Mature e-Government based on spatial data - legal implications[*]

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Abstract

The relation of spatial data and e-Government is important, but not always acknowledged in the development and implementation of e-Government. The implementation of the INSPIRE directive pushed this agenda towards a growing awareness of the role of spatial data and the need for a spatial data infrastructure to support e-Government. With technology, policies, data and infrastructure in place, new iterations of this relationship are needed, in order to reach a higher level of maturity. This paper analyses and discusses the need for the differentiated roles of spatial data as an important step towards more mature e-Government. As part of this understanding, the paper focuses on a subset of data, so-called 'spatio-legal data'. Spatio-legal data are created within the regulated legal environment of public administration, and used for rulings within a given legal area. Sometimes, the legal status of these data is the wording of the law and the spatial data are just visualisation thereof. Under other circumstances, the spatial data themselves represent the legal status. Compliance between spatial data and the legal administrative framework is necessary, to obtain a mature e-Government. A preliminary test of the hypothesis on a small scale, using Denmark as a case study, supports the need for discussion and awareness of the role of spatial data in e-Government with emphasis on the use of spatio-legal data.

Keywords: Legislation, e-Government, public administration, spatial information, Spatial Data Infrastructure

1. INTRODUCTION

The use of maps as bases for various public administration purposes has a long tradition, but in the past decade, spatial data have gone far beyond 'the map'. Today, various Information Technology (IT) solutions are built on spatial data, often without the actual production of a map, for instance, a calendar solution giving the departure time from your office, if you wish to arrive on time for an external meeting, a report on existing restrictions on a property or a request for the nearest place of particular interest.

Owing to a technological push, e-Government has transformed public administration, taking advantage of new technological possibilities. The goal is quicker, cheaper and better public administration, delivering more efficient service to individuals and businesses. One of the often-desired goals is the so-called 'immediate ruling', where individuals apply for a permit or a financial subsidy through an online form, and the system is able to almost immediately return an approval or refusal.

With technology and spatial data in place, new obstacles are created by the circumstance of legal identification and ruling within public administration not being always as simple as an analysis in an IT or a Geographical Information System (GIS). This is often because rulings involve some form of judgment, and because the legislation and the spatial data involved are not suitably linked.

As an example of the foregoing, in Denmark, a lake is encircled by protection lines to a distance of 150 metres from the lakeside, within which it is forbidden to alter or built. The visualisation of the protection lines is a case of de jure boundaries, but in practice, the boundaries are implemented as de facto boundaries, since governmental, online GIS solutions show the boundaries aligned with other precise boundaries (see www.kort.miljoerportalen.dk). What is the real value of this solution, if an individual or an NGO clicks on the map, and sees, or worse, does not see, a protected lake, or the associated protection lines surrounding the lake? So far, Denmark has no legal practice in this field, but from a legal point of view one could argue, that in being guided by the data, the individual would be acting in good faith, since 'available, authoritative data' have been consulted.

This paper discusses the role of spatial data that support e-Government. Focus is placed on legal decision-making based on spatial data in digital public

administration. In order to make sound rulings, discussion of spatial data used and created within a regulated legal environment is needed.

The hypothesis underlying this paper is that spatial data play quite an important role in the pursuit of mature e-Government, hence, recognising this role must be seen as part of the development of e-Government in general. In particular, the above-mentioned spatial data with legal attributes, referred to henceforth as 'spatio-legal data', will play a critical role in obtaining a mature e-Government. A preliminary test of the hypothesis on a small scale, using Denmark as a case study, supports the need for discussion and awareness of the role of spatial data in e-Government with emphasis on the use of spatio-legal data. The paper concludes by establishing a framework for continued discussion of the use of spatial data to support a mature e-Government.

The focus, and therefore, the research question of this paper is: *What legal role do spatial data play in relation to legal decision-making in digital, public administration, and how does this role need to change, to create a mature e-Government?*

2. THEORY AND METHODOLOGY

2.1. Definitions and Use of Terminology

As a platform for further analysis, a brief definition of terms is necessary.

Spatial data

'Geographical data', 'geodata' or 'spatial data', are *data with a direct or indirect reference to a specific location or geographical area* (cf. the legal definition in the INSPIRE directive, Directive 2007/2/EC). The definition of spatial data also includes what is often called 'spatial information'. However, there are good reasons to maintain the distinction between the concepts of data and information. Referring to Longley et al. (2001, p. 6), *data consist of numbers, text, or symbols, which are in some sense neutral and almost context free*, whereas *information is data serving some purpose, or that have been given some degree of interpretation*. Longley et al. note that there are no universally agreed-upon definitions of 'data' or 'information', although these terms are frequently used.

A subset of spatial data may be described as 'reference data', 'core data', 'base data' or 'fundamental data' (Nebert, 2004). As stated in the SDI cookbook (Nebert, 2004), *Core-, Reference-, Base-, Fundamental data, and other similar terms are often used, and generally understood … until one tries to define what concept(s) they cover, or until one tries to define the related specifications* [*sic*]. Nebert attempts this, defining 'core data' as *a set of Geographic Information that*

is necessary for optimal use of most GIS applications, i.e. that is a sufficient reference for most geo-located data [*sic*].

Another subset of spatial data are data used and/or created within a regulated legal environment, referred to in this paper as 'spatio-legal data'. The characteristic of these data is that legislation defines the creation, updating and use of the spatial data. Sometimes, the legal status is the wording of the law and the spatial data are just a representation thereof. In other circumstances, the spatial data themselves represent the legal status.

Traditionally, the data quality of spatial data is evaluated through a set of criteria including *lineage, positional accuracy, attribute accuracy, logical consistency, completeness, semantic accuracy, usage and temporal quality* (van Oort, 2005).

Spatial Data Infrastructure (SDI)

Discussions of the understanding of the concept of SDI have taken place since the early 1990s. For an exposition of the historical discourse, see Homborg et al. (2009), and for an elaborated understanding of the components of SDI, see Vancauwenberghe et al. (2014). In this paper, the definitions established by Nebert (2004) and Rajabifard et al. (2003) are used.

A spatial data infrastructure is *a framework of policies, standards and technologies that enable data providers to publish, and users to access and integrate, distributed heterogeneous geospatial information* (Nebert, 2004). In other words, an SDI is required to link data producers and data users.

Depending on the level of abstraction, an SDI forms different frameworks (Rajabifard et al, 2003). At a global level (the most abstract level), an SDI has a more strategic nature, often more focused on processes than actual product outcome. At the other end of the scale, the corporate SDIs are the most detailed variations, according Rajabifard's model. Often, these are of a very concrete nature, with a strong focus on the product, sometimes overlooking the need for policies on maintenance, metadata, organisational factors and so on.

Despite the significant differences in level of detail, the fundamental interaction between people and data is governed by the technological components of an SDI, represented by the 'access network', 'policies' and 'standards' (Rajabifard et al, 2003). An SDI is not a static product, but is constantly evolving, pulled by technological advancement and changing user needs.

e-Government

e-Government originated in the technological pull of the invention and development of computers and the Internet. e-Government is a multifaceted movement with the general aim of digitising communication between government and individuals, businesses, public employees and government agencies (Siau et al., 2005).

Keng Siau and Yuan Long (2005) argue that a synthesis model based on existing theories of the development and maturity of e-Government comprises of the following five stages (Figure 1): web presence, interaction, transaction, transformation and e-democracy.

Figure 1: Five Stage Model of E-Government (Siau and Long, 2005)
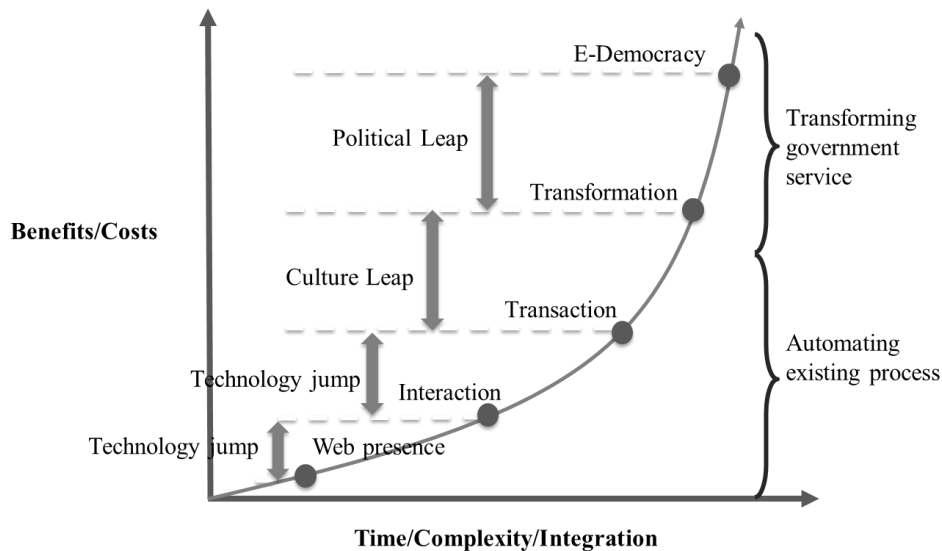
According to Siau and Long, the initial development of e-Government, comprising the first three steps, may be characterised as 'automating existing processes', referring to a transition based on technological jumps from the simple use of the Internet, to more mature digital solutions supporting *interaction* and *transaction.* Thus, the initial stage is the presence of the internet, enabling governments to post simple and limited data through their web sites, such as the agency's vision and mission, office hours, contact information and official documents. The main characteristic of this stage is that governments only provide information on their web sites, and no interaction is possible. In the second stage, 'interaction' is introduced as a transitional step towards pure transactions, providing the possibility of simple interactions between the government and the users,

including basic search engines, e-mail systems and official form downloads. In the third stage, self-service functionality makes it possible to complete entire online transactions, such as license applications, tax filing and personal information updates.

The final two stages of the maturity scale are more abstract, characterised as *transformation* and *e-democracy*, and depend on a cultural and political leap. In other literature, this is also referenced as 'connected government' (United Nations, 2008). This transformation of government services goes beyond automating and digitising existing operational processes. The cultural leap lies in the fact that we need to recognise and accept new ways of governance (and public administration), and new inter-organisational collaborations. The connected government requires a break with the traditional way of organising people, data and systems in quite isolated in domains and administrations. Accepting this new approach to management, the final step on the maturity scale presupposes a political commitment. The political will is an expression of the societal arrangement, specifically, the chosen form of governmental organisation. For instance, in a democratic society, the political desire to transparency within a government is more likely.

The synthesis model is a deductive model describing a generic path of e-Government development. It is not a given that all countries have e-democracy as the ultimate goal of e-Government. However, the development of e-Government may support this goal, if desired.

Another reservation related to the foregoing model is the lack of discussion of the relationship between e-Government and digital public administration. As stated at the beginning of this section, e-Government is viewed as *communication* among stakeholders. However, e-Government must also include the transformation of public administration into this digital environment. In this paper, this broader understanding of e-Government is used.

2.2.   The Links between Spatial Data, SDI and E-Government

If the three terms, 'spatial data', 'SDI' and 'e-Government' are combined, spatial data form the basis for the SDI, or more precisely, the SDI constitutes a platform for sharing spatial data; both spatial data and SDI are necessary for an efficient e-Government.

Since a large share of public data contain a spatial reference (some say up to 80% of all data, Franklin and Hane, 1992), e-Government needs to acknowledge and discuss the role of spatial information. This link is recognised by researchers (cf. Georgiadou et al, 2006), but in practice, the link is not well-recognised, though there is a growing awareness (cf. Hansen et al, 2011).

The EU directive on 'Infrastructure for Spatial Information in the European Community'(INSPIRE) has played a significant role as a regional SDI, formalising the ongoing development of SDI implementation in European countries. Focusing on data standards, metadata and access networks, INSPIRE established an essential basis for e-Government. Still, since the directive only regulates existing data sets, and does not require new data creation, the directive may be seen as a *framework* for SDI implementation, and not as a *demand* for the implementation of an SDI. Hence, with regard to data quality, INSPIRE does not relate to all the above-listed criteria (e.g. 'completeness').

If spatial data are to interact, or be used as basis for interaction, discussions of the use of 'reference data' are necessary. Twenty years ago, reference data referred to the datum the mapping, but today, reference data are a subset of spatial data, necessary as the basis for linking other public data. Hence, in this understanding of the concept, the personal identification number also represents a reference data set. By designating only a limited number of data sets as reference data, a more focused effort may be made, enhancing data quality and enabling the linkage of various public and private data sets. This discussion is pursued later in this paper, but here, is used as a stepping stone to the formulation of this paper's hypothesis.

2.3. Hypothesis

This paper argues for the need for a more holistic understanding of e-Government, SDI and geographic data, and a more elaborate discussion of the role of spatial data as reference data.

In Section 2.1, Siau and Long´s model was presented, to illustrate the understanding of how e-Government matures, initially owing to the development of new technologies, followed by phases of cultural and political adoption, potentially leading to the transformation of government services. In Figure 2, this conceptual understanding is used to illustrate how spatial data has to mature in an analogous process, to facilitate 'connected governance' in a digital society.

Figure 2: The Maturity Stages of Spatial Data, Compared to the Maturity of e-Government
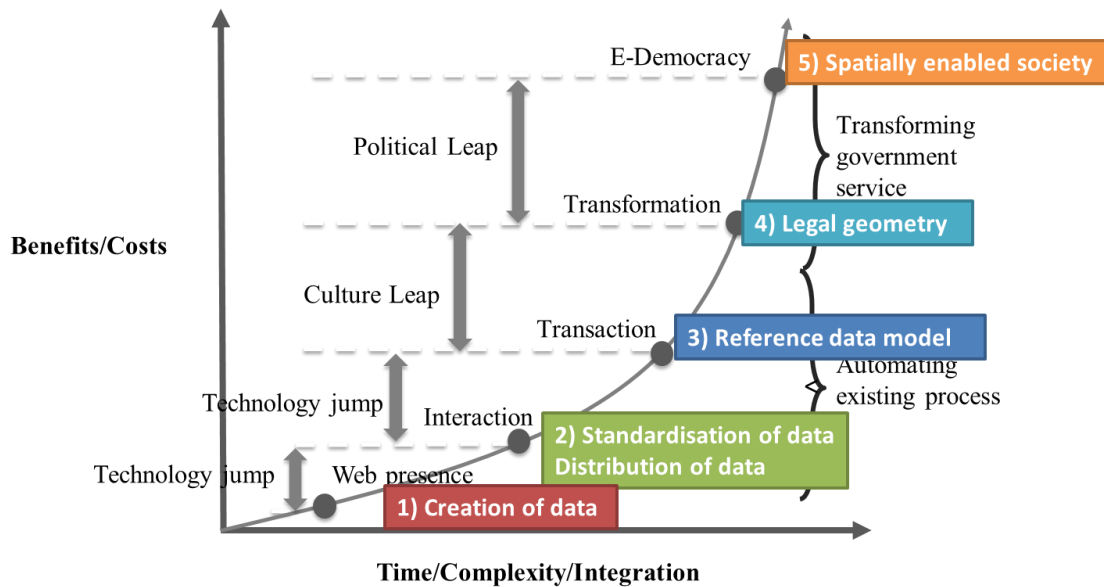
In e-Government based on spatial data, the initial step is the *creation* of data.

If data are to interact with each other, standards need to be implemented, and distribution channels need to be in place – *the establishment of an SDI*. The INSPIRE directive supports this developmental leap in Europe. In many countries, standards and portals were already in place, but INSPIRE aided a common understanding and interoperability among the member states. Discussion of open data is part of this developmental stage (Hansen et al, 2013). By now, it is possible to distribute and access data, and because of the use of standards, it is possible to combine data in a GIS. However, as mentioned above, if spatial data are to interact or be used for transactions – understood as being more than just illustrations on a map – discussions of national SDIs and models singling out *reference data* are important. At the moment, several countries are conceptualising and implementing such models (cf. Denmark, for details, see Hansen et al, 2013; The Netherlands, for details, see Zeeuw and Lemmen, 2012). Reference models allow a smaller number of data sets to function as officially designated basic data sets for digital government. By designating only a limited number of data sets as reference data, a more focused effort may be made, enhancing data quality and facilitating the linkage of various public and private data sets.

Maturity beyond automating existing processes, moving into actually transforming government, demands another view of spatial data than just a technical one. It is crucial to establish a regulated legal environment, defining the use and/or creation of spatial data in decision-making in public administration. This phase does not address the linkage of legislation and spatial data only, but concerns the complete legal framework in e-Government, and hence, the formulation of the law itself: hearing phases and the substance of rulings must be built on predefined, reusable components (Hvingel and Baaner, 2015). With regard to spatial data, the content of the law is what is relevant. The content may be defined by 'who' (the object of the decision – the official legal person, authentication) and 'what' (the substance), elaborated by 'when' (time), 'where' (geography) and 'how' (process and tools). In the figure, this phase is denoted by *legal geometry* comprising the data itself (the spatio-legal datasets), the legislation, the procedures and the rulings.

The foregoing kind of transformation demands a change of mind-set, in terms of the people–law–spatiality relationship, and the way responsibilities within domains are organised.

Eventually, when the challenge is recognised and taken, it is possible to reach a stage of e-democracy, or of 'spatially enabled society', as it would be called in the field of land administration systems. According to Williamson et al (2011), the term 'spatially enabled society' describes the emerging cultural and governance revolution offered by pervasive spatial information technologies and individuals equipped with spatial data: *Spatially enabled societies make possible, amongst many other things, sustainable cities, GFC early warning systems, smarter delivery of housing, improved risk management, and better macroeconomic decision making. The concept is not about managing spatial information, it is about governing society spatially* (Williamson et al, 2011). By nature, entering this last stage is a political choice, in terms of how society should be structured and governed, and therefore, the extent to which transparency is desired.

Rajabifard´s SDI model could gain by being supplemented by the reflections on the model of e-Government maturity (Figure 3).

Figure 3: Rajabifard´s SDI Model Supplemented By Reflections on e-Government Development. The numbers Refer To the Maturity Stages of Figure 2.
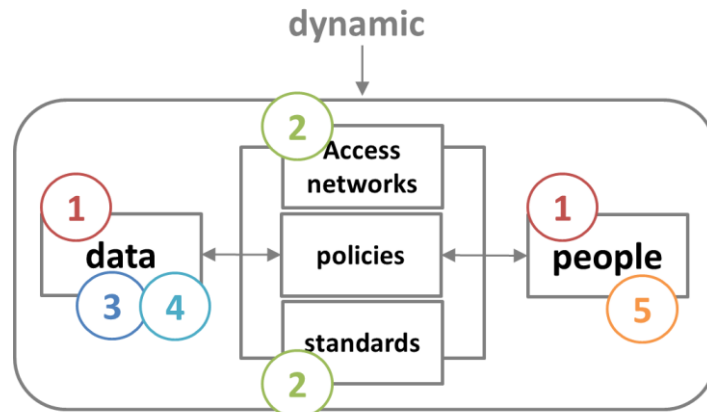
The interplay of 'data' and 'people' is the most important and fundamental role of the SDI model, and therefore, their existence is a precondition for the model, as it is in the e-Government maturity model. The main technological components of *access network* and *standards* comprise the facilitating platform for this interplay, giving access to, and use of, spatial information, which equates with level two in the revised maturity model (Figure 2).

The overarching goal of e-Government is to promote better services for individuals and businesses. Hence, the output of establishing an SDI should exceed the input, and people should expect a comprehensive and satisfactory response, many times greater than the input. When an SDI is in place, the emphasis on the model must once again be on *data*, addressing the legal challenges occurring in phase four of the e-Government maturity model, ensuring usability in regard of data quality and management.

In all the phases of the development, *policies* are needed, in order to formalise ongoing development. Policies may be formulated in advance or after the implementation. Likewise, for *people*. As end-users, producers or decision-makers, people interact with the model in all its stages. The spatially-enabled society is focusing heavily on the people element, since e-democracy and transparency benefit society in general (the individuals).

3. ANALYSIS - TESTING THE HYPOTHESIS

The hypothesis in this paper has been only initially tested, by analysing the ongoing development and implementation of e-Government in Denmark. This initial test will suggest whether the hypothesis is sound, but to confirm the

hypothesis, further testing in other countries is necessary. Denmark is quite advanced with regard to e-Government, and representative of the ongoing development in the Nordic countries, and therefore useful in this initial test.

The Danish use of spatial data in a digital format emerged in the 1970s. For instance, the Danish Building and Dwelling register was founded in 1976, and GIS specialists have been working with these data in GIS ever since.

The need for standardised data and the use of data as reference data for data exchange have been recognised since the mid-1990s. By suggesting a set of unified geographic references for administration and data management, it was possible envisage how to link relevant data about the environment, traffic, health, property, companies and people, for instance (as shown in Figure 4, from 1998).

Figure 4: The Use of Spatial Data as Reference Data for Existing Registers in Denmark, Based On an Illustration from the Danish Ministry of Research (Forskningsministeriet, 1998)
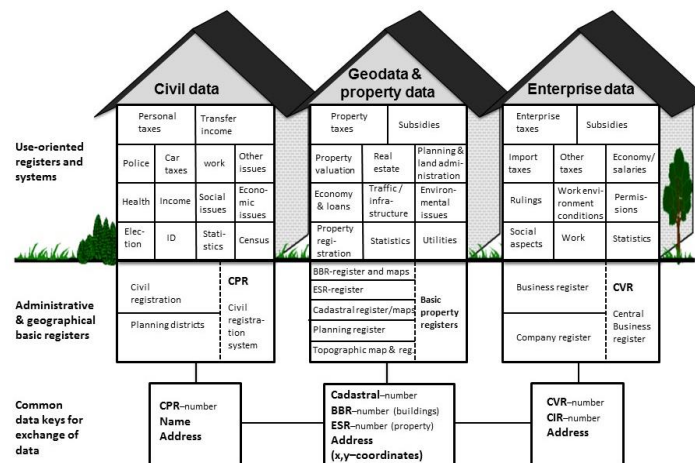
The need for and benefits of an overarching infrastructure were inherent in the work with GIS, as data is generally structured in IT systems. However, the concept of an SDI was not a conscious and intentional effort. One may say that for many years Denmark had a de facto national SDI, consisting of standards, data models, portals (access networks) and policies, more or less unrecognised as such (Brande-Lavridsen and Jensen, 2006). As shown in the infrastructure model, the common keys were reference data, but were not explicitly articulated as such.

3.1.   The Base Data Report and e-Government Strategy

In informal working groups, the role of spatial data was discussed throughout the years. In 2004, a report called 'The Base Data Report' was published by a group consisting of members from relevant ministries, NGOs and universities (Udvalget til nytænkning vedrørende basisdata, 2004). For the first time, the terms 'reference data', 'multi-sector data' and 'sector-specific data' were introduced in Denmark. In the Base Data Report, reference data are defined as that subsection of spatial data that address one or more of the following requirements:

- The data set precisely localises a user's information;
- The data set makes it possible to link various information, comprising data from different users, sources and specialist areas;
- The data set establishes a realm of understanding for the data, when presented for another user.

Compared to the definitions given by Nebert (2004), 'reference data' matches the definition of 'core data' (cf. chapter 2.1).

It is stated in the Base Data Report that *it is essential to outline instructions for the establishment, maintenance and clear division of responsibilities amongst data owners.*

In exploring the question of responsibility and the role of reference data, this report is of great importance, setting forth a contextual model for understanding data. However, the responsibilities are not addressed in this report, but call for follow-up in later work.

Since the release of this Base Data Report, alongside the INSPIRE implementation, the Danish Geodata Agency has advocated for a contextual understanding of data. Figure 5 shows the latest version of the model, from the agency's 2011-strategy. The concepts and their relations remain the same.

Figure 5: The So-Called 'Infrastructure Model', as Represented in the Strategic Basis Called 'Location - a gateway to eGovernment' (The National Survey and Cadastre, 2011)

In this strategy, reference data are characterised by the following qualities:

- They identify the precise geographic location of other data (as the basis for registration or geo-referencing).
- They enable the integration of multiple types of information, including data from various sources and specialist areas (find the location, find events at the location, and determine conditions at the location).
- They improve the comprehension of information when viewed by a third party user (common perspective).

The foregoing strategy does not elaborate on the responsibilities of the authorities managing the appointed reference data, but in the strategy it is stated that *The national eGovernment strategy is expected to define common concepts with authoritative and binding content. Reference data is a term used in the geodata field. This term must be integrated into the terminology and framework being established in the eGovernment strategy* (The National Survey and Cadastre, 2011). Furthermore, the role of reference data is emphasised in the strategy with the following statement: *Reference data must be highly reliable and of high quality (authoritative, authentic)* (The National Survey and Cadastre, 2011). Once again, the actual responsibilities associated with reference data are not elaborated, but with the introduction of the term 'authoritative data', their importance is stressed.

In 2007, the Danish state (Danish National Survey and Cadastre) and six of the municipalities in Denmark established GeoDanmark, an association working to establish unified, public, topographic maps of Denmark, to be used as common object types in public administration. Today, all Danish municipalities are members.

With regard to e-Government, the first official strategy of e-Government in Denmark was launched in 2001, as a follow-up to the European strategy on e-Government, 'eEurope 2002 - An Information Society for All' from 2000. With regard to data, the strategy focuses on the need for access to all relevant public data by public authorities, but there is no discussion of spatial data as such, or SDI. The focus of the strategy is on data security, and on how to transform traditional government into e-Government. As Figure 6 shows, this focus remained the same in the next two strategies, securing the needed technological jump identified by Siau and Long (2005).

Figure 6: The Principal Content of the Published e-Government Strategies in Denmark (The Danish Government et al, 2011)
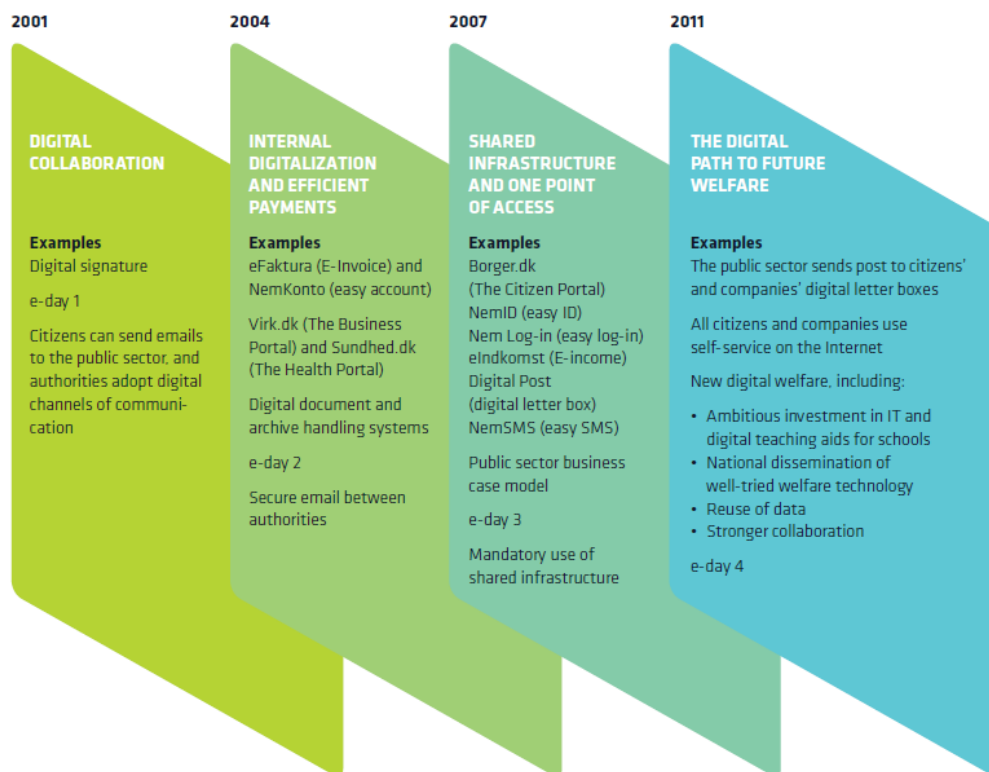
Spatial data enters the scene as a focus area of the 2011 strategy: *Shared, quality-assured environmental data is key to efficient environmental administration. The information helps to create a snap shot of environmental issues, such as the current state, the effects of environmental initiatives and the spread of invasive species. In addition, companies will be able to process environmental cases faster and more efficiently if data is more accessible, making reporting, applications and court proceedings less complicated* (The Danish Government et al, 2011).

The role of, and responsibility for data are discussed in the strategy and the associated action plan, but the definitions differ:

- *'*Authoritative core data': *A small but important part of data used over and over again across the entire public secto*r (The Danish Government et al, 2011).
- 'Core data': *authoritative data covering the fundamental information needed for effective public sector administration*.
- 'Basic data': *core information authorities use in their day-to-day case'* (The Danish Government et al, 2012).

Apart from the different definitions, the understandings all relate to the model presented in Figure 5. The definition still has technical offspring, in terms of standardisation, interoperability and data quality; data needs to be as *correct, complete and up-to-date as possible* (The Danish Government et al, 2012). However, there is no consideration of a legal nature attached to the role of reference data.

The foregoing is the first national strategy for e-Government focusing on the use of spatial data; it is a stepping stone to the discussion on data and their role and connected responsibilities.

3.2. Practical Implications

In practice, many pilot projects are currently active, with regard to public administration based on spatial data, for instance 'the digital building permit' (described below), 'the digital land book', 'the digital planning system', etc.

The digital building permit was a project running for three years, beginning in 2009. The outcome of the project was tested in six municipalities, and the expected savings totalled 10,000 man hours in the participating municipalities. The prototype of the system is shown in Figure 7. The idea was to create a self-service solution, allowing the applicant to draw the desired building (or addition to an existing building) on a map, after which the system would immediately return a ruling on the building permit application.

Figure 7: A Mock-Up of the Idea behind the Digital Building Permit
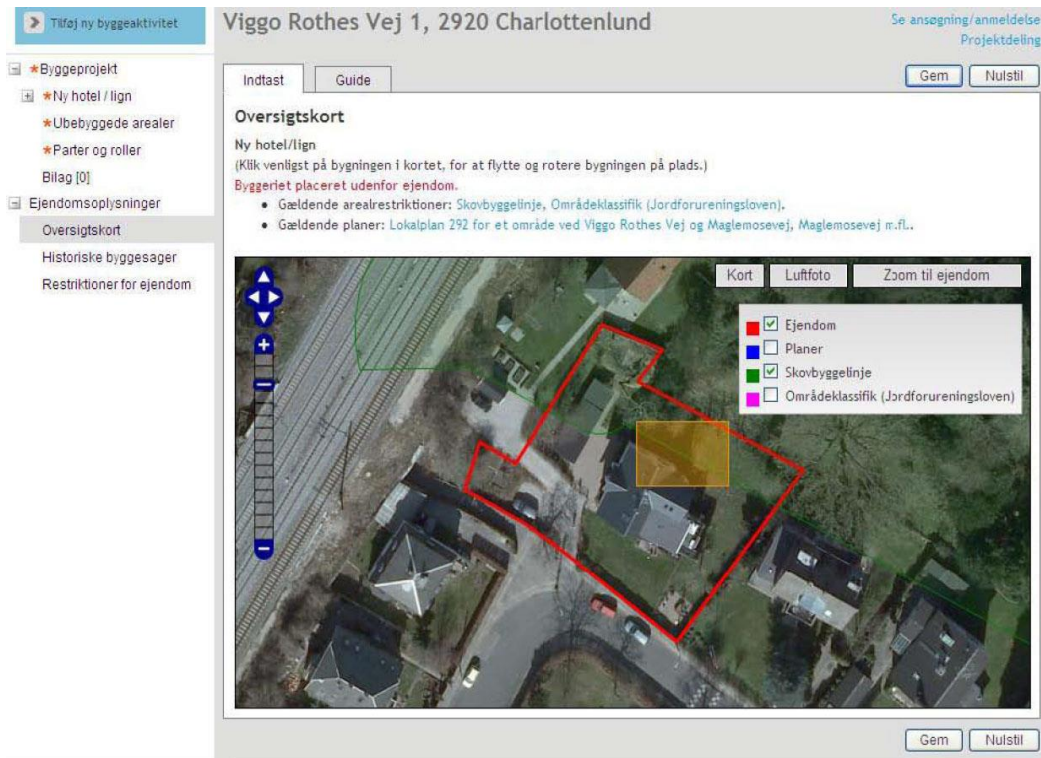
In the illustration, the system returns the answer that the building would fall outside the property, that it would fall inside a forest protection line, that the ground is designated as 'polluted', and finally, that the property is subject to local planning. With the previous knowledge about the nature of the legal state of protection lines in Denmark, a solution such as this makes no sense. Additionally, the cadastral map of Denmark is of highly variable accuracy, and since local plans base their locations on the cadastral map, this affects them, too. By default, all urban areas are designated as 'diffuse polluted soil'. The registration of polluted soil has no legal relevance for a building permit, but obliges those involved in a building project to notify the municipality if soil is removed from the site to another location.

At the beginning of the digital building permit project, expectations were high, and in 2011, the project was awarded an innovation prize by The Association of Municipal Engineering (KTC). However, as the project developed, the obstacles became evident, and the final report of 2012 stated that the expected savings could not be obtained by implementing the system. Still, the system has some good qualities, in terms of support for decision-making. In the evaluation report it

is mentioned that there is a need for an IT-supported simplification of existing legislation. According to the report, this simplification of the law in 'an IT-supported way' supports the goal of immediate rulings.

3.3. Empirical Findings of This Study

Looking back at the hypothesis presented earlier, it may be seen that Denmark has developed according to Siau and Long e-Government maturity model firstly focusing on getting information online, therefore requiring digital data, the necessary technical infrastructure and security issues.

For a long time, digital spatial data has been available in Denmark, as has an SDI, first, as an informal SDI, then, with the implementation of INSPIRE and the latest e-Government strategy, as a formalised SDI.

Spatial information and public administration are now being recognised as essential parts of e-Government.

Now, obstacles occur in practice, since digital systems are unable to automate existing decision-making procedures, as indicated in the introduction. According to the adjusted SDI model in Figure 4, it is now necessary to focus on *data*. With the formulation of a basic data model, this work has begun, but as the vague use of the terms, 'reference data', 'basic data' and 'authoritative data' shows, this discussion demands further attention. As discussed in the hypothesis, a new understanding of data as being *spatio-legal* could help this discussion, since the obstacles are no longer of technical nature but need to address the people–law–spatiality relationship.

4. CONCLUSION

This paper proposes a more holistic and synergetic approach to the development of e-Government, SDI and spatial data. Since a large share of public data contains spatial references, e-Government must acknowledge and discuss the roles of spatial information. An SDI is a facilitating platform for the interaction of data and people, and therefore may be regarded as the backbone of digital public administration.

This papers states that the roles of spatial data need to advance according to the maturity of e-Government. If the transformation of public administration into e-Governance is to succeed, legal considerations of spatial data must be considered. It is crucial to establish a regulated legal environment, defining the use and/or composed spatial data for decision-making in public administration. This phase must not only address the connection of legislation and spatial data, but concerns the entire legal framework of e-Government, and hence, the formulation of the law itself: hearing phases and the substance of the rulings

need to be built on predefined, reusable components (Hvingel and Baaner, 2015). The content may be defined by: 'who' (the object of the decision – the official legal person, authentication) and 'what' (the substance), elaborated by 'when' (time), 'where' (geography) and 'how' (process and tools). In order to stress the legality of some spatial data, the concept of *spatio-legal data* is introduced.

An analysis of Denmark shows a growing awareness of the strategic use of spatial data in e-governance. The analysis also shows how hard it is to grasp the role of spatial 'core' data, in terms of its being a smaller subset of spatial data consisting of authoritative reference data that provide *sufficient reference for most geo-located data*. In Denmark, this discussion and understanding of the people–law–spatiality relationship is still not yet resolved.

5. REFERENCES

Brande-Lavridsen H. and B. H. Jensen (2006). Udvikling af en DAnsk Infrastruktur for Stedbestemt Information (DAISI) under den digitale forvaltnings vinger, *Geoforum Perspektiv,* 10: 14-24.

The Danish Government, Danish Regions and Local Government Denmark (2011). *The Digital Path to Future Welfare, eGovernment Strategy 2011-2015*. Danish Agency for Digitalisation.

The Danish Government and Local Government Denmark (2012). *Good Basic Data for Everyone – A Driver for Growth and Efficiency*, The eGovernment Strategy 2011-2015. Danish Agency for Digitalisation.

Franklin, C. and P. Hane (1992). An Introduction to Geographic Information Systems: Linking Maps to Databases [and] Maps for the Rest of Us: Affordable and Fun, *Database* 15(2): 12-15.

Georgiadou, Y., Rodriguez-Pabón, O. and K. T. Lance (2006) Spatial Data Infrastructure (Sdi) and E-governance: A Quest For Appropriate Evaluation Approaches, *URISA-WASHINGTON DC*, 18(2):43–55.

Hansen, H. S., Hvingel, L. and L. Schrøder (2013). "Open Government Data – A Key Element in the Digital Society", *Proceedings of Second Joint International Conference on Electronic Government and the Information Systems Perspective, and Electronic Democracy*, EGOVIS/EDEM 2013 Prague, Czech Republic. Berlin: Springer.

Hansen, H. S., Schrøder, L., Hvingel, L. and J. S. Christiansen (2011). Towards Spatially Enabled e-Governance – A Case Study on SDI implementation, *International Journal of Spatial Data Infrastructures Research*, 6: 73–96.

Hvingel L. and L. Baaner (2015*). "eReady Land Administration Legislation - the Spatial Dimension" *FIG Working Week. Sofia, Bulgaria 17-21 May 2015*.

Longley, P. A., Goodchild, M. F., Maguire, D. J. and D. W. Rhind (2001). *Geographic Information. Systems and Science*, Chichester: Wiley.

The National Survey and Cadastre (2011). *Location - a gateway to e-Government.* The Danish Ministry of the Environment, National Survey and Cadastre.

Nebert, D. (2004). *The SDI cookbook*, GSDI - Global Spatial Data Infrastructure.

Rajabifard, A., Feeney, M. E. and I. Williamson (2003). Spatial Data Infrastructures: Concept, Nature and SDI Hierarchy, in Williamson I., Rajabifard A. and M. F. Feeney (Eds.) *Developing Spatial Data Infrastructures: From Concept to Reality*. Taylor and Francis, pp. 17–37.

Siau, K. and Y. Long (2005). Synthesizing e-government stage models – a meta-synthesis based on meta-ethnography approach. *Industrial Management & Data Systems*, 105(4): 443–458.

Udvalget til nytænkning vedrørende basisdata (2004). *Basisdata – forståelsesramme og analysemodel til kategorisering af basisdata*. Servicefælleskabet for Geodata.

United Nations Department of Economic and Social Affairs (2008). *UN E-Government Survey 2008 - From E-Government to Connected Governance*, New York: United Nations Department of Public Information.

Van Oort, P. (2005). *Spatial data quality: from description to application*. Delft: Nederlandse Commissie voor Geodesie.

Zeeuw, K. and C. Lemmen (2012). "Spatial Data Infrastructure for knowledge sharing". *8th FIG Regional Conference 2012: Surveying towards Sustainable Development, Uruguay 26-29 November 2012*.

Williamson, I., Rajabifard, A., Wallace, J. and R. Bennett (2011). *Spatially enabled society*. Conference paper from Bridging the Gap between Cultures - FIG Working Week 2011. International Federation of Surveyors (FIG).