist constructivism' (Berger and Luckmann 1967; Bourdieu and Pels 1989). However having different points of departure, Bourdieu and Goffman both take a stand in the micro-macro debate. Goffman's dramaturgical perspective may, to a considerable extent, be comparable to Bourdieu's *habitus*, while Goffman's notion of frames resembles Bourdieu's field concept and practice is more or less interchangeable with Goffman's concept of the 'front-stage'. While blending these two approaches together into one theoretical concept might provide useful notions about the life world affecting individual, group and intergroup behaviour, the very aspect of meaning creation remains unaddressed. Both viewpoints assume univocality, ubiquitousness and fully informed actors and overlook aspects like ambivalence, ambiguity and incompleteness of worldviews.

These theoretical notions do not address the process of sense-making. Therefore, I am going to focus on the interpretation of lived experience as a guide for action and extend this towards a narrative approach using linguistic, anthropological and social psychological insights (Gergen 1994; Boje 1995; Berendse, Duijnhoven et al. 2006), as concepts like these have become influential in the development of less positivistic methods (Polkinghorne 1988; Hatch and Yanow 2003), in which within narrative theory a 'linguistic turn', and a 'narrative turn' may be distinguished (Verduijn 2007).

As language is independently conceptualised, it has no relationship to the originator of an utterance, the concept of discourse is treated as a combination of spoken word and written text, linked to time and space to make sense of the world (Ricoeur 1973; Oswick, Keenoy et al. 2000). To complete a management task, people write, read, speak and listen, using messages which convey myths, sagas, results, setbacks, challenges or strategies, in which the concept of discourse catches the process of enactment, regarded as the linguistic turn (Grant, Hardy et al. 2004).

The dynamic character of organisational practice has invoked interest in other aspects of language use than text alone, such as metaphor, stories, novels, rituals, rhetoric, and sense-making (Grant, Keenoy et al. 1998). The narrative turn is aimed at delineating stories and storylines rather than texts alone (Frye 1957; Burke 1969; Gergen 1999). For the dynamic conceptualisation of organisation, the narrative turn has been considered fundamental in interpretive research (Hatch and Yanow 2003), and envisioned in multiple terms (Berger and Luckmann 1967; Weick 1995; Berendse, Duijnhoven et al. 2006; Veenswijk 2006). The concept of narrative is broad, even as structuring human memory, being both medium and process (Bruner 1991), while the concept of discourse is more defined, more referring to symbolic interactionism (Bruner 1991; Alvesson and Karreman 2000).

Narrative has been regarded as story (Gabriel 2000), as telling a story (Grant, Keenoy et al. 1998) and as the art of telling a story (Kohler Riessman 1993), while there are also other

approaches concerned with linking stories and narratives (Czarniawska-Joerges 1998; Yanow 2000; Boje 2001; Veenswijk 2006). Living in a world of stories, we use narratives to give meaning to experience (Gabriel 2000). Providing account of events, narratives allow us to create an interpretations, either to create stories for single use or to retell and alter them getting a different meaning then if they had been told only once, creating frames for future stories and actions (Tesselaar, Sabelis et al. 2008). Stories may begin a life of their own, becoming narratives to be loosely connected to the originals (Boje 2001). They even may become universal, culminating in identity-creation using social categories (Beech and Huxham 2003). From a manager to a company car, human and non-human identities are created by storytelling, leading to narratives that are continuously reconstructed and therefore subject to change. Having a plot does not imply that narratives are always visible and recognisable; they can be prominent or unconsciously present to actors. They are an interpretation of assembled, either real or imagined stories, which Boje, after Clair, called 'narratives dressed as theories' (Boje 2001).

That narratives only can be understood when interpreted in relation to other narratives, and that a 'grand narrative' is regarded as mutually dependent to 'micro stories', very much resembling the sociological micro-macro debate is implied by the concept of hermeneutics (Boje 2001; Veenswijk 2006). But if narratives are envisioned as confined to some kind of hierarchy, with actors seen as editors to invoke, sustain or to change them (Berendse, Duijnhoven et al. 2006; Veenswijk 2006), there is the danger of overemphasising the role of individuals, implicitly sustaining the idea of 'culture creation' or 'cultural intervention' (Deal and Kennedy 1982; Peters and Waterman 1982).

Narratives have been distinguished by declaring everything non-narrative as 'ante-narrative' or 'lived experience', prior to its reification into a sensible narrative (Boje 1995; Boje 2001; Verduijn 2007). However, that implicitly presupposes that all storylines – the 'Tamara of stories' – are to be known by the researcher (Boje 1995). That is impossible, just as it is impossible as an investigator to be simultaneously at all places at all times. Nonetheless, to construct a coherent image, the incomplete picture is supplemented with fantasies treated as experiences to construct the full picture (Ricoeur 1973; Bruner 1991). Thus, both ante-narrative and narrative are needed for interpretation.

Humans are able to understand change only with great difficulty, only after a certain period of time has elapsed and created an interval (Bergson 1946). Change is therefore reduced to a series of instances: the difference between one state of affairs and another gives us clues about change, determining our thinking about time in a profound way (Burrell 1992; Burrell 2000). Due to modernity dictating a linear concept of time, we tend to experience that as 'concrete lived time' (Chia 2002). While being basic to life, change is still difficult to grasp. In this sense, humanity is 'becoming' instead of 'being' (Heidegger 1977; Burrell 1992; Czarniawska-Joerges and Sevón 1996), eliciting the sense we make of change. Sense-making can be envisioned as the human attempt to comprehend change, in a process in which we attempt to convert an influx of stimuli into adequate concepts (Chia 2002). Because we want to maintain familiar concepts in the process of sense-making, intentional shifts in meaning rarely occur. However, meaning does change, usually imperceptible, due to the changing environment. The propensity to ignore change by creating stable narratives has lead to 'basic assumptions' or a 'deep structures' (Schein 1992). For Schein, the more superficial cultural notions are, the more they are subject to change, in which case perhaps it would be better to describe both superficial and deep structures as changing, but with the latter not being narrated as such.

A narrative framework for research

How narratives come into being and how existing narratives enhance or constrain new narratives, creating either relative stability or a momentum towards change will be conceptualised within the framework guiding this research (Chreim 2005). We will discern narrative conceptualisations about scene, actors and actions, in terms of narrative setting, narrative space and narrative storyboard respectively (see Figure 1) (Burke 1969; Harré 1976). A narrative setting concerns notions about the narrated environment in time, territory and technology. Narrative spaces refer to configurations of actors interacting with each other narrating the world. Narrative storyboards arise from practice and transposed into relatively fixed patterns, to be regarded as the outcome of human beings to let action to be guided by fixed concepts (Chia 2002).
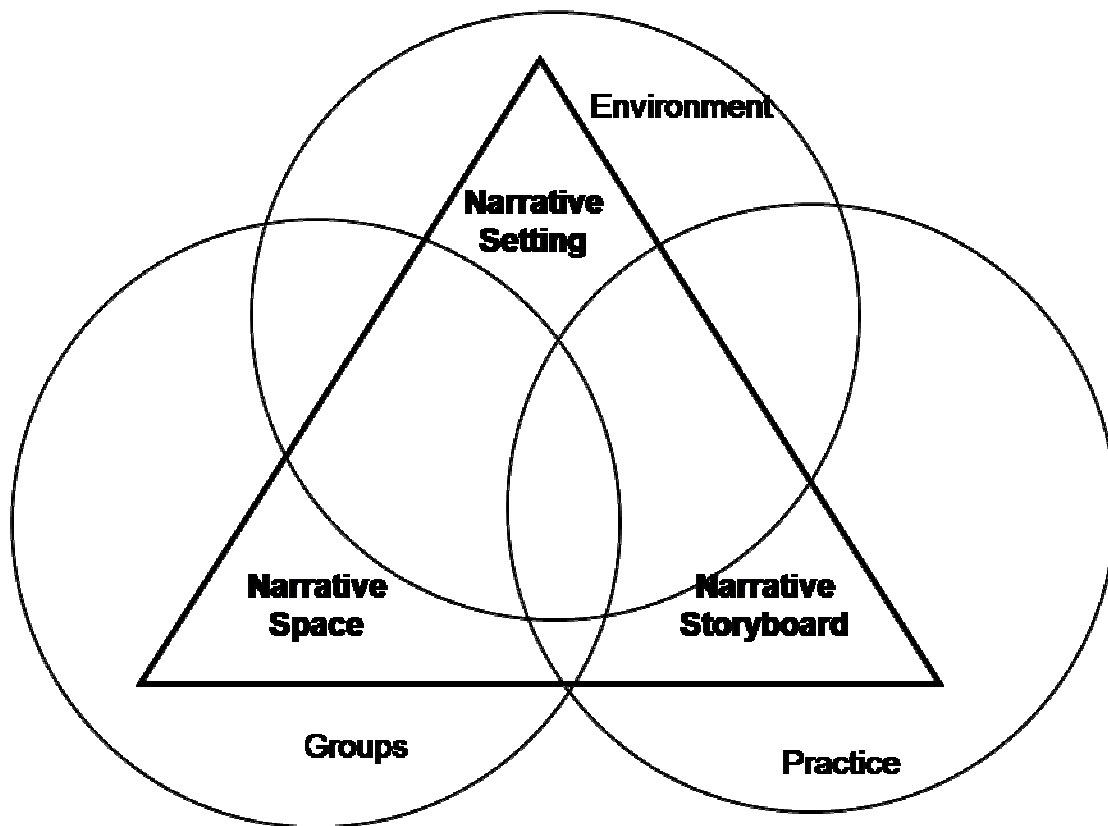

Figure 1. Theoretical Focus

The *narrative setting* conceptualises narratives about the environment: time and territory and technology. These include notions of local and global, of presence and absence, of home and abroad, of change, stability and institutionalisation come together in an enacted location of time, place and technology (Douglas 1986; Lefebvre 1991; Scott 1995). People act in different ways, within different groups, within a specific narrated setting, acting in a local or global manner and in an explicit or implicit way. They enact lived experience on that specific location at that specific moment using images from the past, present and future, from the local community to the global environment. The narrative setting includes buildings, enacted and analysed as a site, space or skin, and as a place to be (Yanow 1995; Yanow 2006; Gastelaars 2008), referring to the theatre-metaphor, using notions of front-stage, backstage, and wider environment (Goffman 1959; Burke 1969). It makes us aware that physical locations may have different, either distinct or

overlapping functions in different contexts. The presence of props and the 'personal front' of people, realised through physical objects, also needs to be mentioned in this context. A narrative setting has tangible and non-tangible aspects (Schneider 1987; Lefebvre 1991; Weick 1995). An intangible software program used through a tangible computer is an example of a complex relationship having fundamental impact on how things are done (Orlikowski 2000). Technology is enacted through subjective, partial and distorted images of future use in the lived environment, linked to time and space (Burrell 1992; Bijker 1995; Orlikowski 2007). Its image is relatively stable, only changing when becoming untenable, influenced by narratives about the past, present and future.

One or more *narrative spaces* may be discerned within a narrative setting. They represent groups of people and are therefore the link to human existence, enacting a department, organisation, profession, religion or subgroup or even a single individual. The interplay between these spaces might invoke action or conversely create a deadlock or cease-fire. Narrative spaces represent 'zoning plans' for enacted human groups, determining nature and limits of at times quite complex combinations, as human thought generates and handles these complexities. They do not necessarily have links to or comply with organisational or societal structures (Lipsky 1980; Douglas 1986; Schein 1996). Governed by a search for predictability, narrative spaces appear to be relatively stable but however vulnerable to change. To adjust to new developments, change is usually conceptualised as moving from one form of stability to another (Barley 1990; Bartunek 2004; Ybema 2008). Thus, a narrative space moves towards a desired state of affairs, enacted as a stable comfort zone to invoke predictability. Narrative spaces allow people to know what to do with whom, who to trust and where to go. They make clear what is important and what is not, what is socially consonant or dissonant, drawing the plot how to progress to another stage.

Narrative storyboards are the bedrock of human actions, providing predefined scripts. In a world that is made up of a constant flow of events we enact that world as stable and predictable, while also requiring fixed recipes for action. Heavily anchored in narratives on the environment and social groups, they are also based on past and future actions (Bergson 1946; Berger and Luckmann 1967; Weick 1995). People adhere to certain unwritten rules in daily life, allowing them to present themselves as good citizens, and thus feel uncomfortable when rules are not properly applied (Garfinkel 1984). Storyboards provide the narrative how to move from an initial state of affairs towards a new state within a particular context. They may relate to action that still needs to take place, that which is being undergone, or that which has already taken place, linking the action in question to time and territory and technology and social groups. In this way a plot of the action is provided and related to the circumstances conceptualised in narrative settings and narrative spaces (Goffman 1959). Storyboards emerge in relation to groups of people, who can be considered as apprentices becoming accustomed to a general way of doing something (Wenger 1998). The people within such a group may feel to be confined in relation to a specific array of actions as a means to move from chaos to order (Latour and Woolgar 1986). Storyboards predict outcomes of actions, allowing people to determine which stories are dominant and how they form a logical sequence (Czarniawska-Joerges 1998). The narrative storyboard makes us aware how actions are confined to enacted patterns. It reveals how a specific storyboard determines the narrative setting and spaces and how in turn the storyboard has been shaped by them. In this way, while the exact prediction of narrative progression is impossible, the narrative provides building blocks for the analysis of change, shedding light on how narrative change can be mapped (Boje 1995).

3. The storyboards of utopia and myopia in the Dutch geoinformation sector

In order to analyse the cases of GBKN, NCGI and Geoportals, I first want to look into two dominant storyboards. They are based on two distinct, old professions in geoinformation, forming a dichotomy of approaches, being around for ages, however still to be traced today (Koerten Forthcoming). These narrative storyboards will be discussed below, revealing narratives on action, of how things are done in practice. To enact the things we do in daily life, narrative storyboards tell us what to do in more or less prescribed ways (Garfinkel 1984; Weick 1995), being the basis for comparative analysis.

The narrative storyboard of myopia

The quest for cadastral surveyors is to register land. They make decisions upon where to draw borders and to decide which belongs to whom. By performing that routine, a service is rendered to society: the cadastral activity secures the economic trade and secures business.

The safeguard of Dutch economic activity is found in the cadastral registry, with the cadastral record as the ultimate source of confidence. Once a record on a lot is filed, it becomes the evidence of the link between the existence of a specific piece of property and ownership, becoming a base for economic transactions. Cadastral surveyors establish a link between the actual situation and the registrative reality in files and records which gets hardly questioned as it would appear as mistrusting the system. It makes the essence of cadastral practice more social than technical, more of a trust towards society than being honest to scientific rules.

Cadastral surveyors have always relied on their autonomy while establishing a property zone: either using sophisticated GPS-equipment or a simple measuring chain; it was their decision which made it final and irreversible. The personal judgement of the individual surveyor was decisive for every action in the field, triggering the focus on single cadastral plots which hampered the development of a view on systematic mapping for a coherent national cadastral map. Cadastral bureaucracy was aimed at preserving the authority of the cadastral surveyor which obstructed the relationship with municipalities to exchange reliable systematically cadastral information. However, being the only nationally operating organization with large scale maps, the Kadaster was still influential to other organizations. Technology is supportive to the cadastral surveyors' practice: to make daily operations easier and cost efficient. It implies that there is no obligation to use cutting-edge technology: efficiency counts more than maximum accuracy.

This picture of cadastral surveyors can be seen as the storyboard of myopia, with an attitude of having an eye for detail, for unique situations and exceptions, as a means-to-an-end attitude, ignoring systemacy. It also implies a utilitarian view on the use of technology, neglecting the bigger picture, regarding it only as a means to an end.

The narrative storyboard of utopia

The scientific drive of geodesists to provide a perfect spatial infrastructure has affected the Dutch geoinformation community as a whole. For more than a century National Triangulation - a scientifically developed and maintained geodetic network of fixed points - has been a reference for virtually all spatial registries and activities. The national geodetic infrastructure was enacted as a quest for independency, eternality and completeness and affected how geoinformation infrastructures were created later on. Geodesists had the urge to maximize reliability, accuracy and inevitability of National Triangulation, thus using scientifically state-of-the-art technology.

Geodesists are scientists, implying that their efforts are ideally subjected to scientific scrutiny. That practice has become connected to the Dutch nation, as the geodesists' expertise is needed

to establish national territory through national triangulation, similar to how the geodesist's quest is to assess the earth's size and shape. The pursuit of universal laws makes national triangulation efforts regarded as uncontroversial, underpinning the legitimacy of the nation. Striving for scientific accuracy also implicates a search for external validity, which is offered by the galaxy through astronomical measurements and geostationary satellites, together with super-national scientific committees. This practice has lead to standards kept by (inter)national independent committees like the National Geodetic Commission.

Geodesists also play a role at the local level, where they establish the relationship between municipal authority and territory within urbanized municipalities. It is the geodesist spirit that helps to enforce municipal jurisdiction by undisputed establishment of metropolitan municipal maps, providing as much accuracy and up-to-date-ness as needed to safeguard local infrastructures and urban planning. Moreover, they have been able to dismiss cadastral mapping in urban municipal development as a municipal mapping source at an early stage, replacing it with accurate and up-to-date maps, produced by internal mapping departments, implicitly signifying municipal authority on urban affairs.

As the professional attitude of geodesists is very much scientifically oriented, aimed at continuous improvement of infrastructure, they preferably use state-of-the art technology. Both in national and municipal geodesy, there is the urge to make things better, more accurate, more reliable, offering more quality, to make it an urge to strive for something that is always just out of reach: the promise of tomorrow. Therefore, the most sophisticated equipment and cutting-edge methods are applied by well-trained geodesists, presented by them as inevitable, to guarantee that novel technology will be applied to keep the fire of progress burning.

These considerations lead me to discern a narrative storyboard of utopia. Application of cutting-edge technology and methods, together with a constituting role in connecting governmental authority with territory moves towards an ideal type geodetic infrastructure. There is an unspoken, shared and future image of infrastructure guiding all efforts to improve. Utopia is still far away and the more efforts are made to reach it, the more distant it gets, making it even more ideal. Every attempt to realize some tiny part of utopia makes it more desirable.

Utopia and myopia: storyboards for analysis

The geoinformation sector used to be a closed community which was able to develop and maintain these storyboards in relative isolation. The rather coarse storyboards of myopia and utopia have been formed in practice, guiding thoughts and behaviour, being influential to what has happened and what is still happening in the geoinformation sector, as they emerged from a historical analysis (Koerten Forthcoming). They certainly have been influential to one another, for the sake of analysis they are regarded here as dichotomous, being mutual exclusive (Douglas 1986; Bowker and Star 2000). Their primary analytical qualities are recapitulated in table 1, a crosstab which relates to respective narrative settings and spaces.

	Myopia	**Utopia**
Narrative setting	Utilizing technology	Determining technology
Narrative space	Authoritative orientation	Scientific orientation

Table 1. A framework for analysis with storyboards

Storyboards are by no means meant to be normative. Of course, normative evaluations can never entirely be ruled out, but here they are meant to be solely analytical, as aides to explanation. Additionally, a storyboard cannot be exclusively linked to a specific group or organization. Specific groups have a hand in the development of a storyboard, but they may

exist inside and outside that group. A summary of the relationship between narrative setting, space and these storyboards regarding the Dutch geoinformation sector in which the cases to be explained are situated is provided in table 1.

4. Two Dutch geo information infrastructures compared using narrative storyboards

This paper is based on two cases within the Dutch geoinformation sector, aimed at sharing, disseminating information that has to be put on a map which is called geoinformation.

One case is *Grootschalige Basis Kaart Nederland* (large scale base map of the Netherlands - GBKN), started in 1975 and still active today. Aimed at building and maintaining a national system of large scale base maps, it was endorsed and still primarily used by utility companies, municipalities and the Dutch Kadaster for their registering obligations. The other case is a combination of the *Nationaal Clearinghouse Geoinformatie* (NCGI) (1995-2006) and its sequel *Geoloketten* (Geoportals) (2005-2008), intended to exchange geo information held by different nationally operating (Semi-) public organisations through a website. Spanning a considerable amount of time with significant technological changes, these cases had profound impact on the geoinformation sector and society as a whole.

Ethnographic research has been carried out to compare the GBKN case, widely appraised as successful on the one hand, with the NCGI/Geoportals-case on the other, considered as unsuccessful attempts. For a detailed description, see (Koerten Forthcoming). In the analysis both cases will be compared and in order to do that, two contrasting storyboards were developed based on an analysis of the history of the Dutch geoinformation field.

4.1 Large-scale base maps and GBKN: It takes three to tango

GBKN has been the vehicle to unite users and producers of large scale base maps. For over 35 years it has the image of a successful system, unified, accurate and up-to-date: a true standard for mapping the Netherlands on a large scale (1:1000 up to 1:500), serving many purposes. It has also been criticized by insiders as an infrastructure that took over 25 years to cover the nation, fuelling stories, debates and analyses (Polman 2002).

Early 2001, GBKN was declared completed, that is to say, it had become a nation-covering system of large-scale base maps. Since then, the focus was on further standardization. To date, the *ministry of Housing, Spatial Planning and Environment* (VROM) intends to use GBKN as part of a system of base registries, meant to streamline dispersed national registries into one system, guided by the principle of write once, read many. Efforts are made to reshape GBKN into BGT (*Basisregistratie Grootschalige Topografie* – Base registration large-scale topography), envisioned as the mark of a new era.

At the outset in 1975 when the royal decree regarding GBKN is signed, there is sheer excitement that troubles of the past will soon be over. GBKN is technologically and nationally oriented with a scientific and independent Central Mapping Board, eager to unite stakeholders together around a set of national universal standards. Operated by the Kadaster, GBKN is seen as to solve rather static, persistent, ongoing problems, to bring all dispersed, isolated, large scale maps of doubtful quality under one national standardized mapping system. At first, sophisticated and newly developed computer techniques are advocated by the scientific committee, but ultimately a proven system of maps on paper is chosen. It standardises drawing paper, filing cabinets and punch holes: all related to conservative techniques which the Kadaster can handle. Meanwhile, metropolitan municipalities are already developing sophisticated, computerised mapping systems to tackle the quest to be up-to-date with map making; however

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they are not willing or not invited to participate in GBKN. The scientifically oriented National Mapping Board makes a map-production strategy to be executed by the Kadaster, while the Kadaster is not the ideal, but the only possible candidate, for GBKN-production.

In the initial years, the Kadaster launches dispersed GBKN map-production projects with different partners, spawning a multitude of approaches. Generally the Kadaster seeks organisations for joint map production, in most cases utility companies pursuing the cheapest way available to register their cables and pipes on a map, while municipalities are ignored.

To be able to solve their own mapping problems, by the end of the 1980s, medium-sized and urbanised municipalities start to take the lead in new mapping projects. Challenging the conventional technological character of GBKN, they apply digital mapping techniques to speed up the up keeping process, using GBKN as a standard to get other participants on board. Meanwhile the Kadaster ignores these urban desires and with a static focus on map production they ultimately move themselves into an awkward position. While at the national level Kadaster and jointly operating municipalities fail to get results, on the local and regional level GBKN projects are increasingly launched and completed without a leading role for the Kadaster, bringing interested parties together in a bottom-up fashion.

In the early 1990s, GBKN starts to become regionally organized in Public Private Partnerships (PPPs), bringing together Municipalities, Utilities and Kadaster. In these arrangements, digital technology appears to be essential for the enhancement of the up-keeping process, in which municipalities play an essential role. With the eyes on the prize of covering the entire nation with base maps, the focus is on information exchange between involved parties. New technologies are welcomed as far as they support the completion process, because quantity is favoured over quality: further standardization should not interfere with the pace of the completion process. While having enough faith in GBKN to plan a completion date, municipalities stress standardization and accuracy, utilities stress efficiency and the Kadaster increasingly wants to serve the production process as a facilitator.

After its completion in 2001, standardization increasingly becomes an issue as it is needed to enable map sales and efficiency. Little by little, GBKN gets the image of a national administration of topography, being even more detached from technology, becoming a ubiquitous standardized information facility, eligible to become a national governmental base registration.

Case analysis

The case reveals a shifting pattern of initiative-taking. Figure 2 shows that the initiative comes from utopia-driven scientists and geodesists, who have do grant the production to the Kadaster in the realisation phase. Stagnation is caused by utopia-driven municipalities who want to define a more dynamic, local form of utopia. After the turnaround, both utopia and myopia combine different interests towards completion, however in the recognition phase the initiative shifts again to utopian spheres as national government tries to gain influence.

Since it is first mentioned as a possibility to unify large scale map making in the Netherlands, a lot is changing. Technology is both an enabler to the production of base maps and also decisive in the process of keeping track of all the changes in the built environment. However, it does not dominate the process of GBKN becoming an infrastructure. If a new emerging technology seems to be tempting to one of the participants, it still would not be applied since it could harm the interests of others.

It is remarkable that after the Kadaster was released from its assignment to produce a GBKN, the apparent false start resulted in PPP cooperation's, tailored to local circumstances. They opened the way for local and regional actors to make GBKN to a success; however

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rationalization processes forced towards both up scaling of organizational arrangements and further standardization, making GBKN fit for use on the national level.
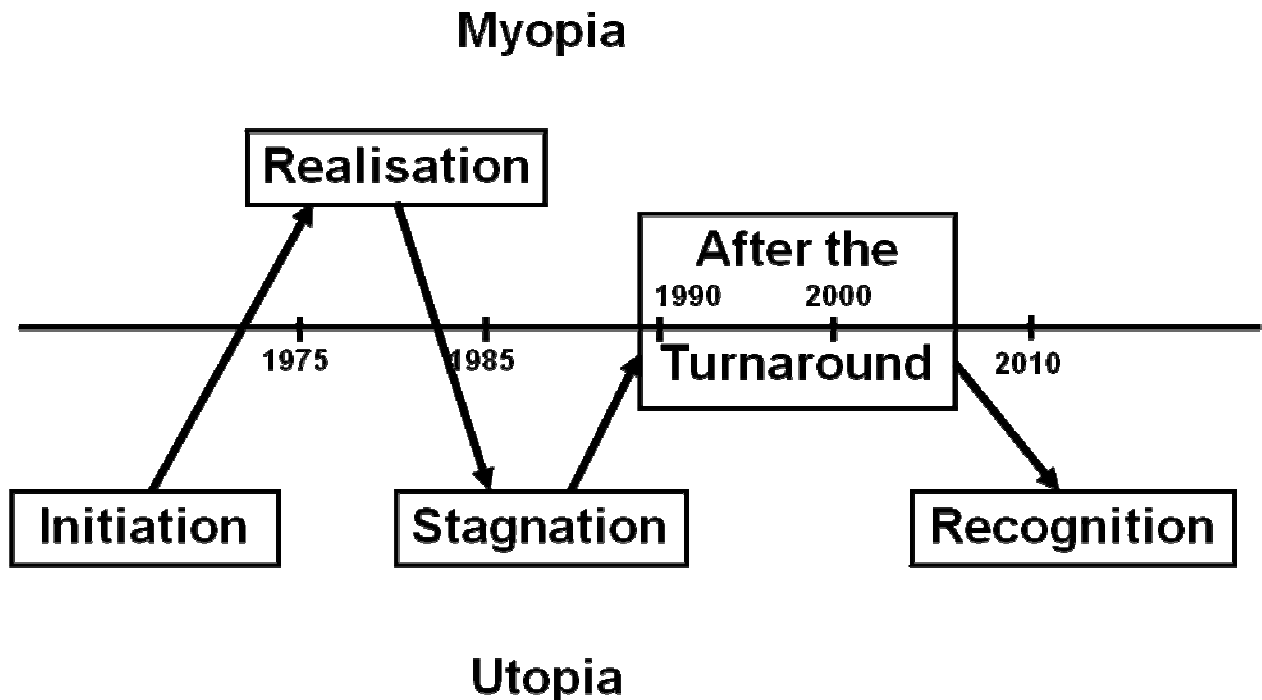
Myopia

Figure 2. Pattern of shifting initiatives in GBKN

4.2 NCGI/Geoportals: technology rules

Both *Nederlands Clearinghouse Geoinformatie (NCGI)*, and follow-up Geoportals were intended to disclose geoinformation of Dutch policy-related organisations of different nature in a consistent manner. In this ethnography, official existence (1997-2006 and 2005-2008 respectively), and predefining developments are included. Both cases are web-based throughout its existence and went through some serious technological redefinitions, which are loosely coupled to general developments regarding maturation of services on the Internet.

The research on NCGI started after its termination in 2006. For that purpose, key persons inside and outside the project have been interviewed and relevant documents and websites analyzed for making a factual reconstruction and to collect opinions and preferences. The official storyline of NCGI was for a great deal derived from NCGI-bimonthly newsletters, published from September 1995 until April 2006 in a Dutch leading professional journal for the geo-information sector. The Geoportals project has been monitored during its course through participant observation: I have been as a full member of the project committee. Monthly meetings were scheduled to address management issues and to developing a scope for the project. Most project events – like workshops, meetings and brainstorm-sessions – have been observed, interviews with key persons were held and documents were also analysed.

I have identified six stages in the process of the rise and fall of NCGI and Geoportals, which starts already in the early 1980s when four national research- for-policy institutions try to cooperate on exchange of geoinformation by starting a joint geographical data organizations

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initiative (in Dutch: *Samenwerkingsverband Aardkundige Gegevensverstrekkende Instituten,* SAG). A few conferences are organized on the topic but serious cooperation does not come about. However, geoinformation professionals of these institutions start to convene on an informal base and they eventually take the initiative to build a rudimentary version of an electronic catalogue, called *Idéfix*. After completion, the spatial policy coordination agency *RAVI* is invited to institutionalise *Idéfix* by making it nationally available. It launches the National Clearinghouse Geoinformation (NCGI), based on both clearinghouse insights imported from the USA and *Idéfix*. After some failing attempts to get NCGI going, its policy is redefined: operations are outsourced to a geoinformation software company. At that time, officials in the management board also become involved in Ruimte voor Geoinformatie (Space for Geoinformation, *RGI*), a program aimed at advancing innovation in the geo information sector. RGI initiates Geoportals, also aimed at the national dissemination of geoinformation. Geoportals is initially aimed at building an infrastructure of thematically organised Geoportals, however slowly but steady it shifts towards the single promoting of innovation.
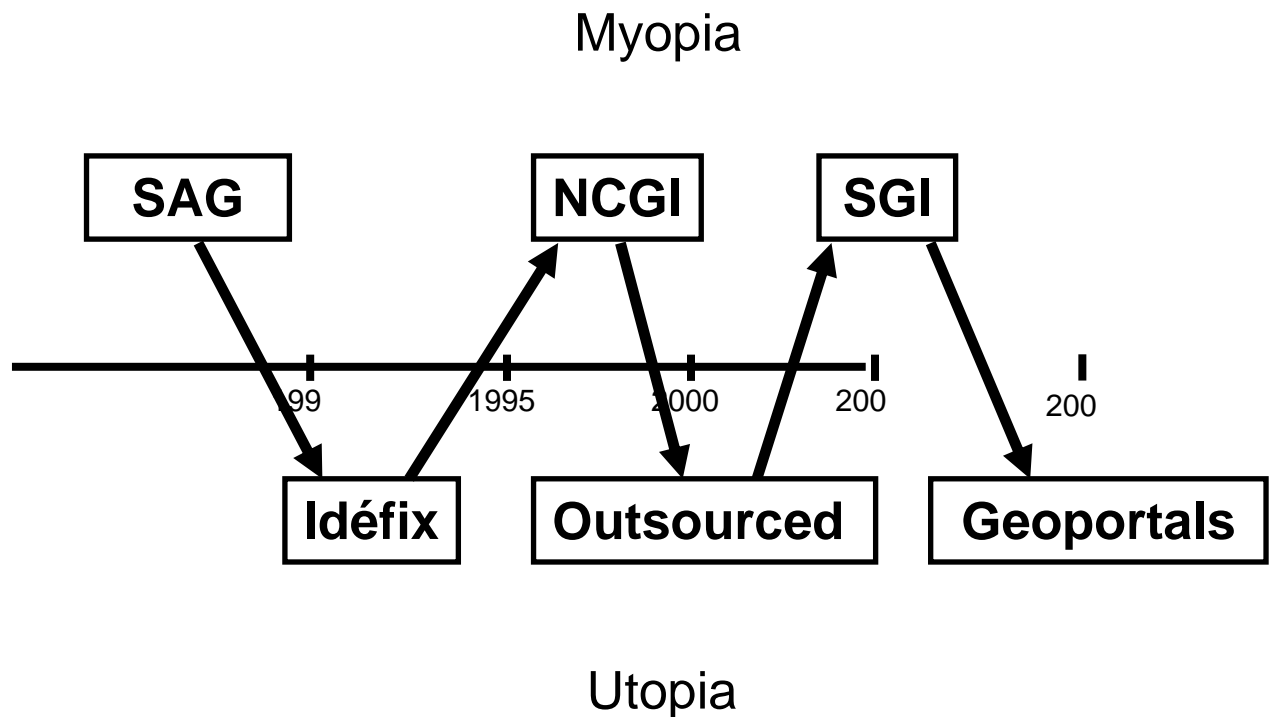

Figure 3. Pattern of shifting initiatives in NCGI/Geoportals

Case analysis

It looks like every time the utopian space of geo-professionals takes the initiative, technological shifts are announced and every time the management space is in control there are arguments about organization, budgets and institutionalization. Acting like a weather box, issues are addressed sequentially, dominated by one of the two storyboards, thus impeding an integral approach. Figure 3 visualises how the initiative switches alternatively from one narrative space to the other.

Technology is the driving force behind change, experienced by geo-professionals as a constant pressure to be committed to the latest developments. Consequently, every novel

technology has repercussions for the approach of both NCGI and Geoportals. Every new technology knocking at the door is felt as an obligation to apply it, even when the preceding technological innovation has not been properly implemented. This preoccupation with technology is most felt in the Geoportals project. Here a group of geo-professionals launches the idea of setting up a system of Geoportals, gets funding for but do not feel they are able to realise that. Getting second thoughts, they increasingly started to see Geoportals as a project to boost innovation, which made it not any more related to concrete solutions. The final phase shows a project team full of confidence, believing that creating innovative software applications is now the new project aim.

5. The narrative construction of geospatial infrastructure

With narratives of surveying and geodesy narrowed down to storyboards of myopia and utopia, I am going to analyze the respective cases. Having these two storyboards in mind, I will try to come to the essence of base maps and GBKN on the one hand, and the National Clearinghouse Geo Information (NCGI) and the Geoportals project on the other.

5.1 Large scale mapping becomes an infrastructure through GBKN

While in the 1960s and early 1970s large scale mapmaking in The Netherlands is still a dispersed and uncoordinated endeavour, geodetically oriented scientists start to act as opinion leaders towards improvement, to make way for large scale mapping as a national concern, to be beneficial to utility companies, municipalities and the Kadaster. They argue that a national system of large scale base maps needs to be developed, requiring a national mapping standard, grounded by an official government decision. Not linked in any way to locally experienced problems, it is seen as universal, expressing unity for the sake of efficiency. While ignoring existing local large-scale mapping systems, they urge all organizations involved in large scale mapping to comply with that new national standard, using state-of-the-art technology. The national attempt to realise a national system of base maps is rewarded with a royal decree, a governmental assignment to produce the *Gemeenschappelijke Basiskaart Nederland* (GBKN).

Urban municipalities already have their own sophisticated and standardized mapping systems, resembling local full-fledged GBKNs avant-la-lettre, serving the local needs of urbanization as experienced at the municipal scale. In pursuit of maintaining the actuality and quality of maps in a rapidly changing environment, urban municipalities move at the vanguard of automated mapping, strengthening their self confidence.

It is a storyboard of utopia which guides these urban developments with a strong relationship between territory and maps, relying on scientific methods. However, in the national arena the lack of large scale maps is tackled with a new system, independent to specific organizations, including these urban municipalities. They act as two versions of a storyboard of utopia, exclusively linked to their own territory and do not become connected to each other.

The Kadaster, commissioned to take up the production of GBKN in 1975, connects the national concern with a myopian storyboard, based on the cadastral means-to-an-end form of infrastructure. It makes the national, unified concern vulnerable to the cadastral mode of conduct, allowing local and regional opportunities to determine where a GBKN mapping initiative will start, which organizations are invited to cooperate, and how standards are applied. The storyboard of myopia guides how GBKN is handled within the cadastral organization, allowing the Kadaster the opportunity to seek the best suitable way to combine the assignment of GBKN with the eternal quest to improve cadastral mapping, harming the principle of a unified GBKN.

It appears that these storyboards do not entirely add up to each other in this phase of GBKN. The Central Mapping Board has certain utopian convictions about how GBKN should look like and how it needs to be implemented; however it is taken up by the Kadaster in a myopian way. Metropolitan municipalities do not play a role at this stage as they are neither inclined to associate with the myopian preference of the Kadaster nor the utopian storyboard on the national level.

Striving for harmony

During the late 1980s, a combination of enabling technology and ongoing urbanization forces mid-sized municipalities to strive for base maps. In order to gain control over the increased turnover in changes in the built environment, investments in electronic large scale base maps are needed. Being accepted as the natural custodians of municipal territory, however, they have to cooperate with other organizations like utilities and the Kadaster. GBKN provides an elegant framework to foster cooperation and information exchange.

The municipal version of the utopian storyboard is the driving force for medium-sized municipalities to have their own large scale base maps, with production and up keeping mostly organized on a regional scale, forced by Utilities and Kadaster, which are essential for funding. While GBKN is still treated as a national unification tool, its character changes towards a national umbrella for initiatives on regional scale, leaving as much room to individual municipalities as possible to promote their constituting role in large scale map making.

Meanwhile, the Kadaster loses its leading role through financial troubles. Following the myopic means-to an-end storyboard, the Kadaster sees an opportunity in changing its role from GBKN-mapmaker towards the one of being a service-provider to regional collaboration.

Public-Private-Partnerships (PPPs) are established to balance the interests between municipalities, utilities and the Kadaster. The myopian means-to-an-end storyboard of the Kadaster, shared also by utilities forces to balance interests. Reversely, the municipalities need the other two partners to realize their utopia-inflicted large scale base maps. It is this situation of mutual complementing interests, sweeping GBKN towards national coverage. Standards emerge, reflecting the benefits for all three participants: large scale maps to serve the needs of individual municipalities as well as effective and cheap mapping on an optimal business scale for utilities and the Kadaster.

The utopian storyboard of municipal interests makes enforced standardization on a national scale less important. Utility organizations consolidating towards semi-national conglomerates and the Kadaster are in need of standards to exchange data at all levels, making standardization a myopia-driven aim.

Only after completion of GBKN in 2001, when all Dutch territory is covered with base maps, a national utopian storyboard starts to get to life again, however now promoted by national government. A policy unit of the ministry of *Volkshuisvesting, Ruimtelijke Ordening en Milieu* (Housing, Urban Planning and Environment VROM) sees GBKN as an essential element of a national system of base registries. Urban planning, increasingly taken up on a provincial and national scale, requires standardization of procedures and dispersed information, which can eloquently be standardized through the large scale base maps of GBKN, using the tendency of national government as a whole to connect GBKN to a Dutch system of base registries.

5.2 Technology dominates the concepts of clearinghouse and Geoportals

The start of Nationaal Clearinghouse Geo-Informatie (NCGI) is a result of the failed attempt to establish a formal relationship between four participating national geoinformation-processing organizations to exchange geo information. They form a likeminded cooperation-seeking constellation of organizations, trying to work out a deal in a myopian way to be beneficial to all. After this setback, GI-professionals belonging to these organizations get together on an informal basis and start to develop *Idéfix,* a database with metadata (data that describes the data to be exchanged) for geoinformation exchange, using state-of-the-art technology. They are hardly concerned about the interests of their respective organizations. GI-sharing is seen as the ultimate goal rather, than to serve the interests of their own organizations.

Driven by a utopian storyboard to standardize data-exchange, GI-professionals see *Idéfix* as a role model for a national, universal, standardized infrastructure for geoinformation exchange, to be enforced with an almost philanthropical attitude. In their view, *Idéfix* is the perfect engine for the clearinghouse concept, which is to have a kind of central catalogue that describes all geoinformation through the disclosure of its metadata. Such a National Clearinghouse Geo Information (NCGI) should be preferably implemented at a matching institutional level, approved and managed by an umbrella-like organization on the national level.

Having become NCGI, independently organised at the national level, a myopian storyboard gets hold of the NCGI. Board members, representing their own respective organisational interests are more inclined to protect their own organisation than to promote a common goal. By putting their own interests first, shared attempts to make NCGI to a national infrastructure are bound to fail.

Faced with decline, the failing initiative is granted again to utopian professionals, offering them a new opportunity: a software-engineering company founded and operated by former *Idéfix*-professionals is invited to take over all operational NCGI activities. With a clean slate, they start to focus again on GI-sharing as a virtue for all, to be developed with cutting-edge technology. The storyboard of utopia sets the scene here and NCGI is presented as universal, being beneficial to everybody. However, the utopian attitude fades again along the way, as the engineering company tries to make a profit by putting its own interests first, increasingly treating NCGI as a commercial billboard.

The myopian storyboard steers the management of individual organizations to join forces on the idea of a national infrastructure launching the *Ruimte voor Geoinformatie* (Space for Geo Information, RGI)-program, which incorporates NCGI. Grants are given to innovative sharing ideas, like the idea of establishing a Geoportals project, again an attempt taken up by individual professionals from diverse geo information organizations. The focus shifts again to utopia, as professionals focus on the geoinformation sector as a whole, separated from individual organizations. Because RGI preaches innovation, Geoportals-professionals feel they have to incorporate cutting-edge technology which needs to be adapted and developed. As the project carries on, the focus shifts from a tangible system of Geoportals towards the development of tools to apply new technologies to enable future infrastructures. An overarching infrastructure to disclose geoinformation is still wanted, but seems further away than ever.

6. Building Geoinformation Infrastructures: two contrasting approaches

The narrative storyboards of utopia and myopia, applied to describe GBKN on the one hand and NCGI and Geoportals on the other call for a comparison. Table 2 offers a summary to be explicated in this section. Geoportals came to life as a result of a failing NCGI, both not delivering the infrastructure initially promised. Because it was seen as successfully boosting innovation, Geoportals was in the end celebrated as a success. GBKN had to face redefinitions, adjustments of organisational arrangements and serious difficulties but is nevertheless still going

strong, celebrating its 35 year anniversary in 2010, while NCGI officially existed less than 10 years and Geoportals less then four.

	GBKN	NCGI	Geoportals
Duration of completion attempt	25 years (successful)	9 years (failed)	3 years (failed)
Time perspective	Solving lasting problems	Future oriented	Future oriented
Territory	Municipal-National	National	National
Technology	Balanced	Cutting-edge	Cutting-edge
Organization	Top down -PPS-Top down	Networked project	Networked project
Tangible results	System of base maps	Website	Software-prototypes

Table 2. Comparing the cases

In the next section I am going to connect the two cases with theory, using the utopia and utopia storyboards to shed light upon time, space and technology in respect to the narrative setting and organizational considerations relating to narrative spaces.

Utopia, myopia and time

GBKN is aimed at long lasting problems that have emerged in the past, which are likely to continue in the future if nothing is done. Because systematic large scale mapping has been desired for decades, the committee charged with finding a solution looks backwards, focussing on problem definitions that already have been formulated decades ago and have hardly changed since. It gives large scale base maps a sense of eternality, being universally present in past, present and future. The quality of being eternal makes it independent, which is in fact the utopian essence of GBKN, regardless what technological standard or organizational form is fashionable, reducing technology to being utilitarian. Computer technology gets eventually inevitable for mastering the immense turnover in the up keeping process, contributing to the utopian municipal requirement of topicality of GBKN-base maps, making large scale base maps the up-to-date reference point to which other, possible changing matters can be hooked.

The clearinghouse-concept is imported from abroad, based on the positioning of metadata, with no links to existing problems. Metadata is profiled as basic, underpinning a database-related approach, connected to the alien-like clearinghouse-concept, meant to prevent the metadata-concept fading away into obscurity. Eventually, it gets traded in for a new fad: Geoportals. Shifting from concept to concept make the objectives unclear for the greater public. The only ones who seem in control and do understand all these unintended shifts are the GI-professionals themselves. However, clearinghouse and Geoportals as concepts do not link to problems of the past; they are meant to provide solutions to rather vaguely formulated present or possible future societal issues, using future technology, which is in constant need of additional development. In the end, NCGI and Geoportals become only linked to technology itself: meant to integrate information that could not be integrated before, however not connected to any possible concrete societal issues.

Utopia, myopia and territory

Initially, GBKN is meant to link up to the national level, assuming that the utopian way of large scale mapping is of everybody's concern in the Netherlands. As the unified strategy becomes fragmented in myopian, Kadaster-led, local and regional map-production endeavours - the lack of a clear national objective becomes evident. That GBKN has a better match with the municipal

version of utopia becomes only manifest after the up keeping routine is recognized as vital to GBKN. Changing its scope accordingly, it remains in a nationally standardized framework, allowing organizations of different territorial scales to work together, and boosting efficiency. The myopia-driven tendency to sell excerpts from maps to other parties to gain revenues stimulates towards further standardization. However, the more GBKN gets standardized at the national level, the more national government gets interested, making it only a small step to transform GBKN into a national base registration.

NCGI starts out as the utopian initiative of individual geo professionals to bring the rudimentary Idéfix database to the national level, after the myopian SAG-initiative of four nationally operating organizations has failed. However, that utopian initiative is blocked at the joint level of NCGI which is dominated by the myopian management interests of individual participating organizations. Consequently, the common goal of establishing an infrastructure is not realised and the initiative goes from a myopia oriented NCGI to the outsourced version, managed by former Idéfix professionals, who advocate a strong utopian attitude to share geoinformation, treating the whole geo information sector as their territory, acting like organizational boundaries have ceased to exist. Like in the Idéfix-days, it is felt that state-of-the-art technology and international standards should provide a sector-wide infrastructure. However, they fail to connect it with some commonly formulated objective that would appeal to geo information organizations. Now it appears more like if they only want to share information to promote and develop their new technological gadgets. RGI tries to set things right in a myopian way, getting the management of organizations in place to distribute a considerable amount of research grants, but then they leave it to the Geoportals project to formulate a new goal to bind to a new concept to share geoinformation, which eventually deteriorates to only promoting technological innovations. NCGI and Geoportals are both unable to bridge the territory between individual organizations to generate a general concept of geoinformation sharing.

Utopia, myopia and technology

At the outset of GBKN, scientific members of the Central Mapping Board are in favour of using new technology, played down by representatives of the Kadaster and utilities play to using regular mapping techniques. It looks like the utopian spirit to deliver the perfect mapping system, preferably with cutting-edge technology, is reduced to a myopian means-to-an-end attitude, to serve the interests of the Kadaster. Technological conservatism contrasts with the metropolitan municipalities' urge to computerize map storage. In the 1980s, mid-sized municipalities are forced to adopt computer technology for map making, a municipal-utopian attack on the myopian practice of the Kadaster. However, as interests get balanced in PPP-constellations, the focus on completion balances utopian and myopian interests in a way to neutralize the utopian inclination to fall for cutting-edge technology-oriented object-oriented-mapping. It appears to be the right constellation to move with a somewhat loosely standardized GBKN towards completion. As GBKN comes under the spell of national government, the utopian storyboard gets more influential because new standards require the state-of-the-art technology of object-oriented mapping.

NCGI and Geoportals can be regarded as unleashed technological endeavours. During the existence of both projects, every useful technological novelty gets colonized, causing a constant shift in new techniques at an accelerating pace. Using cutting-edge technology seems to be a virtue, eventually becoming the only objective of the Geoportals project. Idéfix has laid the basis for that, as it pretended to be an infrastructure, but failed to connect as a technological device to organizations the way GBKN connects large scale map users. The utopia-oriented workforce of

geo-professionals is technology bound, while individual organizations serve their own interests instead of the sector as a whole.

Utopia, myopia and organization

The organizational arrangement at the outset of GBKN suggests a hierarchy, in which scientists-geodesists are a higher, utopia-driven and rule setting stratum, to which the Kadaster is subsequent and has to follow rules in a myopian way. It functions as a one-way street: utopia sets the rules and myopia produces maps, compliant with national, universal, standardized, utopia-driven mapping standards and to be used by the Kadaster and utilities. The urge of municipalities to search for faster up keeping procedures gradually starts to challenge that strategy.

It triggers the emergence of organizational Public-Private-Partnership (PPP)-arrangements in the 1990s, enabling equal representation of municipalities, utilities and the Kadaster, both on the national and the regional level. Completion and standardization of GBKN gets a boost from a myopian means-to-an-end approach of selling maps which creates utopian effects of a universal standard and national coverage. The PPP-arrangement offers both regional and national loci to reconcile utopia and myopia in such a way that they become complementary, empowering them to become obvious and undisputed configurations. However, in situations where municipalities feel their authority is not recognized alternative organizational arrangements arise, towards balancing municipal utopian and myopian claims. This utopia-myopia balance appears to be the perfect vehicle to promote the use of graphic workstations to catch up with the heavy turnover in up-keeping activity, but also to contain emerging discussions on utopian, object-oriented mapping. It even helps to realize utopian goals using myopian means: the desire to sell any possible excerpt from a national standardized map advances further standardization. A standardizing GBKN, moving towards national coverage even becomes attractive to the information-unifying national government, wanting GBKN to be part of a system of national base registries, making it a part of a standardizing effort of a higher order.

These described adaptive qualities of organizational arrangements hardly resemble the ones to be observed in relation to NCGI and Geoportals. The utopian storyboard attempts to transform the Idéfix trial database into an organization of national importance, intended to safeguard a standardized clearinghouse. While individual organisations exercise their power in the NCGI-board, the voice of professionals is not heard. They take action in the outsourcing phase, but do not reach the NCGI supervisory board of managers. Still aiming at standardisation, NCGI is declared outdated because it is seen as too centralistic and gets taken over by the RGI initiative. RGI stimulates professionals to come up with new ideas, which spawns the distributed concept of Geoportals, again having no direct relationship to information providing organizations. The storyboards of utopia and myopia alternatively grant each other the right to take the initiative, yet a dialogue does not emerge. The utopian ideal of having a standardized infrastructure is promoted by professionals, but fails to connect to organizations following their myopian storyboard. An organizational arrangement to reconcile myopian and utopian storyboards does not emerge. The utopian storyboard remains connected to the professional attitude and the myopian storyboard to individual organizations, without negotiating, blending or reconciling attempts.

The wish to exchange geoinformation is expressed here by individual organizations, but its essence is formulated by geoinformation professionals. The utopian attitude of the shop floor spawns concepts like a clearinghouse and Geoportals, which remain unconnected to individual organizations, driven by the means-to-an-end storyboard of myopia. During different stages of NCGI, both levels alternatively grant each other the initiative without any real success. Even a

separate project like Geoportals is only able to find a solution on the professional level, guided by a utopian storyboard, without a response from the inter-organizational management level.

7. Conclusion: a narrative anchor as distinctive for information infrastructures

The two discerned two storyboards utopia and myopia have been used for analysis. Utopia refers to the scientific strive for accuracy, universality and standardization in assessing the earth, while myopia stands for a here-and-now, means-to-an-end, honouring exceptions. In this section I want to go through some conclusions based on this analysis.

The versatile features of geoinformation: the link with the original data

In discussions on geoinformation, a lot is expected from reuse of geoinformation, presuming that if some kind of information is collected at one place, it is quite easy to use it elsewhere. Of course, technical, legal and economic oriented considerations already have been acknowledged in that respect (Welle Donker, Van Loenen et al. 2010); however other aspects regarding geoinformation sharing are still ignored.

Such an aspect is topicality: in the GBKN case, it takes until 1992 to realize that the process of up keeping is essential to base maps. For every user, up-to-date base maps are a concern, however first and foremost for municipalities. Additionally, standardization in mapping is not equally important to all participants. Topicality and the related topic of standardisation determine for the greater part if data collected at one place can be successfully used at another. Within GBKN, these interests seem to be sufficiently balanced with financial motives to give every participant his share.

Considering the shifts in initiative taking and granting, both the NCGI and the Geoportals case demonstrate an absence of dialogue between stakeholders. There is simply no possibility to discuss the nature of information, let alone balancing the interests of their producers. Within the framework of information exchange, being either clearinghouse or a Geoportals, there is no framework to establish if data collected on one place can replace data from another source being held elsewhere. Metadata serves that purpose only in a very limited way. Accordingly, a link between data production and data use among different types of organizations is not established.

Standardisation is envisioned as top-down law-enforcement

Within the sector of Geoinformation, standardisation is a hot topic. First of all it relates to technical standardization: in order to connect electronic devices like databases and software applications of different nature they need to have standardisation of some sort. There are also more abstract conventions to deal with, like in the case of mapping; standards on how to frame reality into an image.

Case descriptions reveal that standardisation has been conceptualised and taken up as a top-down process, in which some central body gives rules to follow that should be used within the field to which they apply. Either envisioned as strict and detailed regulations to be followed by all members of a community or as an understanding of some general preferences, the idea is that they are issued by a central coordinating agency to be recognizable by all.

Other forms of standardisation are not recognized as such, let alone the idea that standardization is a dynamic process, rather than going abruptly from a non-standardized to a standardized reality as soon as rules have been issued. In the Geoportals case a 'light' version

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of standards is advocated, however also conceptualised as a rather static concept to seduce organisations to participate, not as a start of a dynamic process to transform them towards sophisticated standards. In the GBKN case for instance, sales of random map excerpts stimulate standardisation efforts in order to avoid selling excerpts with multiple standards. Differences in standardisation have been acknowledged as a problem, however not as an inevitable starting point for a route of improvement leading to national unified standardisation.

Mind the time perspective: going back to the future

When a reference is made to an infrastructure as an institution, an image is cherished as that it has enduring and lasting qualities (Douglas 1986; Scott 1995). If an infrastructure has to be purposeful to society, it needs to solve existing and pressing problems with solutions that are lasting.

In the case of GBKN, the absence of base maps is regarded as a pressing societal problem being around for decades, in need to be solved now to prevent society from further losses. Consequently, GBKN is connected to problems of the past that are ought to be solved once and for all to gain a better future. Therefore, it looks backwards for its problem definition and initially neither has the intention nor the desire to look ahead for new problems.

Within NCGI, environmental problems are envisioned as lying ahead, acting as a trigger to integrate data from different sources that has not been integrated before. With a keen eye on the future new technology is hailed, and in the course of the project, the initial problem definitions get pushed to the background and traded in for the viewpoint that the application of new technologies is essential alone, not in any way linked anymore to problem definitions.

The distinguishing factor of geoinformation infrastructures: enabling and inhibiting technology

The thing that strikes the most is that the Dutch geo information sector is technology-laden, an observation also made by a lot of interviewees. However, as informed insiders see the role of technology within their sector as obvious, straightforward and simple, as a relative outsider I see it as a delicate factor, making its influence either encouraging or disappointing.

GBKN is the living proof that technology is not the only decisive factor for an information infrastructure. It is the ability to either use innovative technology or to keep technology at a distance that makes GBKN a success in terms of the establishment of an infrastructure. At the start in 1975, cutting-edge technology was declined as the old-fashioned Kadaster was not ready for it. On the other hand, round 1990, when the up keeping of base maps was seen as a problem, the latest state-of-the-art GIS workstations were used because they were desperately needed to keep track of the heavy turnover in environmental changes that had to be mapped. However, already a few years later, object-oriented mapping which would require additional technological innovations was kept at a distance. The image that remains is a rhythm of attraction and let-go, either embracing or declining innovations. Such a treatment of technological temptations is absent in the cases of NCGI and Geoportals. There innovative technology is focal, and regarded as essential for having an information infrastructure, diverting attention from the goals and gains of infrastructure towards having cutting-edge technology as an ultimate, however false source of success.

A non-tangible information infrastructure-concept: the narrative anchor

The common opinion is that information infrastructures rest heavily upon their constituting technologies and that the relationship between them is rather straightforward (Nolan 1979; Venkatraman 1991; Harvey 2000; Puri 2006). Technology is only seen as enabling towards information infrastructures.

A tacitly developed relationship emerges from the analysis of the GBKN case. Here, from the outset the focus is on base maps, making them the essence of the infrastructure and as a concept freestanding from technology. Moreover, it is able to establish relationships with different kinds of technology at various levels, depending on specific infrastructure needs, while at the same time users are able to apply it as a frame of reference for their applications. The base map concept acts a narrative anchor between application and technology throughout the 35 years of existence of GBKN.

The narrative anchor also provides a link with time as it is ought to solve lasting problems that already existed for decades. It is expected that these problems will last when nothing is done to contain them, so they have to provide solutions in the future. Thus the narrative anchor connects past present and future, offering a device to connect them all. An infrastructure has a relationship to one or more entities of territory, either being physical or imaginary. The narrative anchor acts as a device to establish all these relationships. In the GBKN case, these were the municipal entity of up keeping, the jurisdiction of utility firms, and the jurisdiction of GBKN itself, the nation.

The case of GBKN has revealed the essence of infrastructure: the narrative anchor. Figure 4 offers a schematic representation of how it is related to other aspects. The liaison between possible applications and the constituting factors of an infrastructure is formed by the narrative anchor. Time, Technology and Territory are essential to an information infrastructure and need to become linked. If this is done right, like in the GBKN case, a long-lasting infrastructure will come into existence.
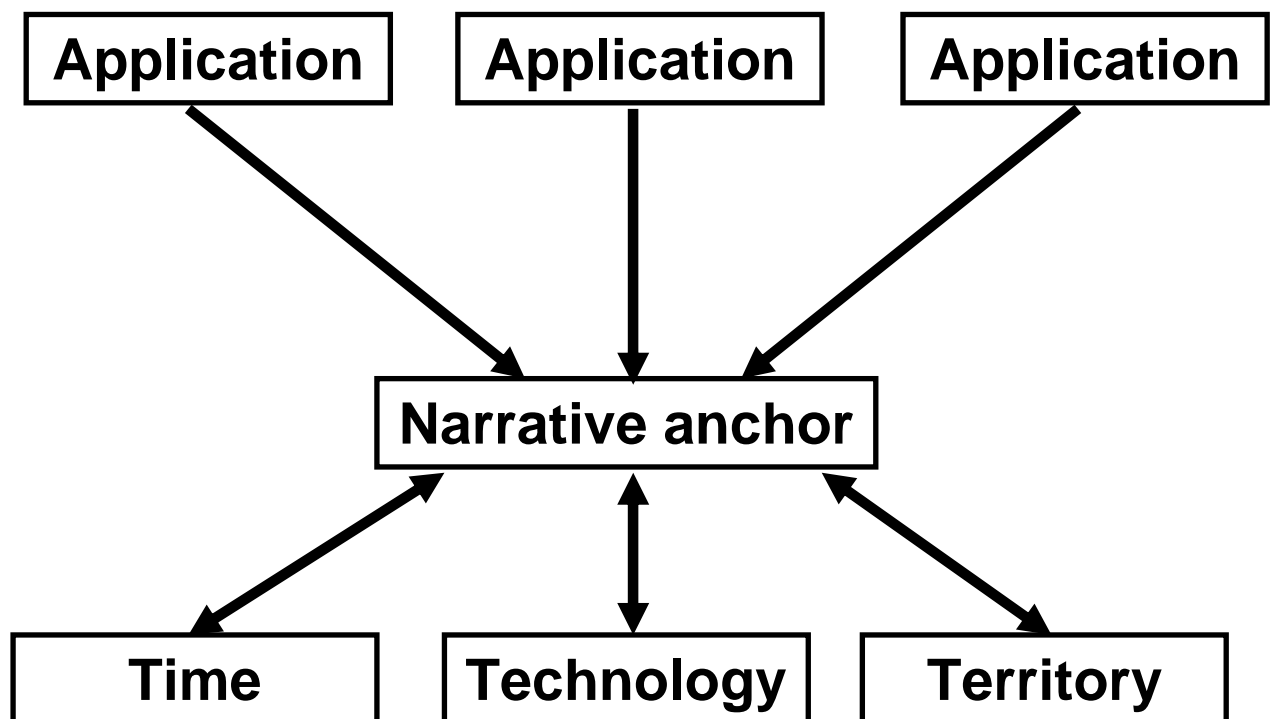

Figure 4. A narrative design model of information infrastructures

This model derived from research is in stark contrast with the cases of NCGI and Geoportals. Here, attempt to develop a narrative anchor are made: Idéfix, metadata, Clearinghouse and Geoportals are distinctive concepts which are easily traded for newer ones. Consequently, the narrative anchor(s) of NCGI and Geoportals have trouble to establish a relationship with the three T's: Time, Technology and Territory. Cases are not linked to the past and the present, only to the future. They also fail to keep the temptations of cutting-edge technology at a distance. Finally, the territories of the organisations that are supposed to participate are fully ignored. The image that remains is depicted in figure 5 where applications have a direct link with technology, without a narrative anchor. The result is that technology controls the fate of these infrastructures, lacking a mediating effect.
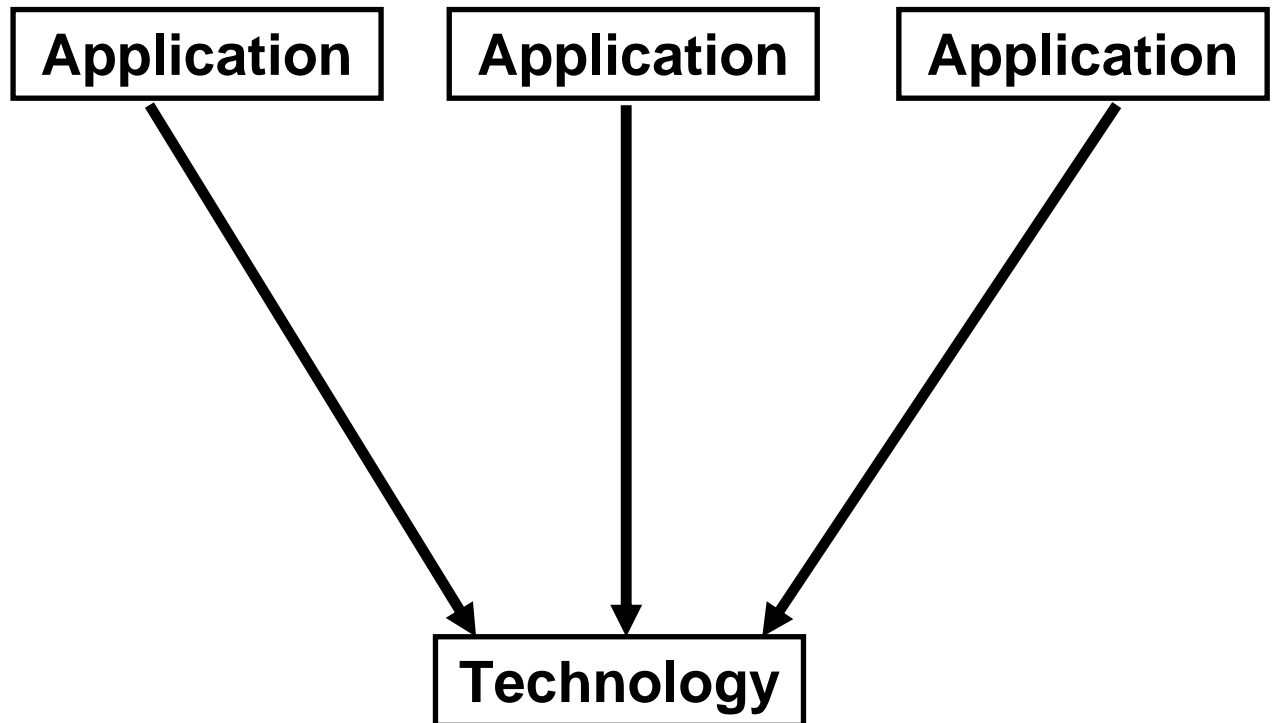
Figure 5. The direct relationship of applications with technology within NCGI and Geoportals

Implications for the design of geoinformation-infrastructures

The discovery of the narrative anchor as the distinctive element of a successful geoinformation infrastructure is the most striking conclusion of this research. Based on an analysis of three ethnographies describing how information infrastructures were conceptualised in these respective cases, it appears that a direct narrative link between time, territory and technology on the one hand and the application of a geoinformation infrastructure is undesirable and counter-productive. What is needed is a non-tangible narrative anchor that acts as a liaison between the application of an infrastructure and the constituting elements of an infrastructure: a balance between time, territory, technology and organisation.

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