



Towards spatially enabled digital government

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Abstract. Geographical information (GI) and spatial data infrastructure (SDI) has gained increasing awareness among researchers as well as among executive level managers and politicians. In Europe especially the adoption of the INSPIRE Directive has put spatial data infrastructure on the agendas of the parliaments combined with national e-Government strategies. In Denmark this top-down approach to development of e-Government has been combined with an informal, bottom-up approach with a focus on standardisation, the use of geographical information systems (GIS) and IT-architecture. Though, dealing with the transformation of procedures relating to traditional parts of the Danish public administration lack of awareness regarding place and location as integrative infrastructural elements is still a challenge. This paper will present the Danish case of digitalising the administration of real property rights as means of analysing the potentials as well as challenges in fulfilling the vision of a spatially enabled digital government.

1 Introduction

The understanding of the role of information and communication technologies (ICT) as the backbone in digitising Governmental efforts is changing. So, the UN e-Government Survey 2008 emphasises how the concept of "connected governance" is leading relating to a shift from "the provision of services into a new e-government-as-a-whole concept understood as a holistic approach to ICT-enabled public sector governance" (United Nations, 2008). As part of this change geographical information (GI) and spatial data infrastructure (SDI) has gained increasing awareness among researchers as well as among executive level managers and politicians.

An SDI can be regarded as an enabling platform linking data producers, providers and value adders to data users (Masser et al, 2008), and in Europe especially the adoption of the INSPIRE Directive (European Commission, 2007) has put spatial data infrastructure on the agendas of the parliaments combined with national e-Government strategies (Hansen et al, 2010). As pointed out by Enemark and Rajabifard (2011) the vision of "spatially enabled governments" concerns establishing "an enabling infrastructure that will facilitate the provision of the place or location to all human activities as well as government actions, decisions and policies". Dealing with the methodology of

the "EU eGovernment Benchmark" (EUeGovBE) for the years beyond 2010 Schellong defines digital government as a term framing the concepts of e-Government, e-Governance as well as any future technology of ICT (Schellong, 2010), which in this paper leads to the use of the phrase "spatially enabled digital government" referring to the concepts of e-government-as-a-whole and connected government as well as the idea of the SDI as enabler of the information society in the broad sense. As means of analysing some of the potentials as well as challenges in fulfilling the vision of a spatially enabled digital government this paper will present the Danish case of digitalising the administration of real property rights.

Following the introduction is a description of the theoretical framework referring to the conceptualisations of "digital government", "government-as-a-whole" and "spatially enabled government". On this background the case of digitalising the administration of property rights will function as an empirical example. Finally a conceptual framework focussing on central aspect regarding value of spatial enablement of the processes of digital government will be used to illustrate the central understandings.

2 Spatially enabled digital government

Creating data infrastructures is a key issue in the initial processes of digitalising govern-

ment procedures (United Nations, 2008) and due to its integrative character the spatial data infrastructures can be considered an enabler of the information society in a broader sense (Enemark et al, 2011). Referring to this understanding the basic concept of SDI, the holistic approach of e-government-as-a-whole, and a typology of digital government aspects will be explained.

2.1 Spatial data infrastructures

Spatial Data Infrastructures is about facilitation and coordination of the exchange and sharing of spatial data. It is described as the underlying infrastructure, often in the form of policies, standards and access networks that allows data to be shared between people within organisations, states or countries (Hansen et al, 2010). Referring to researchers as Rajabifard, Feeny and Williamson (Rajabifard et al, 2002) Hansen et al (2010) points out how the dynamic nature of the spatial data infrastructure is attributed to the rate of technological advancement and changing user needs. People and data are the key elements in SDI, and a spatial data infrastructure at any level whether local, regional, national or even global involves an array of stakeholders both within and across organisations including different levels of government, the private sector and a multitude of users (Rajabifard et al, 2002). In order to design and implement a spatial data infrastructure, the stakeholders need to be identified together with the business processes and functions of the organisations involved. Besides you must know the data required or provided by the functions – and the flow of data between various functions. In this respect data sharing, exchange, security, accuracy and access as well as rights, restrictions and responsibilities must be managed (Hansen et al, 2010).

2.2 E-Government-as-a-whole

Masser et al (2008) emphasises the great challenge due to the lack of awareness regarding spatial concepts besides a small elite of spatially aware professionals and

1. Infrastructure: Creating an information infrastructure both within the public sector and across society at large based upon reliable and affordable Internet connectivity for citizens, business and all stakeholders in a given jurisdiction.
2. Integration: Leveraging this new infrastructure within the public sector and across society in order to share information and bundle, integrate, and deliver services through more efficient and citizen-centric governance models encompassing multiple delivery channels.
3. Transformation: Pursuing service innovation and e-Government across a broader prism of community and democratic development through more networked governance patterns within government, across various government levels and amongst all sectors in a particular jurisdiction.

Fig. 1. Three phases framing the process of developing e-Government (United Nations 2008)

points out how more inclusive models of governance to enable the very large number of stakeholders from all levels of government are needed. Referring to Spatial Data Infrastructures Masser et al furthermore stresses how establishing a spatially enabling platform facilitating an interoperable environment creates an opportunity for a whole-of-government initiative to develop from the often fragmented developments at different levels (Masser et al, 2008).

The UN e-Government Survey 2008 is focusing on the concept of *connected governance* which is also referring to the idea of *e-government-as-a-whole* characterised by Government agencies and organisations “sharing objectives across organisational boundaries instead of working solely within an organisation” (United Nations, 2008). This shift puts a focus on the use of ICT to increase value of services instead of just providing services (United Nations, 2008).

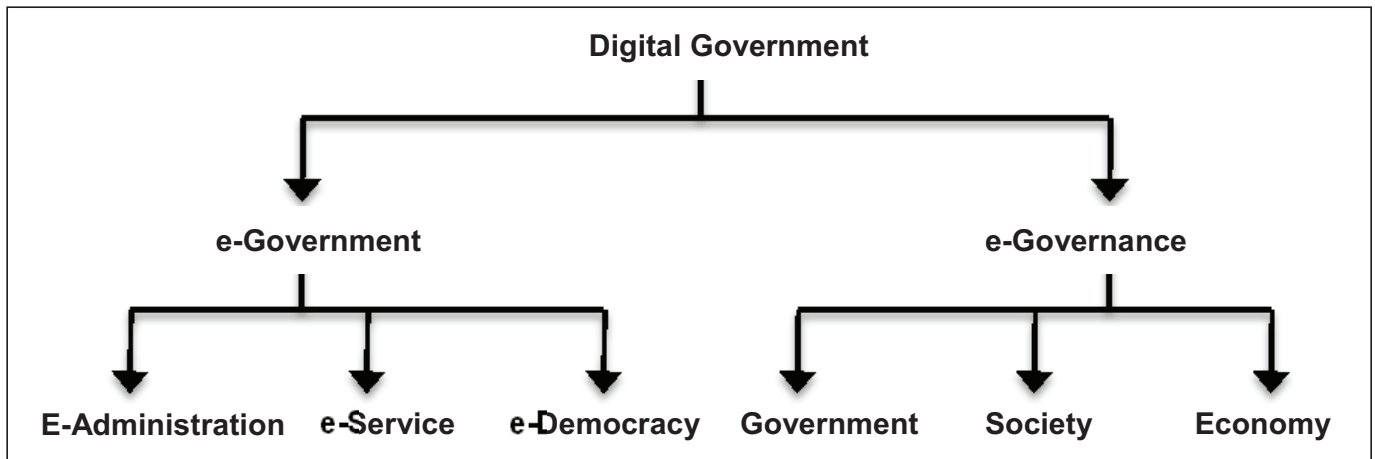


Fig. 2. Typology of Digital Government after Schellong (2010)

Due to this understanding the process of developing e-Government can be framed by three phases, where the first phase is focused on creating information infrastructures gradually moving towards a second phase characterised by integration of information, services and governance models followed by a phase of transformation (figure 1).

2.3 Digital government

Dealing with the methodology of the "EU eGovernment benchmark" (EUeGovBE) for the years beyond 2010 Schellong (2010) emphasises the need for specifying the concepts of e-Governance and e-Government. On this background he proposes the term "digital government" as a means of framing "the concepts of e-Government, e-Governance as well as any future technology of ICT" (Schellong, 2010). Under this term Schellong defines the concept of e-Government as "the use of ICT in government", which also includes diverse elements of "new technologies, varying channels or ways of utilization in any government domain" as Schellong points out.

As Schellong defines it e-Governance is more qualitative and refers to the role of government in regulating ... and facilitating ... growth of the information society and ICT" (Schellong, 2010). Schellong stresses the importance of keeping the complexity in mind and he introduces a typology making

it possible to distinguish central issues of e-Government and e-Governance (figure 2). Due to this typology e-Government includes:

- e-Administration – understood as the internal use of ICT
- e-Service – subsuming the external use of ICT
- e-Democracy – activities and the use of ICT within the field of public participation

The more qualitative aspects of E-Governance are categorised as matters relating to government, society and economy (Schellong, 2010).

Referring to the concepts of e-government-as-a-whole and connected government as well as the idea of the SDI as enabler of the information society in the broad sense this leads to the use in this paper of the phrase "spatially enabled digital government".

3 The Danish case of e-registration of real property

Denmark has been using ICT in government for several decades – firstly focusing mainly on process automation to achieve efficiencies in public administration shifting towards more elaborated e-Government, which can be seen as corresponding to the UN phase one and two (Schroeder et al, 2010). During the previous ten years the

Danish society has moved steadily towards an SDI by collecting data, making institutional arrangements and adopting standards (Danish Government, 2003)(Danish Government et al, 2007). The INSPIRE process has facilitated the development of a formal national SDI and in December 2008 the Danish Parliament adopted a new law concerning the setup of an Infrastructure for Geographic Information, so geographic information is now considered as a key component in e-Governance (Danish Government, 2008).

Registration of rights of real property has been known in different forms in Danish law for more than 800 years. The present registration system bases on The Act of Registration from 1926 with later amendments. In the period 1926-2006 only few or minor amendments of the Act of Registration have been made, among others in relation to a conversion of the Land Register to digital form in 1992. In 2006, however, a radical amendment was made, and the demand for digital registration became a reality from 2008 (Mortensen, 2007)(National Survey and Cadastre et al, 2010).

3.1 Basic architecture

The introduction of digital registration only meant few changes in the material rules on the legal effects of registration. On the other hand a number of formal rules were changed due to the fact that all documents had to be notified in digital form with effect from September 2009 – either via an Internet-based portal solution or through electronic system-to-system communication between the registration system and professional trade solutions. After September 2009 rights of real property cannot be notified for registration by use of paper documents. The basic architecture is illustrated in fig. 3.

Amendments to the Act of Registration and implementation of the concept of digital registration make new demands on the users of the land register information and the actors who contribute to the continued maintenance of the land register.

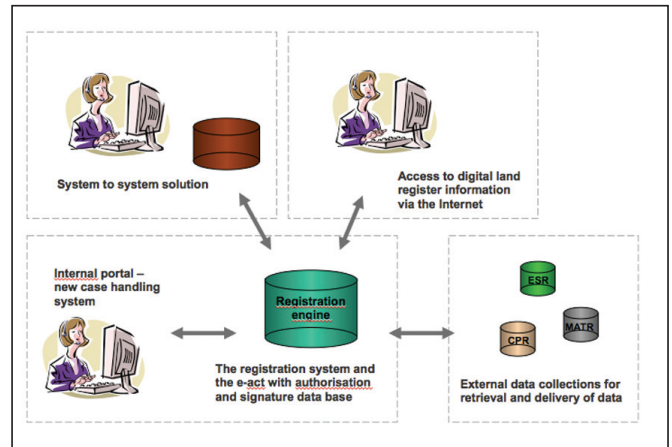


Fig. 3. Registration – basic IT architecture

3.2 Location of easements

As a stage in the introduction of digital registration provisions have been entered into the Act of Registration, which concerns a demand for geographic location of easements. The location of easements primarily has to document the situation out of consideration for legal and judicial matters. It is also essential that the registration are regarded in relation to the rest of the property field and the infrastructure for maps and geo-data, a relation, which will support that the location remains up-to-date.

Location of easements has to meet three purposes:

- To secure and document the state of the law at the property, including the geographic delimitation of easements
- To inform rights holders, rights obliges and others about the state of the law
- To secure that information about the state of the law is updated and coherent with other information regarding utilization of real property.

To handle the located easements a digital location database (SFDB) is implemented. SFDB makes available a number of services as means of handling the locations related to the registration processes. Furthermore SFDB can be considered a genuine "network service" which is put at the disposal of the actors who notify registration of ease-

ments – for example chartered surveyors in private practice.

When registering a new easement, three documents have to be prepared:

- The notification including easement text, possible power(s) of attorney and digital signature
- e-sketch (portable document format) – presenting the situation of the easement on the cadastral map
- File in GML-format (Geography Markup Language) – as identification of the location

3.3 The user interface

With the introduction of the electronic registration system a categorization of easements is introduced at the same time. This categorization also has to appear from the location, and it is the responsibility of the notifier that the correct category is put on the easement as well as the location. The categories are introduced to support the visualization of the information in the user interface, and it will also be an extremely useful tool at the identification of for example registered utilities, buildings on hired property and in GIS analyses.

To present the information from the location database a web feature service (WFS) displaying the located easements has been built up. The service makes it possible for the user of the registration system as well as the plot owner to get a survey of the easements published on the single property. Digital registration of property is one among a number of national e-services having access via the national front-end portal for citizens: Borger.dk (www.borger.dk). This portal is on one hand an entrance to general information about public service linking to the relevant websites. Secondly Borger.dk delivers targeted information to the individual citizen by the use of a personal sign-on.

4 Value of spatial enablement

The OECD emphasises how the member countries increasingly are focussing their

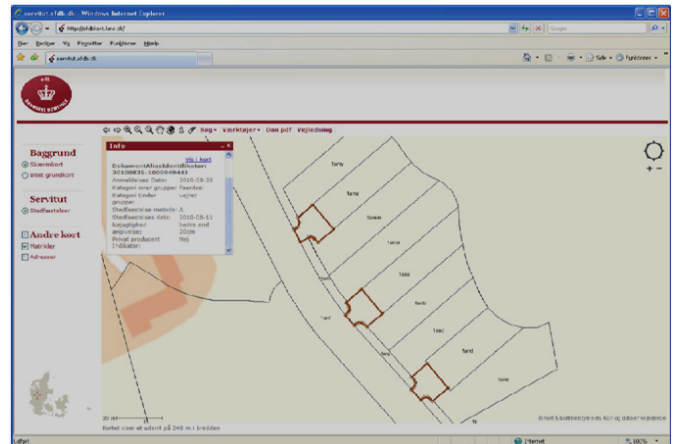


Fig. 4. Visualisation of located easement (www.tinglysning.dk)

efforts to broaden the focus on e-Government programs to enhance its value as a driver to enhance efficiency and effectiveness, while sustaining on going service delivery improvement (OECD, 2010). The concept of spatially enabled governments concerns establishing “an enabling infrastructure that will facilitate the provision of the place or location to all human activities as well as government actions, decisions and policies” (Masser et al, 2008). This vision is referring to the understanding of location and spatial information as common goods made available to citizens and business to encourage creativity and product development.

4.1 Value of geographic information

Dealing with assessment of the value of geographic information Loenen et al (2009) refer to Longhorn and Blakemore (2008), who identify different components of the value of geographic information (Longhorn et al, 2008): Value of the location attribute, time independency and cost savings as well as value due to giving data a legal status, network effects and quality of datasets. Loenen et al points out how defining value is difficult in general as it is a subjective term that relates to different jurisdictions dealing with various aspects of value as commercial, economic or socio-economic value and non-commercial value as well (Loenen et al, 2009).

As pointed out by Enemark and Rajabifard (2011) spatial enablement allows business transactions to be linked to a place or location and further facilitates the evaluation and analysis of relationships between people, business transactions, and government. In this respect one of the key objectives of the SDI as enabling platform is to facilitate the interoperable environment through the ability to integrate multi-source datasets (Masser et al, 2008). Though, even if it is possible to identify different components of value of geographic information assessing value of services regarding its geographical components is complex and depending on the actual use context (Masser et al, 2008). Furthermore the major challenges in implementing such a spatially enabling platform seems not to be technical, but institutional, legal and administrative in nature (Masser et al, 2008).

UN points out that a by-product of the focus on the value for citizens is the recognition that an increase in the value of services is not possible without consolidating the way the back-end systems and processes work to bring about the front-end service delivery (United Nations, 2008). So it is emphasised how an effective connected government is about a "bigger and better" front-end with a "smaller and smarter" back-end. Masser et al (2008) stresses how the SDI as an enabling platform based on interoperability architecture will be the main gateway to discover, access and communicate spatially enabled data and information about the jurisdiction. In addition to data it will also be possible to share business goals, strategies processes and value added products.

4.2 Back-end processes and front-end delivery

To be able to frame some of the complexity of the government-as-a whole concept and operationalize the understanding of digital government aspects related to matters of value and usability and at different levels of a spatially enabled environment the concept of front-end verses back-end proces-

ses can be elaborated due to the need for distinguishing (Schroeder et al, 2011):

- Back-back-end processes – referring to the basic infrastructural elements handled by professionals insuring central SDI-aspects as basic data sets, interoperability and quality
- Back-end processes – referring to e-Administration understood as typical e-Government functions which normally do not interact with outside entities
- Back-end/front-end processes – referring to e-Services mostly used by professionals and linked to back-office administrative functions within governmental organisations
- Front-end processes – referring to front-office e-Services designed for citizens and business which also can be related to the concepts of e-Democracy

Referring to this understanding the case of the national effort of digitising the registration procedures regarding property rights in Denmark will be used to illustrate central aspects of spatial enabled digital government.

As illustrated by figure 5 different aspects of digital government central elements of the system can be distinguished:

- Basic spatial datasets – related to back-back-end SDI-processes ensuring interoperability and data quality by providing national basic datasets as the cadastral parcel from the land register
- System to system solution – back-end process handling the located easements by means of a digital location database, which makes available a number of services for administration of the registration processes.
- Case handling system/internet portal – back-end/front process characterised by the property right Internet portal (tinglysning.dk) in the front-end giving access to the electronic registration system lin-

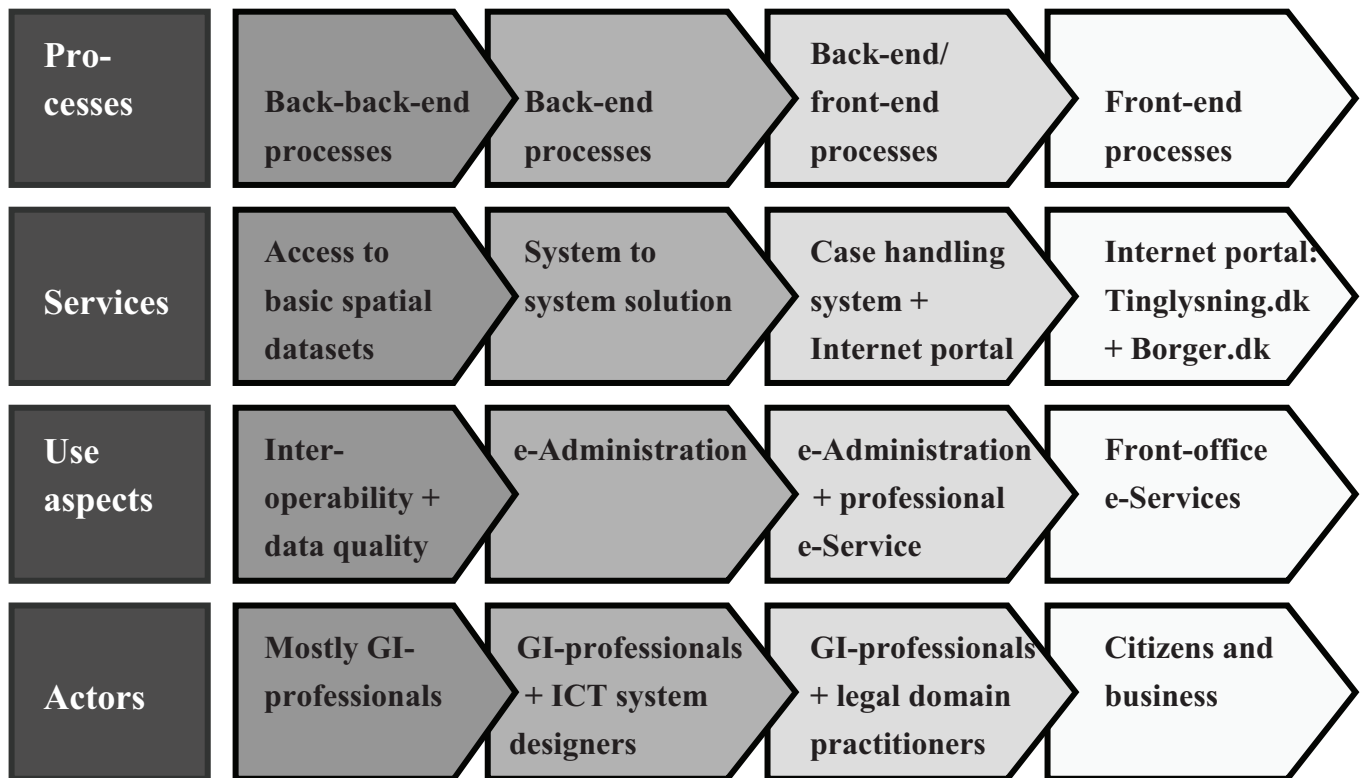


Fig. 5. Aspects of a value chain referring to the processes from back-end basic infrastructures to front-end services

ked to the digital location database in the back-end.

- Front-end internet portal (Tinglysning.dk/Borger.dk) – the character of the front-end process is illustrated by the citizens portal (Borger.dk) functioning as the main public e-government entrance linking to diverse national e-services – among others the portal for e-registration of property giving access to a survey of easements related to a single property.

The model above (fig. 5) illustrates the central role of GI-professionals as main actors in use and development of the back-end of system. During this first iteration of an ongoing system development process it has been a great challenge to create the necessary spatial awareness to be able to re-engineer traditional procedures of the back-end as well as fulfilling usability demands at the front-end. Though, it is obvious how this kind of functioning prototypes is a must when trying to make the visions of a spatially enabled digital government tangible for

citizens, professional parties and policymakers.

4.3 Next step

Considering the next iteration the Danish strategy for the further development of digital government for the period 2011-2015 illustrates how the spatial awareness has increased and the need for administrative and geographic basic datasets is regarded as a central aspect of facilitating the future well fare of in the society (Danish Government et al, 2011). Special attention is given to:

- Further development of authorised basic spatial datasets
- Facilitation of common distribution of basic datasets
- Ensuring reuse of data for instance diverse spatial data as property data, building data and address data
- Improved and qualified basic data as a means of developing e-services for enterprises and citizens

- Strengthening the focus on developing and implementing self service solutions

In general the increased access and use of spatial data in our private and professional lives makes the potential of spatial information more and more visible to citizens as well as professional parties as it is pointed out by Enemark and Rajabifard (2011). As emphasised by Schellong the complexity of issues in modern society furthermore leads to an increased focus on the role of networks of government, citizens, and business as means of achieving a higher level of public value (Schellong, 2011). Though, being able to reach this phase of transformation (fig. 1) understood as the level of digital government where service innovation is pursued "across a broader prism of community and democratic development through more networked governance patterns" (United Nations, 2008) demands a change in the way citizens and businesses interact with the system (cultural leap) as well as new ways of conceptualising public service delivery and governance patterns (political leap) as pointed out by Nielsen (2011).

5 Conclusion and perspectives

Considering the implementation of digital administrative government systems in the light of the visions of e-government-as-a-whole and spatially enabled government a number of challenges remain. Dealing with the further development of e-registration of real property rights a central task is to re-engineer existing e-services due to the usability needs of the end user to provide easy access to information. Furthermore there is a need for refining the system-to-system-solutions to be able to communicate more efficiently. A number of fundamental functionalities are still lacking due to the vision of a full digital enhancement of the process of handling easements in the real property rights system.

As illustrated by the Danish strategy for the further development of digital government for the period 2011-2015 the spatial aware-

ness has increased and the need for administrative and geographic basic datasets is now considered a key issue of facilitating the future well fare of in the society. The focus on reuse of data, on improving and qualifying basic data as a means of developing e-services for enterprises and citizens, and on developing and implementing self-service solutions emphasises the specific responsibility of the GI-community as central actors of the innovation process towards the spatially enabled digital society.

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