How states use spatial information strategically: learning from the history of maps

Charlotte van Ooijen
Tilburg Institute for Law, Technology and Society (TILT)
Tilburg University
C.W.vanOoijen@uvt.nl

1. Introduction

Technologies which deal with spatial information, such as GIS (Geographical Information Systems) and LBS (Location Based Services), offer governments numerous possibilities for generating, sharing and combining geographically referenced information on objects as well as citizens. Governments use these technologies as both analytical tools in the process of policy making and means for providing services to citizens. As a result of the increasing availability of information and communication technologies (ICT's) and their interwovenness with public administration the possibilities for state use of spatial information keep on growing. It can be argued, however, that even before the rise of ICT, which has enabled the above described technologies, spatial information was already of great strategic importance to states. In this paper it is outlined that an interaction between the power of technology and the power of politics can be found even centuries ago, when historically analyzing the use of maps by Western European states. Furthermore, maps may be considered as manifestations of culture in society (Black, 2004: 9). Consequently, conceptual perspectives on studying the use of spatial information in the ICT age are developed.

2. Spatial information technologies of the past...and present

In order to get more insight in the meaning of spatial information technology for today's public administration, the historically emerged strategic significance of maps for Western European states is researched. The research sheds light on the importance of maps as the first politically relevant technologies which deal with spatial information. First, however, a general introduction on the topic of spatial information is given followed by some thoughts on the technology involved.

2.1 Spatial information – a conceptual note

Definitions of spatial information range from equalizations to the concept of geographical information, meaning "all information which is linked, in one way or another, to a place on the surface of the earth" (Bregt, 1999), to broader descriptions, such as "any information that has a location in space" (Government of South Australia, 2006). A common feature in all definitions is the notion of space or location. Still, some additional questions on the concept are raised here. First of all, when referring to space, what are we talking about? Does space equal (parts of) the tangible earth and its surroundings as we know it, or does it also involve mythical and fantasy worlds? And how about this new world we are getting more and more familiar with, the world of cyberspace, can the footsteps we leave here also be considered as spatial information? A second series of questions can be raised about the meaning of place or location. Do these just give answer to the question of *where* an entity can be identified, or about *when* it can be found as well? In other words, is the dimension of time subsistent in spatial information? And if so, how important is time when assessing spatial information? A third issue worth assessing is the issue of representation. This involves the distinction between real and abstract spatial information (Government of South Australia, 2006; Wood, 1993: 7). 'Real' in this context means: what can be observed by our senses. One can think of buildings or traffic that we actually see in our real world. The abstract type then denotes a series of general, mostly government imposed, agreements which do shape reality, but cannot be seen with bare eyes. One can think of bus routes, land parcels, or jurisdiction. A fourth matter of importance is the question of who is being served. What is the purpose of the collection and transfer of the spatial information at hand? When considering the topics that are being raised above, spatial information appears to be a rather dynamic concept. Because of this variable nature there seems to be no point in formulating an overall definition. Instead, it is more interesting to assess in what way these four dimensions of spatial information, space, time, representation and purpose, are of use when researching spatial information. Another crucial aspect of the manifestation of spatial information has to be taken into account as well.

2.2 The meaning of technology

In order to have any effect, it is essential for spatial information to reach an audience in one way or another. In other words, the information needs a supporting technology that serves as a medium for communication. What then are the technologies for transferring spatial information and what role do they play in this process? When discussing the role of technology, it must be clear that this isn't a neutral instrument at the mere disposal of whoever wanting to use it for whatever kind of message. Rather, these media ought to be understood as meaningful entities in themselves. Marshall McLuhan (1967) eloquently described this approach as "The medium is the massage". Consequently, the content of information cannot be separated from its form. In fact, the technology which is being used actually shapes the information itself. In this view, it is impossible to perceive bare information as such. We can only 'see' information via the mediating technologies that transfer it and shape our view at the same time. For example, we will have a different

perception of our planet whether we are looking at a satellite image or at a graphic map. Now, if this thought is taken one step further, does technology, by shaping our look upon the world, also shape the actions we take? If a positive answer is given, this would imply that maps, being spatial information technologies, affect the behaviour of all of their users, including states. On the other hand, it is likely that states have had their share of influence on the development of mapmaking. These two views can be linked to the contemporary technology debate in which four positions can be found concerning the supposed influence of technology on changes in society (Lips, Bekkers and Zuurmond, 2005: 38-40). Here, these positions are discussed with regard to the interaction that maps have had with Western European politics. First, one could say that maps are powerful technologies in themselves, having specific characteristics by which they influence the actions of anybody who comes into contact with them. In this view, a map shapes the way in which policy makers see the world and thus alters their policy objectives. This intrinsic-power perspective coincides with the deterministic view in the technology debate. The second perspective would be that maps are merely instruments for those who want to exercise power. In this view a state leader or a government sets out policy goals which can be attained by using maps. Again, looking at the technology debate, a parallel position can be found. According to the voluntaristic position "the way in which informatization is given shape may serve predominantly the power position of the person(s) who decide about its deployment" (Dantzinger et al. 1982, in Snellen 2005: 403). In the third, socio-constructivist, perspective this idea is not entirely abandoned, but there is more of an emphasis on the dynamic environment in which choices about technology are being made. The development of mapmaking then depends heavily upon both the meanings that involved actors, such as states, attach to this technology and the interactions that occur between these actors. Lips, Bekkers and Zuurmond (Ibid.) propose a fourth approach, called the information ecology, which forms a synthesis of the other ones. Here, the development of mapmaking is formed by the technological possibilities and demands as well as the societal -thus cultural- and political context in which maps are being used. Furthermore, the effects that take place in society are varied, and consequently locally determined.

Clearly, arguments can be found supporting all four perspectives. However, it will be demonstrated that the changes which occur over time in the use of maps cannot be solely explained by either technological or political developments. It appears that some kind of interaction has to take place. Now, before moving on to these historical encounters, what exactly is being meant when referring to maps?

2.3   The idea of a map

When referring to maps, nowadays, most people will think of a folded piece of paper with a schematic reproduction of a certain geographical area on it. In this modernistic view, a map is a visual reproduction of reality. According to Black (2004: 10) it is more appropriate to say that a map is a portrayal of spatial relations. In this definition, a portrayal isn't necessarily visual and permanent, but can also be somebody's verbal description of a route. The spatial relations don't just involve geographical information about the contemporary world, but can

refer to situations in the past or in a different reality. In the Middle Ages for example, it was common to find religious and mythical symbols on the *mappae mundi*, the maps of the world (Ibid.). When looking at this rather broad definition of maps, it is not easy to grasp what are the binding elements among the diversity of maps that have appeared throughout the ages. One can wonder whether it is even possible to find the essence of *the* map or, as the Greek philosopher Plato might have said, the idea of a map. Maybe, the manifestation and use of maps have changed in such a dramatical way over the ages that one may have to conclude that maps have taken on new identities which can hardly be related to the very first maps. Only by travelling through time we can learn about the development of maps and their relation to government activities. In this time journey it is interesting to look at what kind of portrayals have been made and in what way Western European states have manifested themselves as true artists and involved audiences at the same time.

2.4   A connection between the past and the present

This paper deals with the history of maps within the context of the rise of Western European states. It stresses the strategic significance of the information provided through maps and therefore aims at enlarging the insight in the importance of spatial information as we know it today. More specifically, the paper looks at the impact technological developments have had throughout history on this meaning of maps within societal and political networks. The aim of this paper is then to enlarge the understanding of the power of maps throughout history and consequently broaden the insight in the implications of spatial information technology for public policy making today. Thus conceptual perspectives on studying the use of spatial information in the ICT age will be developed.

3. Powerful tendencies in the history of maps

Certainly it is not claimed that *the* complete history of maps will be provided here, but *a* history of maps, or rather a series of important developments, will be laid out. Michel Foucault would even contest that there is such a thing as *the* history. According to Danaher, Schirato and Webb (2000: 98), he "would encourage us to think of multiple, overlapping and contesting histories". History, then, should even be recognised "in terms of an ongoing chaotic struggle between different forces, and according to different levels-or patterns-of time" (Ibid: 101). In other words, one consistent, linear story about mapmaking and politics cannot be told. This research, then, aims at displaying some of the "chaotic struggles" which have been crucial for the development of the interaction between mapmaking and politics in the Western European context. Although it wasn't until the seventeenth and eighteenth century that maps became of substantial interest to states, some examples of state use of maps before that time will be mentioned.

Long before our Western civilization came into being or one could speak of the existence of national boundaries, some early maps were already created. Most authors (Black, 2004; Van de Poel, 2001; Joustra, Ter Mors, Galema, 2005; Aber, 2004) refer to inscriptions in Babylonian clay tablets when speaking about the very first map. They do not seem to agree, however, on the date of birth of this creation, ranging from 3800 B.C. to 500 B.C. An important contribution to the start of a tradition of travelling and

Babylonian clay tablet, inthe collection of the British Museum

mapmaking in the ancient Greek world and beyond was made in the fourth century B.C. by Alexander the Great, who commissioned geographers to acquire knowledge of explored sea routes (Black, 2004: 23). Greek astronomers and geographers have greatly contributed to our knowledge about the world. They developed ideas about the spherical nature of the earth and applied maths for calculating distances. Ptolemaeus, who worked during the second century A.D., was one of the most famous and influential Greek scientists. Most of his, mainly written, work has been well preserved and served as an important starting point for mapmaking in the fifteenth century. Some doubts have been cast whether Ptolemaeus actually drew maps himself (Crone, 1978: 3), but his coordinate system and projections have turned out to be of indispensable value nonetheless. At the same time, the Romans started displaying a growing urge to conquer and control the world. For this purpose maps were of extreme importance. On the one hand, Roman generals used maps for planning their campaigns. The Peutinger map (Tabula Peutingeriana) can be considered as the first road map in the world. On the other hand, maps served as means for the display of power. For example, the big scaled map *Forma Urbis Romae* was engraved in a wall for everyone to see (Black, 2004: 24).

Little is known about European mapmaking after the decline of the Western Roman Empire (476 A.D.). Crone (1978: 5) indicates that "from the fifth to the tenth century, geographical knowledge was at a standstill in the western world". There are some indications though, that spatial information did play a role when in 809 Charlemagne divided his territory among his sons. Aside from what is sporadically known about the practical use of maps in the Middle Ages, maps of another, religious, kind have been preserved. When looking at the *mappae mundi* it becomes clear that the bible was of great influence on the perception of the world at the time. Typical of these maps is the T-O form: the continents of Asia, Europe and Africa are portrayed within a circle (O), while the T-shaped waters in the middle of the map separate these continents. The T-form symbolizes the holy cross. In addition, many religious symbols were added onto the map. There is little evidence though, that maps were being used for political purposes at the time. Black (2004: 31) claims that until the middle of the fourteenth century the majority of maps were used in science. From that period on they were gradually used for practical purposes, but still verbal descriptions were more commonly used.

The most significant technological developments in this pre-modern era were the use of printing, triangulation and scaling. The art of printing changed the possibilities for the spread of maps radically. In the 1470's the first printed maps came out in Europe and in the course of the sixteenth century printed maps took over from hand drawn maps. Map makers profited from this development, because they had more access to more recent maps which they could copy and adapt. A new, more widely spread, audience could now be serviced, which gave rise to a commercial dimension of mapmaking. An important move towards a more objective and a less impressionistic method of making maps was realized by the invention of triangulation in 1533. By calculating sides and angles of triangles, distances between two points on the round surface of the earth now could be measured. Around the same time the use of scale, which was first invented by the Romans, became more and more customary. Still, the possibilities that maps offered didn't draw substantial attention from the rulers of the time. This may be explained by an emphasis on routes or illustrations, rather than on borders and territories as can be seen on maps from the seventeenth century onwards. Furthermore, the Religious Wars dominated Western Europe in the last half of the sixteenth century, which caused a decline in royal authority (Clark, 1995: 36). However, Mercator, one of the most significant geographers in the sixteenth century, in his 1595 *Atlas* draws attention to a new added value of geography: "it will contribute greatly to the knowledge of political regimes, providing that it describe not only the position of various places, but also their nature or legitimate condition, which the duty of the geographer always demands" (Crane, 2002: 250).

Black (2004: 31) indicates that a shift in the perception of borders slowly started taking place in the fifteenth century. It was discovered that maps provided the possibility to think of frontiers in terms of lines instead of zones. It wasn't until the start of the seventeenth century though that European rulers really started to get interested in obtaining accurate maps of their territories. Henry IV of France in 1607 appointed royal land surveyors in order to map all border and coastal lines. At that time in France political power had become more centralized as a result of three processes (Clark, 1995: 34). First of all, the French monarchy had expanded its territory of rule. Secondly, the royal authority had strengthened at the expense of the church and local nobles. The third, and with regard to maps the most interesting, development was the decline in the geographical mobility of French Kings. On the one hand it had become impossible to personally visit all areas of the expanded territory. On the other hand they no longer needed to do so, because food became more easily available. Because *La France* was ruled from a central residence, either in Paris or Versailles, it is likely that the king had to find new ways to keep an eye on his territory.

3.2   An increased state interest in maps

In the course of the seventeenth and eighteenth centuries the art of cartography developed enormously. More and more of the new world and European colonies were being mapped. This involved both sea routes and new coastal lines that were discovered. The Dutch profited from this increasing interest in the new world and set up quite a business in cartography. By means of maps the directors of shipping companies were able to proudly present their new

discoveries while an increasingly wider audience could stay informed about trading activities overseas. It is not surprising that state leaders also increasingly saw the benefits that maps could offer them. Military activity evolved more and more around the use of maps. Increasingly, large-scale military surveys were conducted. Many first detailed maps using new standardized techniques were made by army engineers. Also maps were being made in order to inform the public about military battles. In 1666 the French king Louis XIV founded the *Académie royale des sciences* in order to supervise military and economic activities, the expansion of roads and canals, and the exploitation of natural resources. By this means he also formally organised the *ingénieurs géographs* who functioned as surveyors attached to military and civil bodies (Crone, 1978: 85). This development clearly demonstrates an increased state control over mapmaking activities. Aside from military purposes, maps started being used for administrative and taxation purposes when depicting estates. The estate borders and ownership could now be more accurately determined. It was being extensively employed by the Swedes and later on by the French as well. Not only a greater awareness of estate borders was realised, also the borders of the state territory became more explicit. State rulers assigned cartographers to map their territories and especially the exact location of the state borders. These maps started playing an important role in diplomatic negotiations and disputes. From this time on it became more common to enclose maps as part of treaties. In the Anglo-Dutch treaty of 1718 a map delineated the frontier between the United Provinces and the Austrian Netherlands (Black, 1997: 16).

These forms of government use of maps in fact weren't completely new. Already around 1540 some maps were made indicating places where defence works could be built and others which were being used for planning, executing or explaining routes (Black, 2004: 46). Also an example of early diplomatic use can be found in the sixteenth century during the negotiations of the English-French treaty of Ardres (Ibid). The mapping of estates already took place in sixteenth century England as well. But at that time these kind of mapping activities to weren't part of state culture. It can be established that a professionalization and a popularization of cartography took place when this cultural transition actually did take place.

In the course of the eighteenth century more accurate maps emerged and replaced the former ones because of an improved measurement of longitude which could now be combined with triangulation. From this period on, maps were no longer mere illustrations or decorations but turned into instruments that both displayed power and actively supported it. The perceived importance of maps is demonstrated by the founding of state topographic institutes both in France and in England. In the French Revolutionary and Napoleonic period major shifts took place with regard to internal French and European borders. This new imposed reality was given form by mapping the changed jurisdictional-territorial criteria. This development also stimulated France's enemies, such as Britain to start up mapping projects. Governments gained control over mapmaking activities by imposing regulation. From 1773 on, for the construction and maintenance of British roads, law imposed the making of maps. The Ordnance Survey, Great Britain's current national mapping agency, originates from 1791 when "the Government realised that in planning adequate defences to repel any invasion, the

South Coast of England needed to be comprehensively and accurately mapped. So it instructed its Board of Ordnance – the defence ministry of its day – to speed the necessary survey work" (Ordnance Survey, 2007).

3.3   More and more creativity in mapmaking

At the start of the nineteenth century it had become unthinkable to engage in state politics without using maps. Both cadastral and topographical mapping became more and more institutionalized by governments and even more accurate maps appeared. This process was facilitated by a series of technological breakthroughs. Steam-powered machinery instigated mass production of paper and printing. Along with an increased use of lithography this created more options for copying, revising and reproducing maps. Also colour printing was introduced which provided new possibilities for incorporating more details into maps. Meanwhile, the public's demand for maps only grew, because people wanted to be able to stay informed about the wars that nation states were engaged in. This did not only happen by means of the well known basic topographical maps which depicted the battles and new borders, but as of 1870 the new genre of the satirical map could be found in the newspapers as well as on prints and postcards (Joustra, Ter Mors, Galema, 2005: 27). This development can be understood as part of a growing sense of nationalism in Europe.

Satirical map:
"Hark! Hark! the dogs do bark!"
by Walter Emanuel (1914)

Also in the nineteenth century, the thematic map conquered a strong position in the field of mapmaking and enjoyed a growing public interest. This type of map doesn't solely display the core geographical information of a certain area, but also gives information on the spread other types of data, such as illnesses, population data and geological data. Especially for scientific purposes these maps were of great relevance, but later turned out to set a tradition in public administration as well, when looking at the use of GIS.

Even though the idea of using history for explaining and legitimizing contemporary political situations wasn't entirely new, along with the growth of nationalism, maps were increasingly

used in this manner. For example, in the historical atlas *Géographie historique de la France. Atlas spécial*, which was published around 1854-61 under Napoleon III, evidence was offered of France's heroic and successful past and critique was uttered towards the preceding governments (Black, 1997: 56). This offered the public a sense of pride about their nation and strengthened the position of Napoleon III as their ruler. Other European nations also continued to produce historical atlases which were "to play their part, in war as in peace, in confirming a sense of national destiny and continuity with a glorious past" (Black, 1997: 101). These historical maps, however, usually didn't aim at providing a most complete coverage of history. Rather, they emphasized selected historical accounts in order to make a certain claim, and omitted events which did not serve that particular purpose. Many examples of these types of historical claims can be found in (pre-) Nazi mapmaking. Black (1997, 125) mentions a German map depicting the imperial frontier in 1000 and the linguistic frontier more to the west than the actual post-First World War frontier. During the Second World War, however, most mapping was contemporary, displaying actual and possible redrawing of frontiers (Ibid: 129).

In the twentieth century aerial photography and later on satellite technology literally added a new perspective onto mapmaking. The big advantage of these new technologies was not only that they provided a new, and more up to date, point of view from above, but also that they made visible what the eye could not see by using new measurement techniques. These new technological possibilities obviously were of great use during the World Wars and were growing at the same time because of the demands of war.

3.4   A future for maps in the ICT-age?

Continuing developments in the nineteenth and twentieth century, at the beginning of the twenty-first century military activities remain of essential meaning for mapmaking and vice versa. Governmental topographic institutes keep on making maps for military use, but find other clients as well, both in the public and in the private sector. At the same time, these military mapping activities have been beneficiary for the development of cartography by creating new technical standards and adding to state map collections. Another branch of mapmaking, cadastral mapping, doesn't display an obvious strategic purpose like the former, but still enjoys a state interest. By controlling the cadastral registry governments are supplied with the necessary data to levy ownership taxes. So the old principles of state power, the monopolies on the use of (military) force and taxation, remain stronger than ever enabled by the latest cartographic developments.

Aside from these historically evolved functions of map making, new promises for the future await which will be shaped by politics and technology in the contemporary socio-cultural setting. Today's GIS (Geographical Information Systems), which are increasingly being used in public administration, are in fact more than maps. They are "automated, digital information systems concerned with data related to locations stored on computers" and "a by-product of the use of computers in the Cold War arms race" (Black, 1997: 229). Vanneste (2001: 86)

mentions several advantages of GIS over the traditional paper-based map. Now, maps can be treated digitally, do no longer have scale and are unlimited as to the spatial area and the objects that are depicted. Furthermore, a large database can be set up containing attributes about all map objects. Then, the different map layers and attributes can be combined in several ways. In summary, the map transforms from a static device into a dynamic system. Vanneste (2001: 92), however, utters some reservations about the use of GIS. She points to the fact that GIS-users aren't necessarily professional cartographers, but are producing maps which will consequently not always be of good quality. Furthermore, there is a danger that users will be disillusioned when expecting fully automated miracles from GIS. It can thus be stated that GIS have a lot of potential which cannot easily be realised because of their complex nature. When looking at the most interesting possibilities of the use of GIS within public administration, these come down to analyzing and monitoring functions by means of combining, visualizing and correlating spatially spread data of social entities and their characteristics on the one hand (Snellen, 2000), and providing web-based citizen-oriented services on the other hand. The success of the use of GIS for these purposes may partly depend on the knowledge and skills of the policy makers and the citizens who work with these devices.

What, then, is left of the original art of mapmaking, knowing that even the traditional military and cadastral maps nowadays are in fact digital data sets and considering that digital data combined with the possibilities that ICT's offer can lead to other spatial manifestations such as 3D-visualisations or location-based mobile phone services? It appears that a transition is taking place in the discourse about this topic. The contemporary mapmakers have turned into geo-information professionals who are generating, sharing and combining (geo)spatial data in order to make their products. More and more discussions are about problems regarding accessibility and exchange of *data* rather than *maps*. There is evidence that this changing discourse is going beyond the technological context and is slowly entering governance as well. At the EU-level recently a new directive has been adopted, entitled INSPIRE, which is an acronym of "Infrastructure for Spatial Information in the European Community". This directive is aimed at using spatial information for environmental benefits. Also on a national level similar initiatives are undertaken, such as the NGII (Nationale Geo-Informatie Infrastructuur) in the Netherlands. Furthermore, local (Dutch) governments increasingly integrate GIS in their websites to offer additional services to citizens. The notion of spatiality still doesn't seem to have penetrated all parts of government. This is not surprising considering that the use of maps becoming an integral part of state culture didn't happen overnight either, and neither did the introduction of ICT's.

4. Conclusion

Maps have grown into being very important sources of information and mechanisms for ordering the world. They have proven to be powerful tools for states and citizens. Still throughout history it remained challenging for states to keep up with cartographic developments and manage these in order to fulfil their own objectives. It can be stated that

maps indeed "work by serving interests" (Wood, 1993) and that the number and diversity of interests have grown over the ages. Mapmaking became part of popular culture in the seventeenth century. Before that time it enjoyed some sporadic interest from scientists and travellers. In the course of the eighteenth century cartography had acquired a firm position at the political stage. Political control over mapping activities became more apparent during the nineteenth century which clearly left its mark on popular cartography as well. Also popular culture has increasingly interacted with political culture due to the grown importance of the people for the state. The current prevalent "citizen as a client" approach demonstrates this.

When studying the implications of spatial information technology for current public administration, the following developments are worth considering. Whereas a major problem in early cartography was the lack of information, both in quantity and reliability, right now there seems to be an unlimited and complex amount of reliable information. Organizing spatial information and making it usable to the 'right' people now deserve attention. Furthermore, it appears to be that the emergence of the surveillance societies, in which systematic surveillance has become "a routine and inescapable part of everyday life" (Lyon, 2007: 449), goes hand in hand with a growing spatial awareness. Governments who increasingly monitor citizens' activities will not only want to know *what* is happening, but also *where* things are happening. Therefore, it is likely that the whereabouts of citizens will increasingly be monitored by the use of spatial information technologies. Another interesting development is the grown presence of spatial information technologies within popular culture. It is worthwhile to look into how governments deal with the better spatially informed citizen and takes regulatory actions to control the flows of spatial information that are being provided by private parties. In this perspective one may think of car navigation systems and maps which are being accessed through the internet. More and more people use navigation devices or web-delivered route descriptions to get around. The majority of these services is delivered by commercial enterprises and is not based on government maps. Consequently, people's movements are less and less controlled by government. Policy makers dealing with traffic and tourism will have no choice but to respond to these developments. Related to this issue is the changed meaning of mobility, which will continue to influence public policy making. Not only have people been able to get around more easily over the past years, their communication patterns have become more mobile as well. First the internet gave a huge impulse, and now mobile phones can provide people with information wherever they are. Also, in line with the surveillance discourse, mobile phones enable the monitoring of people's locations as well as the delivery of services related to their locations. A last point of relevance is the development of cyberspace alongside the physical world. If states want to exercise power over the virtual world, the challenge for governments is to try and map cyberspace and peoples movements within it. Especially, because more and more contacts between citizens and governments happen in this world rather than in the real world. All of these developments, information management, surveillance, popularization, mobility, and cyberspace, play a role when researching spatial information in contemporary society.

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