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Awareness - A Tool for Investigating Inter-Organizational Collaboration in Land Administration Systems?

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Awareness – a tool for investigating inter-organizational collaboration in land administration systems?

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Contents

Forword

The present PhD thesis titled "Awareness – a tool for investigating inter-organizational collaboration in land administration systems?" was carried out between 2005 and 2008, under the supervision of Professor Stig Enemark from Aalborg University, and Special Consultant Knud Villemoes Hansen from The Danish National Survey and Cadastre.

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Acknowledgements

Abstract

The societal focus of land administration systems has changed over time. These years many systems are changing towards a paradigm concerning the spatially enabling of government, and to make the "where" provided by spatial information a common good. This development are both driven by a technology push, and a market pull. The technology push regards internet, databases, modeling, standards, open systems, GIS, and a general growing demand for new services. The market pull regards e-governance, sustainable development, electronic conveyance, and integration of public data and systems. This means that public organizations administrating land are being required to move from a single-purpose perspective to a multi-purpose perspective. Instead of focusing just on a specific function in the administration of land, organizations now also have to focus on making land information, expertise and services available to other governmental organizations and to the wider society. The multi-purpose perspective hence concern a land administration system, whose parts in close interaction enable government to organize its businesses and processes around "place", and to support public society with tools to use "place" as the central entry to information.

Inter-organizational collaboration is the key to the development of multi-purpose land administration systems. Different organizations from various jurisdictions need to work together closely when agreeing on how they will jointly register, store, use and share data and how they will make their data available to the wider society. This collaboration is generally regarded as very difficult. In particular, organizational issues are considered one of the key fundamental constraints to inter-organizational collaboration.

In the spatial community, the term awareness is often used when discussing issues concerned with inter-organizational collaboration. Awareness towards other organizations, and the role the organizations play in society is regarded as an important tool for overcoming constraints to inter-organizational collaboration. However, a major problem by using the term awareness in discussions of inter-organizational collaboration is that awareness is undefined and often misused as a term in the spatial data handling community. The (over)-use of the term awareness, without having a rigorous definition to rely upon increases the difficulty of understanding and developing collaboration issues. The difficulty in quantifying and describing issues in collaboration make the development of effective spatial data infrastructures problematic since this development should be based on a conceptual framework that clearly addresses the problems spatial organizations currently encounter.

As a result, the focus of this PhD thesis is on the nature and role of awareness. It explores why and how awareness plays a fundamental role in overcoming organizational constraints and in developing collaboration between organizations in land administration systems. The thesis discusses the concept of awareness in the area of organizational collaboration in land administration systems, and explains the important role awareness plays in the development of multi-purpose land administration systems. Furthermore, since people in the land administration community often refer to the existence of awareness as a success criterion for the development

of inter-organizational collaboration, the thesis looks at the various factors that affect the degree of awareness in an organization in order of developing a methodological framework for analyzing collaboration in land administration systems. The developed methodology is tested on four cadastral systems (Victoria, Western Australia, The Netherlands and Denmark).

Resumé

Det samfundsmæssige fokus indenfor land administrations systemer har ændret sig over tid. I disse år retter mange systemer sig således mod et paradigme, der i langt bredere forstand end tidligere indbefatter "stedet" som indgang til information på tværs af den offentlige sektor og i samfundet generelt. Overordnet set er denne udvikling drevet både af en teknologisk udvikling og en række krav fra markedet. Den teknologiske udvikling omfatter udviklingen inden for internettet, databaser, modellering, standarder, åbne systemer, GIS, og et alment øget krav til nye services. Markedskravet retter sig mod fokus på digital forvaltning, bæredygtig udvikling, elektronisk tinglysning, samt integration af offentlige data og systemer. Dette betyder at offentlige organisationer indenfor land administrations systemer nødvendigvis må flytte deres fokus fra et mono- til et multifunktionelt perspektiv. I stedet for at hver organisation fokuserer på enkeltstående funktionaliteter indenfor land administrations systemet, må organisationerne nu også fokusere på at lade land information, ekspertise og services være tilgængelig for andre offentlige institutioner og samfundet i al almindelighed. Det multifunktionelle perspektiv omhandler således et land administration system, hvis dele i tæt sammenhæng sætter den offentlige sektor i stand til at organisere sine forretninger og processer omkring "stedet", samt støtter offentligheden med værktøjer, der bruger "stedet" som en central indgang til information.

Nøglen til udvikling af multifunktionelle land administrations systemer ligger indenfor inter-organisatorisk samarbejde. Forskellige organisationer fra forskellige områder må arbejde tæt sammen i forhold til at beslutte hvordan de sammen vil registrere, opbevare, bruge og dele data, og i forhold til hvordan de vil gøre deres data tilgængelig for samfundet. Inter-organisatoriske samarbejder anses dog generelt for at være meget vanskelige at gennemføre på baggrund af en række organisatoriske forhindringer fx værn om magt og ressourcer. I forhold til at overkomme disse forhindringer, benyttes begrebet "awareness" ofte i den engelsksprogede fagverden. Det anses således som vigtigt at have "awareness" mod andre organisationer og den rolle organisationerne sammen spiller i samfundet. Begrebet er dog vanskeligt at benytte i forhold til at diskutere inter-organisatorisk samarbejde, da begrebet er udefineret og ofte misbrugt som en term blandt folk i land administrations systemer. Brugen af termen uden en stram definition øger således problemerne ved at forstå og udvikle inter-organisatorisk data infrastrukturer og samarbejder på land administrations området, da disse samarbejder burde være funderet på et konceptuelt grundlag, der klart adresserer de problemer som land administrations organisationer oplever.

Som et resultat heraf vil denne Ph.D.-afhandling fokusere på karakteren og rollen af "awareness". Afhandlingen vil undersøge hvorfor og hvordan "awareness" spiller en fundamental rolle i forhold til at overkomme inter-organisatoriske forhindringer mellem organisationer. Afhandlingen vil diskutere konceptet "awareness" indenfor land administrations systemer, og forklare den vigtige rolle begrebet opfylder ved udviklingen af multifunktionelle land administrations systemer. Yderligere vil det blive undersøgt hvilke faktorer, der påvirker graden af "awareness" i et system, i forhold til at udvikle en metode til at bruge "awareness"

som fundament til at evaluere inter-organisatoriske samarbejder indenfor land administrations systemer. Den udviklede metode vil blive testet på fire matrikulære systemer i henholdsvis Europa (Holland og Danmark) og Australien (Victoria og Western Australia).

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List of acronyms

3D	3-Dimensional
CAD	Computer Aided-Design
DCDB	Digital Cadastral Database
DLI	Department of Land Information
DSE	Department of Sustainability and Environment
GI	Geographic Information
GIS	Geographical Information Infrastructure
GPS	Global Positioning System
HR	Human Resource
ICT	Information and Communications Technology
INSPIRE	Infrastructure for Spatial Information in Europe
IT	Information Technology
LAS	Land Administration System
NSDI	National Spatial Data Infrastructure
RRR	Rights, Restrictions and Responsibilities
SDI	Spatial Data Infrastructure
SLIP	Shared Land Information Platform
SII	Spatial Information Infrastructure
VGSC	Victorian Government Spatial Committee
VROM	Ministry of Housing, Physical Planning and Environment
VSC	Victorian Spatial Council
VSIS	Victorian Spatial Information Strategy
WALIS	Western Australian Land Information System

1   Introduction

1.1   Sharing and inter-organizational collaboration

The concept of land is complex. Land may be understood as a physical space, a commodity, a resource, a factor of production, a community etc. The variety of concepts of land is unlimited and dynamic due to the general development and trends in society. Consequently, the administration of land has changed over time. Taking Western land administration systems as an example, the people to land relationships have according to Ting and Williamson (1999) affected the broad design of land administration systems through four main stages: A Fiscal/Juridical Stage (up to late 1700's), a Land Transfer Stage (late 1700's to WWII), a Planning Stage (Post WWII and Post War reconstruction), and a Multi-Purpose stage (1980's onwards).

Whereas the development of land administration systems hence goes back centuries, the systems have undergone some of the biggest changes in the last 10-15 years. The future paradigm is thus about spatially enabling of government, and to make the "where" provided by spatial information a common good. This development is both driven by a technology push, and a market pull. The technology push regards internet, databases, modeling, standards, open systems, GIS, and a general growing demand for new services. The market pull regards e-governance, sustainable development, electronic conveyance, and integration of public data and systems. This means that public organizations administrating land are being required to move from a single-purpose to a multi-purpose perspective. Instead of focusing just on a specific function in the administration of land, organizations now also have to focus on making land information, expertise and services available to other governmental organizations and to the wider society. The multi-purpose perspective hence concern a land administration system, whose parts in close interaction enable government to organize its businesses and processes around "place", and to support public society with tools to use "place" as the central entry to information.

Sharing of data is one of the keywords in this process. Through efficient and effective spatial data infrastructures (SDIs), land administration organizations can effectively handle land information data in and between the organizations. SDIs allow easy access, smooth sharing and seamless integration of data, both internally in the organizations and externally towards other governmental institutions, private branches and ordinary citizens. SDI is thus generally understood to be "a framework continuously facilitating the efficient and effective generation, dissemination, and use of needed spatial information within a community or between communities" (Van Loenen 2006).

However, if land information is to be set free in a multi-purpose perspective, it relies on the transition from a technical to a multi-discipline environment combining public policy, law,

and public administration, with technical competences (Williamson et al. 2007). A crucial focal point in this regard concerns inter-organizational collaboration. Since land management often happens in organizationally fragmented environments, sharing of spatial data requires high levels of inter-organizational collaboration. Organizations administrating land must change their focus from data handling in isolated organizations that fulfill sharply outlined tasks – "silo thinking" – to service orientated, modern organizations that deliver land information to the wider society in close contact with other governmental organizations. Different organizations from various jurisdictions and ministerial sectors must commonly agree on how to register data, store data, share data, and handle the processes that make this possible both internally and externally. Collaboration, in the broad sense of the process by which organizations work together to accomplish a common mission is hence essential when organizations need to work together closely. Organizations must commonly agree on how they will manage the land administration functions of land tenure, land value, land-use and land development, and, equally important, on how they will make this information available to the wider society in order to encourage creativity, efficiency and productive development among citizens and businesses.

However, inter-organizational collaboration is generally regarded as a difficult task (Onsrud and Rushton 1995b). A number of barriers exist on both the individual, organizational and systemic level. Such barriers range from power concerns, to unclear benefits for the organization, and to lack of overall political focus. Consequently, the organizational demands of a multi-purpose paradigm are generally not well met by organizations in land administration systems. In many systems, the organizational structures and inter-organizational relations still build on a culture that legitimizes organizational entrenchment. Ultimately, the societal demands for change towards a multi-purpose paradigm among the land administrating organizations cannot be fulfilled until the organizations change the perspective towards more inter-organizational collaboration.

1.2   Awareness as a tool

When analyzing scientific literature in the field of spatial information, the existence of "awareness" is often regarded as a mean to overcome barriers of inter-organizational collaboration. Awareness is seen upon as a success criterion for the development of inter-organizational collaboration among researchers in the land administration community as expressed in many statements: Awareness is e.g. regarded as essential when developing the maturity levels of inter-organizational collaboration (Van Loenen 2006). Furthermore, awareness is regarded as a key factor in realizing the advantages of collaboration in spatial data infrastructures (SDIs) and a way of speeding up its development (Rajabifard 2003;Rajabifard et al. 2002;Rajabifard and Williamson 2001). Moreover, awareness of the potential opportunities by geographic information technology is regarded to play a critical role in the development of national geographic information strategies (Craig 1995;Masser 1998;Williamson 2003).

While none of the researchers in the land administration community actually define awareness, it becomes clear, when analyzing literature and the general use of the concepts in the community at conferences etc., that two kinds of awareness seem to be necessary regarding awareness as a promoter for inter-organizational collaboration. Firstly, the involved organizations need to be aware of the existence and relevance of each other's functions and responsibilities in order to develop effective, collaborative relationships. Secondly, the organizations in common need to be aware of the potential social, economical and sustainable opportunities that the organizations together possess in terms of interacting with the organization's external environment. The two kinds of awareness may be addressed as internal and external awareness, see figure 1.1.
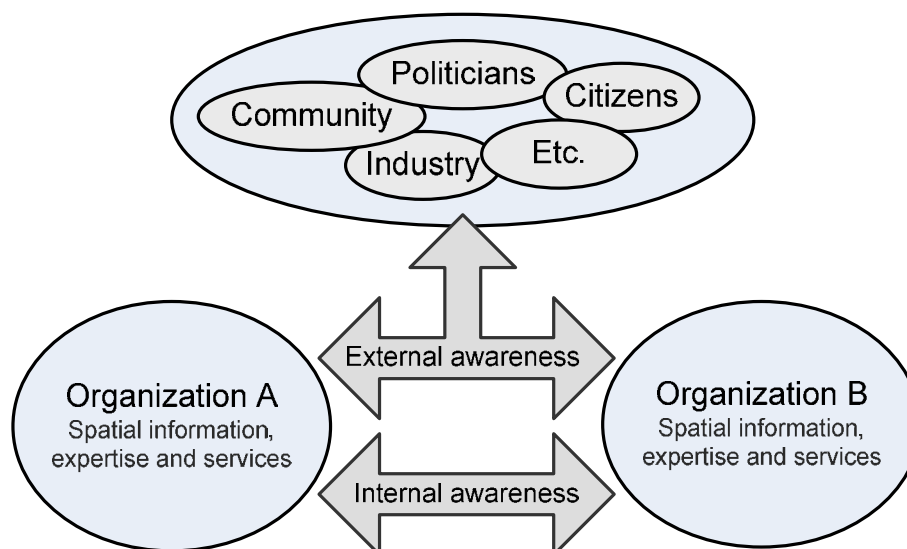
Figure 1.1 Internal awareness concerns inter-organizational relations, while external awareness concerns the organization's relation to the external environment

However, the question is what awareness actually means in relation to organizational collaboration? In order to answer this question, the below sections will introduce some of the definitions and models of awareness – both in a general context and in an organizational context.

1.2.1   Introduction to awareness

On a general level the Oxford American Dictionary of Current English defines "aware" as being "conscious; not ignorant; having knowledge". In the field of psychology, awareness can on the personal level be defined as being "… awake to reality, to recognize the situation in which one exists" (Oden 1969).

In an organizational context Alter and Hage (1993) support the above meanings of awareness as knowledge and recognition in their book "Organizations working together". Here, the authors

focus on awareness between organizations and argue that awareness is the main precondition for developing collaboration among organizations in an inter-organizational network. From one organization to another there should exist awareness of other organizations needs and "a perception that they in some way are compatible with ones' own". Hall (1996) supports Alter and Hage's definition of awareness on the inter-organizational level by defining awareness as "the recognition of other organizations and the recognition by organizational representatives that their organization is interdependent with other organizations in their field."

More specifically, Van de Ven and Ferry (1980) have built a model that presents an understanding on the importance of awareness when developing inter-organizational relationships, see figure 1.2.
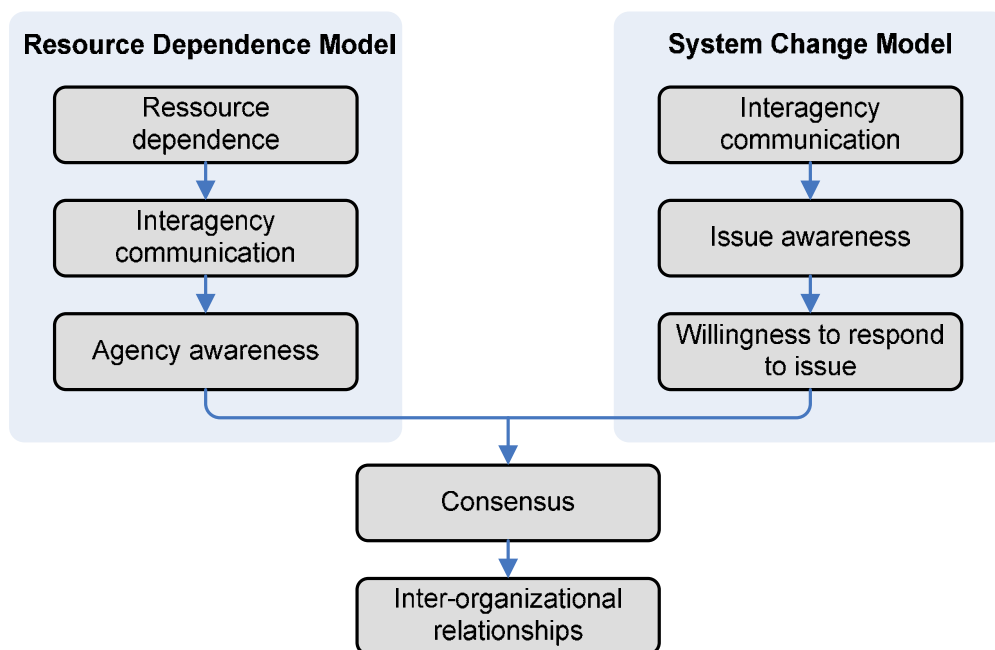
Figure 1.2 Awareness is important both within and between organizations, when organizational changes occur (Van de Ven and Ferry 1980)

Figure 1.2 displays on the left – the resource dependence model – how awareness is essential in the acknowledgement of an organization's resource dependency of other organizations and on the right – the system change model – how awareness can lead to actual system changes towards increased organizational collaboration.

Both the resource dependence model and the system change model emphasize the importance of interagency communication. In the resource dependency model, acknowledgement of resource dependency leads to interagency (or inter-organizational) communication, which again leads to awareness of other agencies. The system change displays how inter-agency communication develops awareness on a specific issue and increases the willingness in the organization to respond to this issue.

Alter and Hage (1993) supports this view by arguing that awareness is central in the strengthening of inter-organizational networks in the way awareness promotes willingness to collaborate and develop trust among organizations. Alter and Hage see willingness and trust as the basic conditions for the development of inter-organizational networks because it changes the normal perceptions of cost and benefits. It requires that organizations "concerned with their own prosperity and survival, share resources and work with other organizations…" (Alter and Hage 1993)

In summary, awareness is on the general level closely related to knowledge and recognition between two participants. In the specific field of organizational collaboration, several authors suggest that awareness is very important to the relationship between organizations. Awareness in an inter-organizational sense is about organizations having knowledge of other organizations purpose and role and on how their organization is interdependent with other organizations in their field. Furthermore, awareness is seen as fundamental to the development of organizational relationships because it affects trust between organizations, the willingness to work together, and the organizations understanding of mutual interdependency.

1.3   Research focus

While the above sections have argued that awareness indeed is a an important factor when developing inter-organizational relationships, a major problem by using the term awareness in discussions of inter-organizational collaboration is that awareness is undefined and often misused as a term in the spatial data handling community. The previous cited authors drawing on awareness recognize the term widely, but do, as mentioned, not define the concept. Additionally, awareness seems to have a "buzz-word"-status in the broader spatial field. An investigation on the frequency the words "awareness" and "spatial data" occur on the same website thus comes up with 357.000 hits (www.google.com, 16th of March 2006). Whereas this investigation may not be scientifically rock solid, a closer investigation of the sites come up with such various use of awareness as "awareness courses on national spatial infrastructures" (United Nations 2006), "GIS awareness booklets" (GeoData Institute 1993), and the use of awareness as a social indicator for studying the INSPIRE geo-portal (Crompvoets et al. 2004).

The use of the term awareness, without having a rigorous definition to rely upon, increases the difficulty of understanding and developing collaboration issues. The difficulty in quantifying and describing issues in collaboration makes effective sharing of spatial data difficult since this development should be based on a useful conceptual framework that clearly addresses the problems spatial organizations currently encounter.

As a result, the focus of this thesis is on the nature and role of awareness as a tool for overcoming problems with inter-organizational collaboration in the spatial sharing community. The thesis will use land administration systems as the overall discipline for investigating awareness. Land Administration Systems is defined as the social, legal, economic and technical framework within which land managers and administrators must operate when determining,

recording and disseminating information about the ownership, value and use of land when implementing land management policies (United Nations 1996). More specifically four cadastral systems in the developed part of the world will be used as a case for investigating awareness in this thesis (see chapter 7). Cadastral systems are defined as the cadastre and the land tenure parts of land administration systems. Cadastral systems have been chosen as a case because of the relatively defined organizational boundaries of these systems, and because of the authors' relation to this field through his daily position in the organization of The National Danish Survey and Cadastre.

Additionally, whereas the overall focus of this thesis is on the nature and role of awareness, the specific focus on awareness in this thesis will be on the use of awareness as an evaluation tool. Awareness thus has an interesting nature since it apparently is a precondition for developing collaboration among organizations and for creating the knowledge base required to take use of the data in the organizations beyond the boundaries of the organizational networks. Awareness hence seems to be suitable for investigating the *potential* of developing collaboration in inter-organizational networks and for making the organizations set eyes on the broader use of their data. If we look on the case of cadastral systems, a focus on the potential for development of multi-purpose cadastral system is today of more interest than the actual function of the systems in a traditional manner. Several countries in the developed world thus have very efficient existing cadastral system that fully comply with the distinctive function of a cadastral systems in term of securing rights and restrictions on land. A number of countries have however today only started developing fully multi-purpose cadastral systems founded on highly developed SDIs and understanding of the broad benefits from spatial data. Can this be explained through inefficient levels of awareness on the inter- and extra-organizational level?

Moreover, the focus of the investigations in the cadastral case studies will primarily be on the policy and management group, in order of providing answers as close to the overall organizational policies as possible. Technicians from the operational parts of the organizations will be deselected because of the policy-orientated focus.

The overall focus on this thesis will therefore be a study of whether and how awareness may be used as an evaluation factor in terms of investigating the potential development of inter-organizational collaboration in land administration systems, using cadastral systems as case, focusing on policy and management groups within the organizations.

1.4   Aims and preconditions

When outlining the aim of the thesis it is important to recognize that the areas of awareness and inter-organizational collaboration are very complex. As stated in the above investigations on how the concept of awareness is being used in literature and in general in the community, awareness is multi-faceted and is being used in a number of different ways. The general aim

will therefore be to develop an overall representation of the reality of awareness in the context of organizational relationships that could form the foundation for further research when investigating the nature and role of awareness.

Furthermore, it is important to recognize that the overall purpose for building an awareness evaluation model not is to build a framework that enables a comparative evaluation of cadastral systems in different countries. Instead, the aim is to provide an insight within each of the countries' cadastral systems. The aim is to provide a tool for individual evaluations – a tool that from an awareness perspective can act as an introduction to some of the aspects that constrain inter-organizational collaboration within individual cadastral systems.

Lastly, it is important to acknowledge that awareness is relative. What seems as a low degree of awareness in one organization may prove to be high in another. A certain degree of awareness can indicate possible problem areas within the single inter-organizational network, but it will be methodologically wrong to compare levels of awareness between networks. Awareness can only be measured in terms of the context it exists within. This also means that it is impossible to measure the exact degree of awareness in an organization. Like other signs of organizational efficiency, e.g. organizational adaptability, awareness must be measured indirectly by defining indicators of awareness in organizations through the existence of a number of adjoining factors.

1.5   Research contribution

While we found that there only exists a very limited amount of literature on awareness in the spatial data community, we do already find literature that take an evaluative focus in the handling of spatial data between organizations, both in general and in the specific area of land administration systems. The below review will clarify how the focus on awareness as an evaluative factor can contribute to the existing knowledge in the field.

The focus on evaluation models, focusing broadly on spatial data sharing, seemed to begin in the mid-nineties. The initiative that apparently started the discussions was the publication of the multi-disciplinary "Sharing geographic information" edited by Onsrud and Rushton (1995a). This publication with contribution from more than 30 researchers, focused on multiple aspects of data sharing both from a theoretically and a practical angle. Among the many general models of data sharing in the publication (e.g. Calkins and Weatherbe 1995;Pinto and Onsrud 1995) we find Kevany's "Proposed structure for observing data sharing" (1995), that by focusing on nine issues of sharing (sharing classes, environment, need, opportunity, willingness, incentive, impediments, technical capability and resources) provides a framework for evaluating data sharing. The strengths of the framework is its very comprehensive list and description of factors and the way the framework provides a useful method for rating the different factors and thus giving an overall presentation of data sharing. The limitations of the framework is however that it not establishes any links between the different issues or build any hypothesis on the importance of the issues in order to facilitate or obstruct sharing of spatial data, and that the

focus not lies specifically on inter-organizational networks. Furthermore, Kevany bases the framework on personal experience and do not support it by theoretical foundations (McDougall et al. 2006).

In the years after 1995, several other models of data sharing comes up, e.g. Nedovic-Budic and Pinto's (1999) model based the constructs of context, motivation, mechanisms and outcome, and Wehn de Montalvo's (2003) model on willingness to share data across organizational boundaries. As these models, along with the other models from the 1995 publication provides a very useful insight in the issues that effect data sharing and inter-organizational collaboration, none of the models have a clear evaluative focus.

To find recent evaluation frameworks, we will have to move on to Warnest's research (2005), where he discusses the need of inter-organizational collaboration in building national SDI in federated countries. Warnest evaluates in parts of the Australian spatial data sharing system, a number of issues that form collaboration strategies in national SDIs: Purpose/basis for collaboration, mutual benefit, informal collaboration, formal collaboration, outcome and stages of collaboration. The strength of his evaluative framework is the coherent approach to issues that affect data sharing and the extensive list of hypothesis he lines up. His research does however not aim intensively at the preconditions for developing inter-organizational collaboration, but more on the different kinds of collaboration that are important in developing national SDIs, which makes the models hard to use in the evaluative inter-organizational context land administration systems.

If we go into the specific area of land administration systems, we find only a few examples of evaluation frameworks. E.g. Mulolwa (2002) who through a number of logically developed indicators develops a generic framework with indicators structured into four main areas. The areas cover organizational, financial, legal, and technical aspects. He then applies a simple 3-level scoring system (worst to best) for each indicator, give weights to each aspect, and is thus able to rate a whole land administration system and identify its strengths and weaknesses. However, looking into the organizational component, we find that inter-organizational collaboration not is regarded as a subject for analysis, besides that the roles and relations of the organizations should be clearly defined.

Another example of an evaluation model within land administration systems is Steudler's (2004) research on methods for evaluating the overall field of land administration systems. Steudler focuses on four evaluation levels: Policy, management, operational and external factors, from which he builds an evaluation model that he tests on four European countries. The strengths of Steudler's model are the comprehensive list of factors to affect the function of land administration systems supported by examples of good practice. While the management level of Steudler's model do state cooperation and communication between the organizations in a land administration system as important, the model do not go further into investigating what role inter-organizational collaboration plays to the function of land administration systems.

In summary, it seems that while there do have been developed evaluation models in both the general area of data sharing and the specific area of land administration systems, none of

the models take awareness (or the like) into account, and none of the evaluative models look specifically on inter-organizational networks and sharing in this environment. An investigation of awareness as an evaluation factor for inter-organizational collaboration in cadastral systems and for investigating the organization's focus on external use of data hence seem to be able to contribute to the existing knowledge in the field.

1.6   Research questions

From the problems and focus discussed in the above, the overall research question of this thesis will therefore be:

Can awareness be the area for investigating inter-organizational collaboration in land administration systems?

To answer this question, the five objectives of the research are:

1. To *document* whether and how inter-organizational collaboration plays a role in the development towards land administration systems founded on a multi-purpose perspective.

2. To *investigate* and *define* the role and nature of awareness with regard to inter-organizational collaboration.

3. To *develop* an evaluation model for investigating awareness as an evaluation factor for inter-organizational collaboration in land administration systems using cadastral systems as case.

4. To *test* an evaluation model as an evaluation factor for inter-organizational collaboration in land administration systems against four case studies on cadastral systems.

5. To *discuss* the findings of the thesis in order of assessing the broad use of awareness as an area for investigating inter-organizational collaboration in land administration systems.

1.7   Thesis structure

The below table shows the overall structure of the thesis.

INTRODUCTION	**Chapter 1 – Introduction**
- Problem statements	• Background of research
	• Focus
	• Research questions
BACKGROUND	**Chapter 2 – Management and administration of land**
- Current theory	• Nature of spatial information
- Current practice	• Setting the scene on land management, administration and cadastral systems
	• Land administration and inter-organizational collaboration
	• Nature and role of SDIs
	Chapter 3 –Inter-organizational networks
	• The domain, the actors and their relations
	• Facilitators and obstacles to inter-organizational relations
	• Networks structures
METHOD BUILDING	**Chapter 4 – Awareness and other aspects to affect inter-organizational relationships**
- Model building	• Overall model on data sharing
- Development of factors for evaluation framework	• Discussion of aspects to affect inter-organizational relationships
	• Review of willingness, trust and interdependency
	Chapter 5 – Models on awareness
	• Relation between internal and external awareness
	• Models of phases of internal and external awareness
	Chapter 6 – Additional tools for investigating awareness
	• Management communication
	• Organizational structures
	• Visions
	• Inter-organizational coordination bodies

| CASE STUDIES
- Research model
- Design
- Methodology
- Analysis
- Results | **Chapter 7 – Evaluation framework and methodology**
• Evaluation framework
  • Research methodology
  • Research design

Chapter 8 – Case study of Victoria's cadastral system

Chapter 9 – Case study of Western Australia's cadastral system

Chapter 10 – Case study of Netherlands' cadastral system

Chapter 11 – Case study of Denmark's cadastral system |
| SYNTHESIS
- Analysis
- Discussion
- Conclusion | **Chapter 12 – Conclusion and future research** |

Table 1.1 Outline of thesis

1.8   Outline of thesis

1.8.1   Introduction

Chapter 1 – Introduction - Introduces the thesis by raising the importance of awareness as a precondition for developing inter-organizational collaboration in land administration systems. The chapter outlines the focus and aim of the investigations, review existing literature and presents the overall research questions. The chapter ends up with a structure and an outline of the thesis.

1.8.2   Background

Chapter 2 – Management and administration of land – set the scene by introducing the concepts of land management, land administration and cadastral systems. Hereafter, the chapter looks into the development in society that drives the collaborative course of land administration systems. Lastly, the chapter investigates the concept of SDI, both as an illustration of the elements involved when discussing inter-organizational data sharing relations, and in order to clarify how the development in this area also show the increasing need for inter-organizational collaboration within the area of spatially information handling.

Chapter 3 – Inter-organizational networks – shortly introduces the domain and nature of inter-organizational networks in order of characterizing these networks and in order of explaining why organizations engage in networks.

1.8.3 Method building

Chapter 4 – Awareness and other aspects to affect inter-organizational relationships – initially introduces a model to put the concepts of willingness, trust and interdependency into context with awareness. Hereafter the chapter investigates the concepts of willingness, trust and interdependency in relation to their use when analyzing awareness.

Chapter 5 – Models on awareness – develops two models on awareness – internal and external awareness. The chapter firstly develops two general models, secondly the general models are adjusted to the analysis of cadastral systems.

Chapter 6 – Additional tools for investigating awareness – introduces four additional factors when investigating awareness: Management communication, structural analysis, down written visions, inter-organizational coordination bodies. The factors are used when developing the overall analytical framework for analyzing cadastral systems.

1.8.4   Case studies

Chapter 7 – Framework and methodology for evaluation – sets out the research methodology and design for investigating awareness in cadastral systems through a series of case studies.

Chapter 8 – The Victorian cadastral system – performs a case study of the Victorian cadastral system.

Chapter 9 – The Western Australian cadastral system – performs a case study of the Western Australian cadastral system.

Chapter 10 – The Dutch cadastral system – performs a case study of the Dutch cadastral system.

Chapter 11 – The Danish cadastral system – performs a case study of the Danish cadastral system.

1.8.5   Synthesis

Chapter 12 – Conclusion and future research – presents a summary of the major findings, states the success in achieving the research aims, puts the findings in perspective and provides an entry to future research.

2   Management and administration of land

2.1   Introduction

The previous introduction chapter has introduced the overall areas of interest of this thesis – land administration systems, cadastral systems, SDIs and spatially enabling of governments. This chapter will look further into these areas in order of supporting the thesis' discussions on the importance of inter-organizational collaboration in land administration systems.

The chapter will begin by setting the scene by introducing the concepts of land management, land administration and cadastral systems. Hereafter, we will look into a number of the developments in society that more specifically have driven the collaborative course of land administration systems. Lastly, we will investigate the concept of SDI, both as an illustration of the elements involved when discussing inter-organizational data sharing relations, and in order to clarify how the development in this area also displays the increasing need for inter-organizational collaboration within the area of spatially information handling.

2.2   Setting the scene

2.2.1   Spatial data and information

As said, this section set the scene for the area of this thesis: Land management, land administration and cadastral systems. However, before we do this, it is fitting to tie a few words to the concepts of spatial data and spatial information, which often are being used indiscriminately in the spatial community, and to why spatial information often is being regarded as special.

As Wallace et al. (2006) points out "good government is not about having data but about having information". Data and information are hence not the same. The model in figure 2.1 by Bellinger et al. (2004) presents the path from data, over information and knowledge to the initial step of wisdom.
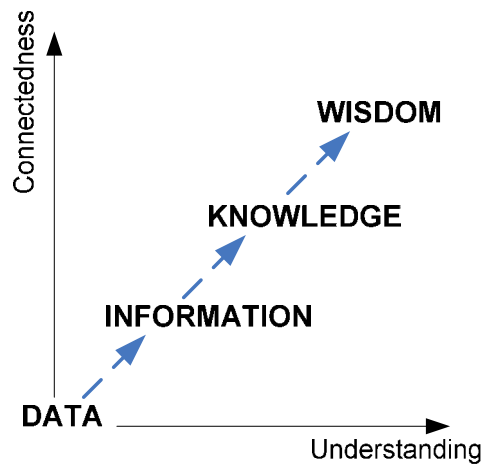
Figure 2.1 From data to wisdom (Bellinger et al. 2004)

Data is a raw representation without meaning, information is data that have been given meaning by putting it into a context, knowledge is information that only is useful to specific tasks, and wisdom provides understanding of previously unknown areas (Bellinger et al. 2004). In this regard it is of interest that Masser (1998) describes information in the spatial data area to be data + metadata.

And information is indeed important. With the word of Williamson (2003), we live in an age of information. Information is being used in a variety of decision-making processes in today's society. Among the different types of information, spatial information plays a special role in the decision-making in society. If we think about it, almost all information is bound to a location: Natural resources have a geographical location, every traffic jam happens somewhere, and daily life is unfolded in certain areas. "Spatial information is critical to promote economic development, improve our stewardship of natural resources, and protect the environment (The White House 1994)." When information not is floating in space but is location bound, it is possible to link information to other activities that occur in the same or nearby location, and take the step from information to knowledge. Now information can go into decision-making processes with help of spatial analysis. It is hence not surprising that many authors (e.g. Longley et al. 2001) argue that "spatial information is special". To put numbers to this statement, estimations state that more than 80 % of government data is geographically located (Rajabifard et al. 2003).

Looking into the nature of spatial information we find that spatial information is diverse. Wallace et al. (2006) list up that spatial information "includes position, time, distance, measurements and relationships of a person, place or thing". However, when referring to spatial information in this thesis, we will (as many other researchers, e.g. Masser 1998; Rajabifard, Feeney, and Williamson 2003) define spatial information as "information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the earth (The White House 1994)."

2.2.2   Land information

The kind of spatial information that relates to the ownership, value and use of land is defined as land information (United Nations 1996). While spatial information thus relate to all information that can be geographically identified, land information relates only to a part of this information pile.

Land information is of special interest since land is the source of all life. On land, we are born, build and live our life. Many authors thus regard land as the most important asset of a society (e.g. Dale and McLaughlin 1999).

Land can be regarded as both a physical commodity and an abstract concept (United Nations 1996). Physically, land provides the base for life and development in a society – today and for the future generations. Throughout the world, there exists a still increasing pressure on land as a resource, caused by increase in population and environmental issues. This asks for a sustainable use of land by the individual owner and an overall planning and regulating policy by the public administration. Abstractly, land is an economic and juridical asset that possesses a certain value or gives right to a certain disposal. Land is widely recognized as being an fundamental foundation for economic development (see e.g. de Soto 2000;World bank 2005).

2.2.3   Land management

The importance of land calls for a sound management of land. However, despite the importance of land management, it is not until recently that an overall conceptual understanding on how land is being managed has been developed. Actually it was not until Enemark et al. in 2004 made use of the United Nations (1996) term on land management ("the activities associated with the management of land as a resource from both an environmental and an economic perspective") that the first broadly used, overall conceptual model relating to more than the land administration functions was build on land management. The authors used the United Nation term to state that land management consists of four general components, which all influence the way management of land is carried out. The four elements are: Country context, land policies, land information infrastructures and land administration functions, see figure 2.2.
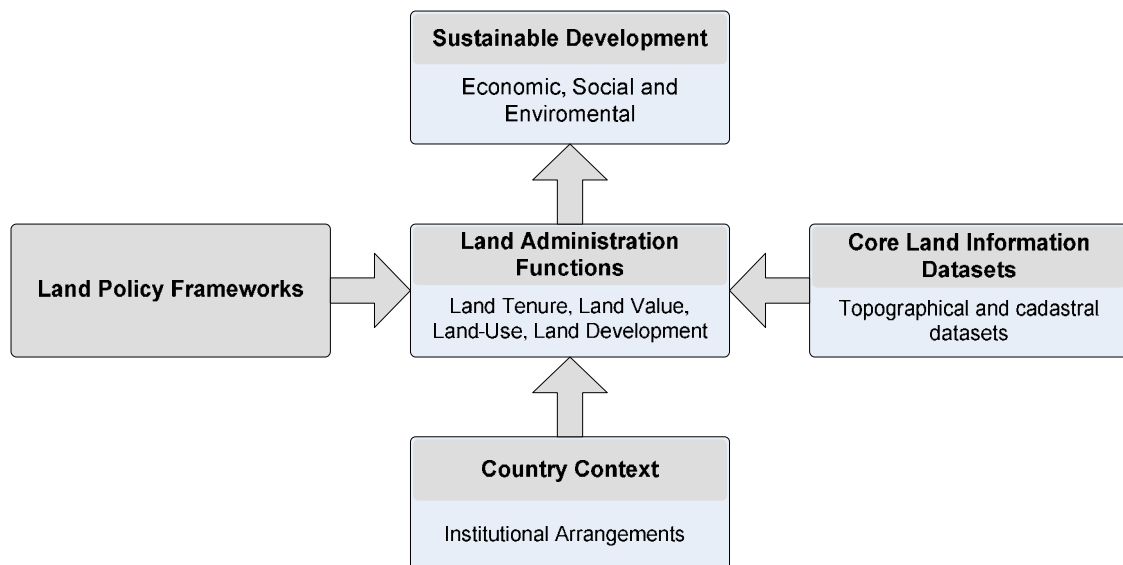
Figure 2.2 The land management paradigm (Enemark et al. 2005)

Country Context is the underlying institutional arrangements (organizational structures) that influence how land administration functions are managed. Enemark et al. (2005) acknowledge with the term country context that the institutional arrangements "differ widely between countries and regions throughout the world, and reflect local cultural and juridical settings".

Land Policy Frameworks are the overall national policies that influence on the management of land.

Land administration functions are the operational components of land management that put the land policies into effect, see figure 2.2.

Land Information Infrastructures are the core cadastral and topographic datasets that land administration functions are based on and that facilitates these functions.

The model in figure 2.3 displays a recent understanding of the overall land management paradigm, and will act as the conceptual foundation guiding this chapter.
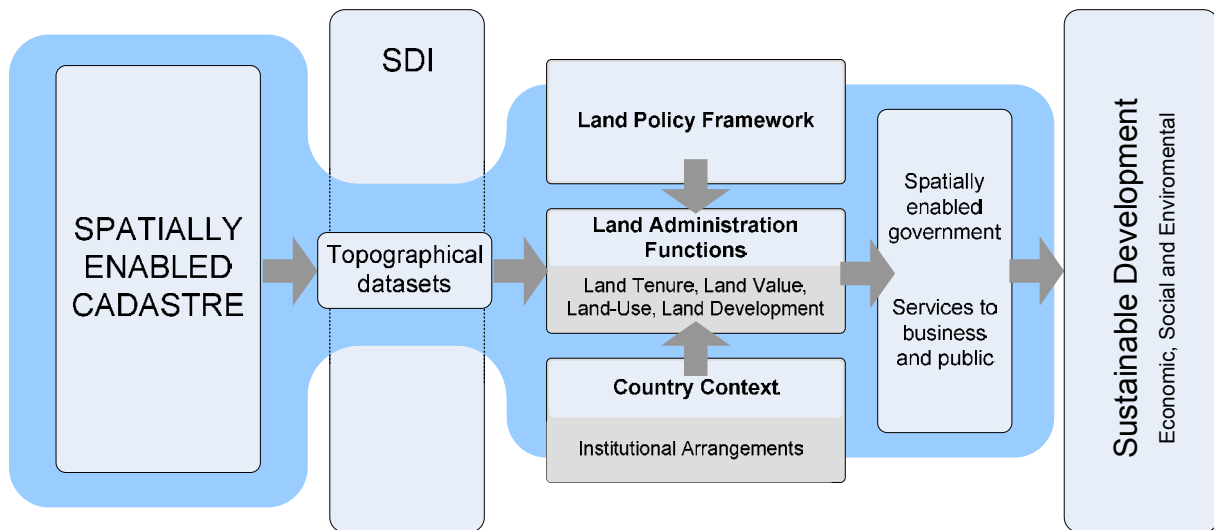
Figure 2.3 The cadastre acts as the engine of the land administration in the new version of the overall land management paradigm (developed from Enemark 2004;Williamson et al. 2007)

Generally, the model also displays the overall land management paradigm on putting the resources of land into good effect (United Nations 1996). However, the model furthermore demonstrates that a countrywide digital cadastral database (DCDB) supported by topographical data sets should be the engine running the land administration functions that make spatial information support the triple bottom line of economical, social and environmental sustainable development by spatially enabling government (see section 2.3.5) and by providing services to business and public. More thoroughly, we see that a national SDI should act as the underlying structure operating as the connecting mechanism in the model, facilitating the efficient and effective generation, dissemination, and use of land information.

2.2.4   Land administration

As was the case with the land management paradigm, the Land Administration Guidelines by the United Nations (1996) was the starting point for the developments of a modular display of the collection, processing and presentation of land information. Until then, this connection was poorly defined, the definitions and terminology was unclear, and it was very hard to share and translate a common conceptual understanding between different jurisdictions (Williamson 2001;Zevenbergen 2002). The Land Administration Guidelines by the United Nations (1996) however changed this picture. The guidelines used the term land administration to describe the "processes of determining, recording and disseminating information about the ownership, value and use of land when implementing land management policies", and we saw several authors starting to use this coherent understanding when discussion the management of property (e.g. Dale and McLaughlin 1999).

However, regarding a modular development again Enemark was a frontrunner. By developing the model (2005;2001) in figure 2.4, he demonstrated how the land administration functions are internally connected, and how they relate to the overall land management paradigm.
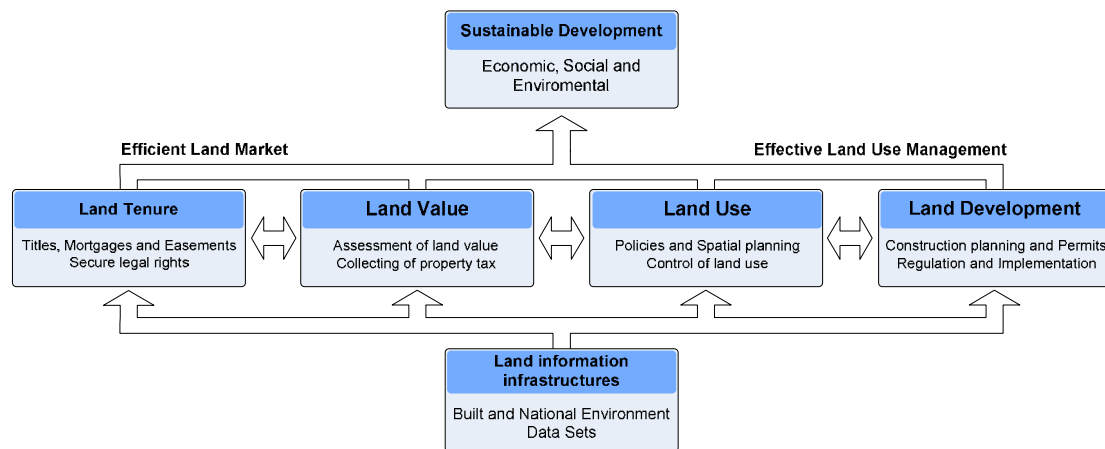
Figure 2.4 Land administration systems in a global perspective (Enemark et al. 2005)

The base of land administration systems is the land information infrastructures, which in general corresponds to the component of the DCDB and the topographical datasets in the land management paradigm. The land administration functions consist of land tenure (securing and transferring rights in land and natural resources); land value (valuation and taxation of land and properties); land use (planning and control of the use of land and natural resources); and land development (implementing utilities, infrastructure and construction planning) (Enemark et al. 2005). Furthermore the model displays through the arrows that the land functions are functioning together with an SDI as the foundation for facilitating the efficient and effective generation, dissemination, and use of the land information in and among the land administration functions. Lastly, we find that all functions in the land administration are highly interrelated, e.g. is the land value influenced by the possible future use of land as determined through land policies and spatial planning. However, as the model displays there exist a particularly close relation between the functions of land tenure and land value, which together should lead to an efficient land market, and between the functions of land use and land development, which together should lead to an effective land use management (Enemark 2001).

Even though Enemark et al. (2005) not make an explicit definition of land administration system according to their models, we find that: Land administration systems are the operational components of land management that put land policies into effect by building and supporting organizational infrastructures, which facilitates the implementation of land policies and supports both efficient land markets and a sound administration of land. Furthermore, the authors state, by use of the above mentioned United Nations (1996) statement, that land administration systems address the social, legal, economic and technical framework within which land managers and administrators must operate.

2.2.5   Cadastral systems

As mentioned, this thesis will focus on the relationship that exists between the cadastre and the land tenure parts of land administration systems – a system often referred to as cadastral systems. However, as several authors (Enemark 2005;Williamson 2001;Zevenbergen 2002) point

out, the definitions and terminology is very unclear in the academic field in this area. It is thus hard to share and translate a common conceptual understanding because the world's land administration systems are designed in many different ways depending on the origin, history and cultural development of the country of jurisdiction. Nevertheless, we will as stated in the introductory chapter, define cadastral system as the sum of the organizations identifying land parcels, and recording ownership in land (including rights, restrictions and responsibilities) (Williamson et al. 2008).

Figure 2.5 displays the core data model of a cadastral system. The land parcel (that can be a property) relates to a person (natural or non-natural) via a bundle of rights, restrictions and responsibilities (RRRs) (Williamson et al. 2008).
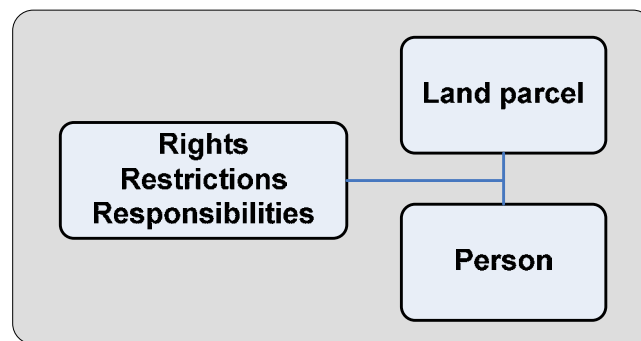
Figure 2.5 Data elements in a cadastral system (Williamson et al. 2008)

In a simplified version, the cadastral system is thus the only system within the land management paradigm that can answer the fundamental question of "who owns what where". Consequently, cadastral systems plays a vital role in the interaction between the functions of a land administration system (Enemark 2005).

2.2.6   Cadastral information is the engine

Before we head into the investigations of the increasing importance of inter-organizational collaboration in the management of land, we will lastly investigate the role of the cadastral information in the overall land management paradigm since it as stated plays a central role here. Figure 2.2, displaying the overall land management paradigm, illustrates that the DCDB are very important to the land administration functions. Why this is the case is quite simple: While a cadastre is basically "just a record that identifies the individual parcels/properties" (Enemark 2005), it is most often the only record that does so in a nation. This means that often the cadastre is the vital information layer of an integrated land management system (Williamson 2006). In the form of a countrywide digital cadastral database (DCDB), governments can use the cadastral, topographically arranged basic building blocs to support decision making in each of the functions of a land administration system (Williamson et al. 2007).

However, the potential of a DCDB is far bigger if one looks at the role of the cadastre parcel as an overall, easy understandable, multi-purpose identifier and information hub that allows exchange of spatial bound information across both land administration systems as well as the broad information industry. The role of the cadastre as an easy entrance to spatial bound information relates to the fact that the cadastral parcel is unique since its geographical coordination and spatial descriptors of land parcels allows government and spatial industry to describe places in a way that everybody can relate. As Williamson puts it: "The familiar configuration of parcel based descriptions in the DCDB ensures people-friendly identification of precise locations of impact of private ownership and, more vitally, of government, business and community policies, regulations and actions" (Williamson 2006).

2.3 Land administration and inter-organizational collaboration

The administration of land has changed throughout the years. In general, we see a development towards much closer inter-organizational collaboration; a development that, as mentioned in the introduction, has been both pushed and pulled by a number of factors in society. The below sections will look into a number of these factors ranging from general societal trends to more land information related factors in order of supporting and explaining the collaborative focus in this thesis.

2.3.1 Development of land administration

In order of displaying the trends towards closer inter-organizational collaboration in the administration of land, and thus justifying the collaborative focus of this thesis, a good starting point is the role land and land information has played through time.

In general, land has played a still more important and comprehensive role in society. As stated in the introduction, the role of land has changed from a predominantly fiscal role to a role where land today plays a multifaceted role, as both a fiscal and juridical entity, and as a scarce resource (Ting and Williamson 1999). The changes in the relation to land have meant a continual development in the policy focus driving land administration. Figure 2.6 illustrates how land administration have changed the focus from a mere economic paradigm to a focus where land administration is regarded as an asset in society continually driving development.
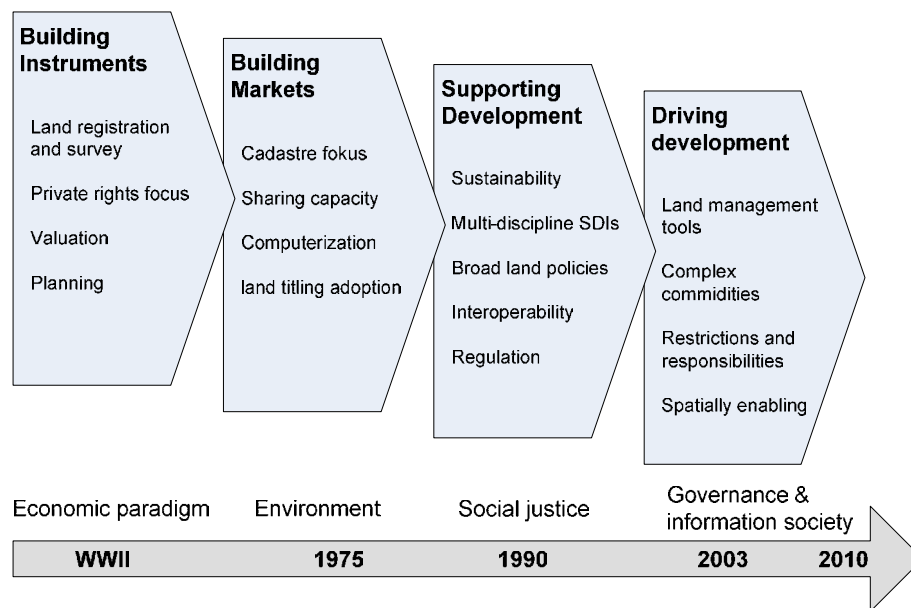
Figure 2.6 The policy focus on land administration has changed through time (developed from Williamson 2006)

Studying the changing policy focus in land administration in figure 2.6, it becomes clear that the development has demanded an increasing focus on cross-governmental collaboration. Whereas early silo based systems and closed organizational structures could exist in the early phases of the model, we see that a broad focus on land policies, complex commodities and RRRs, and the emerging focus on spatially enabling require cross-organizational collaboration.

Analyzing literature (e.g. Williamson 2006;Williamson et al. 2008) we find that three overall trends have been driving the development in figure 2.6 towards cross-organizational collaboration. Firstly, the development in Information and Communications Technology (ICT) has improved the possibilities for sharing spatial information. Secondly, environmental issues, focus on emergency management, complex RRRs etc. make governments require accurate and comprehensive information from several sources. Thirdly, there has been a change in the overall public administration agenda towards e-governance, which very much focuses on cross-administrative collaboration. While acknowledging that the trends are highly interrelated, the below three sections will review the trends separately.

2.3.2   ICT-development

Whereas land administration systems in general not is regarded as the fastest sector to incorporate new ICT (Wallace and Williamson 2005), developments in the area of ICT have dramatically changed the way organizations can acquire, handle and disseminate spatial information. Firstly, we find that the acquiring costs of spatial information have dropped dramatically. The development from field survey, over aerial photography and satellite imaging, and to nowadays GPS has meant a massive drop in the costs of spatial information (Rajabifard 2006), which means that spatial data are likely to be used in more areas than before. Secondly, we find that methods of handling and disseminating information have evolved into methods

that support sharing of spatial information and thus advance inter-organizational collaboration. Figure 2.7 demonstrates how Williamson (2006) uses the Australian system as a case to illustrate the collaborative course of land administration in the last three decades.

1970	1980	1990	2005
Manual Systems *Hardcopy Maps and Indexes*	**Computerization** *DCDB and Indexes*	**Online Land Administration** *Web enablement*	**eLand Administration** *Interoperability*
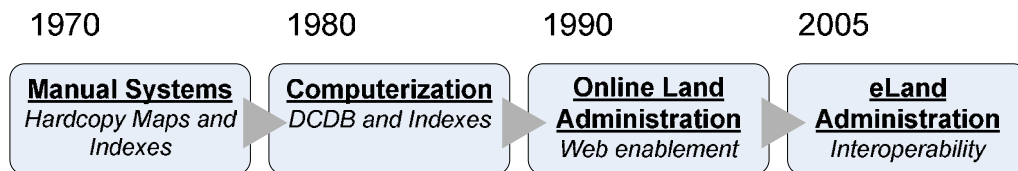
Figure 2.7 The development in ICT has enabled a development from information islands to interoperable organizations (developed from Williamson 2006)

In the first stage of manual systems, the systems acted as "information islands". As Ryttersgaard (1998) puts it; information in the systems were "produced and maintained in order to fulfill and support the core business of the responsible body". In the 1980s, computerization of the cadastre and land registry begins. While the role of neither the cadastre nor the land registry changes in this process, it initiates an institutional development of bringing the else separated functions of surveying and mapping, and cadastre and land registration together. In the 1990s, it becomes possible to access land information over the internet, which facilitates digital cadastral lodgment and e-conveyance. Still the web enablement does not change the fact that in practice land tenure happens within institutional silos. However, other data sets, particularly natural and built environment data sets, begin to be integrated. Together with the web enablement, this process is by large initiated by the concept of SDI that emerges from the academic arena at the same time. Today, we see that the development and focus on system interoperability encourage actual cross-organizational collaboration. Nowadays, fundamental information of parcels and properties technically and practically can form the administration throughout government in areas such as taxation, planning and land development.

Overall, the technological development from manual systems to interoperability has thus supported an institutional integration and collaboration across government sectors managing land administration functions. Figure 2.8 puts the technological development in context with the extrovert development of the organization; illustrating the stage from conversion of data to the stage where knowledge is managed in interaction with the individual citizen.
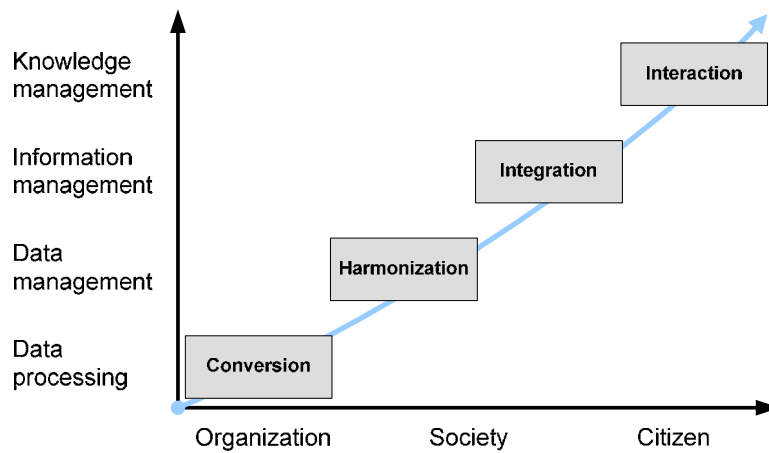
Figure 2.8 Technical possibilities make it possible to change the focus of the organization (Ryttersgaard 1998)

2.3.3   Rising complexity

Concurrent the development in ICT, a number of societal trends have increased the needs for more accurate and comprehensive spatial information. This need has resulted in demands for improved inter-organizational collaboration.

On the general level, the increased focus on environmental issues is a good example of a development that asks for extensive collaborative initiatives. Taking Denmark as an example, the collaboration in the area of environmental spatial information started as non-structured ad hoc exchange of information between organizations holding environmental data. Today a formalized partnership has been formed among national, regional and local players in the environmental arena. A portal for exchange of environmental data is running and the partners are together developing common digital solutions (Danmarks Miljøportal 2008). On the European arena, we find the same development. Environmental cross-border issues have e.g. been the main driver for the European INSPIRE network (Annoni and Craglia 2005).

Another example on the general level is the area of disaster risk management. Disaster risk management is defined as the "systematic process of using administrative decisions, organization, operational skills and capacities to implement policies, strategies and coping capacities of the society and communities to lessen the impacts of natural hazards and related environmental and technological disasters" (UN/ISDR 2004). Figure 2.9 outlines the key element of disaster risk management.
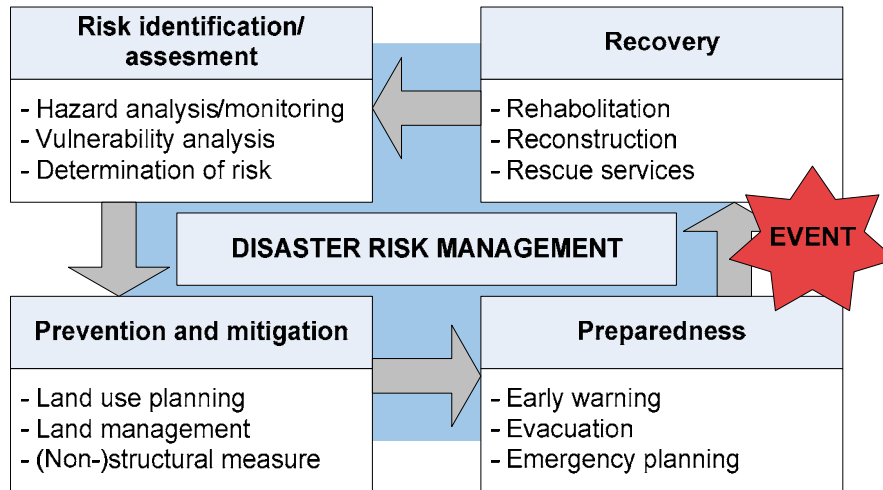
Figure 2.9 Key elements of disaster risk management (FIG 2006)

In the lower left corner, the model illustrates how the functions of land administration play a crucial role in especially the phase of Prevention and Mitigation. Cross-organizational policies and initiatives in land administration systems can help to identify disaster-prone areas and control the type of land use and land development in such areas (FIG 2006).

Lastly, in the more specific case of land administration, we find the case of the rising complexity within the areas of rights, restrictions and responsibilities (RRRs). Enemark (2007) defines RRRs the following way: "Rights are normally concerned with ownership and tenure whereas restrictions usually control use and activities on land. Responsibilities relate more to a social, ethical commitment or attitude to environmental sustainability and good husbandry." Over the last 50 years, many new interests have thus emerged over land different to traditional property rights. In response to concerns of environmental degradation, globalization and social equity, interests legislated by governments tries to control community's behavior in relation to land. The legislation gives power to government or other mandated bodies on such different areas as native land titling, nude bathing areas, and surveyor's access to properties (Bennett et al. 2008). A recent study found that 500 individual statutes in the Australian state of Victoria applied some type of control over land, and the national Australian Government has a similar amount (Bennett et al. 2005). As Williamson argues the complexity of the interest are now straining the system, an in some cases make it fail (Williamson 2006). In terms of organizational collaboration, Bennett argue that the solution of the problems are a more integrated management of interests created by public administration (Bennett et al. 2008).

On the whole, the above examples illustrate that both general and more land administration related developments in society, and in the way land are being administered, call for extensive inter-organizational collaboration among organizations administering land information. The below section will look into e-governance as the last of the three main trends in society that these years seem to encourage collaboration among land administration organizations.

2.3.4   Change in governance focus

Whereas, the above section on ITC (section 2.3.2) mentions e-land administration as a consequence of a technical development and specify a more citizen orientated focus on this behalf (figure 2.8), this development is, as said, also encouraged by a general change in the perception of governance in society.

In general, governance is a unifying term for new forms of government that violate the classic authoritative (Weberian) decision monopoly of the state (Rifsdal and Jacobsen 2005). The European Commission (2001) thus defines governance as the "rules, processes and behavior that affect the way in which powers are exercised…. particularly as regards openness, participation, accountability, effectiveness and coherence".

In many countries, government's main respond to the changing view on power is by trying to use digitization of the existing public administration as a mean to put the citizens in center – e-governance (Regeringen 2008). Often governments focus on two aspects for justifying the often very big expenses in this process – effectiveness and democracy. By using Denmark as a case, table 2.1 illustrates the arguments of the two aspects in the e-governance process (Rifsdal and Jacobsen 2005).

Effectiveness	Democracy
• To improve future economic opportunities within the existing socio-economic framework. <u>Good economy</u>.	• To improve the democratic rights of the citizens through information about public administrative work. <u>Responsibility, openness, and information.</u>
• To improve productivity and effectiveness in the public sector through ICT and organizational changes and increased collaboration. <u>Good control, good organization, and increased productivity and effectiveness.</u>	• To secure the access to administrative decisions. <u>Transparency.</u>
• To make case handling fast and flawlessly. <u>Cheaper, faster, better public sector.</u>	• To develop new possibilities for dialogue between citizens, users, politicians, companies and administration<u>. Participation and dialogue.</u>
	• To improve the due process of administrative processed by securing citizen's inspection and control of own data. <u>Control.</u>

Table 2.1 Effectiveness and democracy are two main arguments for conducting e-administration (developed from Rifsdal and Jacobsen 2005)

As the above table argues, one of the means to implement e-governance is enhanced inter-organizational collaboration in the area of ICT. In order to improve efficiency, fully automated, integrated online services should be implemented across the public administration (Ministeriet for videnskab 2003). Looking into the area of e-land administration (see figure 2.7), which is the land administration equivalent to e-governance, we see the same arguments. Williamson et al. (2008) thus argue that the aim of e-land administration is to become "inter-institutional, based on partnerships among agencies, and between government and private sector". The importance of inter-organizational collaboration in the area of e-land administration is further supported in figure 2.10, which illustrates that five phases are involved in building an e-land administration system. Phases that go from a mere distribution of information, to the conducting of e-land administration.
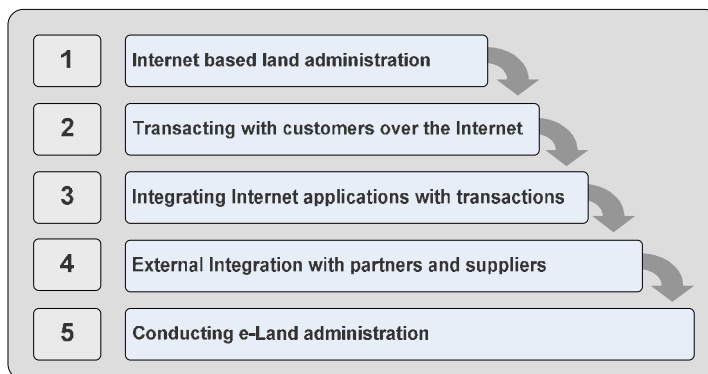
Figure 2.10 Five phases are involved in building an e-Land administration (Williamson et al. 2008)

In overall, the above section reason that general changes in the perception of governance in society have positively affected government's view on inter-organizational collaboration. Especially the arguments for efficiency in the public administration seem to encourage the focus on collaboration across government. The same trends are demonstrable within the area of land administration.

2.3.5   Towards spatially enabling government

As e-governance and e-Land administration today is seen upon as the frontier of public administration, the emerging field of "spatially enabling government" tries to look into the future of land administration. The vision of spatially enabling government make the concept of "where" penetrate all levels of government (Williamson 2006). Wallace et al. (2006) articulate the vision as this:

> "… all major government information systems are spatially enabled, and where location and spatial information are regarded as common goods made available to citizens and businesses to encourage creativity and product development. In short the vision relies on educating policy makers about the power of spatial information."

Whereas e-Land administration thus focuses on digitizing existing solution and routines, the vision of spatially enabling government argues that the existing land administration functions – digital or not – are inadequate when it comes to supporting the future needs of sustainable development in society. As Wallace et al. (2006) puts it, the degree of taxation, regulation and needs for sustainable management aims at spatially enabling governments in order of releasing the power of land information to service these emerging policy needs.

Combining information is the key term in this regard. Land information should be transferred from a technical environment to a multi-disciplinary environment combing technical competences with public policy, law and public administration (Williamson et al. 2007).

Figure 2.11 illustrates five components of the vision.
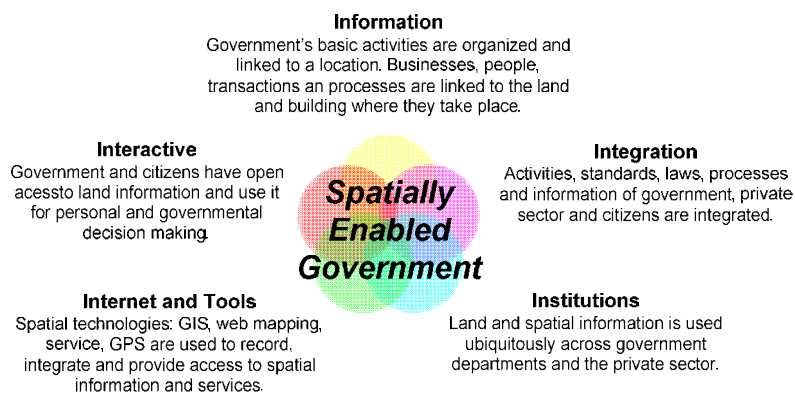
Figure 2.11 The vision of spatially enabled government (developed from the concept of iLand by Williamson and Wallace 2006)

However, spatially enabling government is only a vision at this point and is in general far from implementation by any government (Wallace et al. 2006). The path to fulfilling the vision involves several stages, both regarding rising awareness in government on the benefits of spatially enabling, a general improvement of how information is organized, and more important, a re-organization of administration and work patterns (Williamson et al. 2007). The last point is thus of special interest in term of this chapter's aim of displaying the importance of inter-organizational collaboration. The vision of spatially enabled government hence suggests that inter-organizational collaboration will become even more important in the future administration of land than we see today.

2.4   Spatial data infrastructures

In the introduction of this chapter, we emphasized that SDI is the underlying structure acting as the connecting mechanism in the overall land management paradigm (see section 2.2.3). However, SDI also acts as a foundation for this thesis in general. In the introduction to the thesis, we thus suggested that one of the means for a multi-purpose land administration system

is an efficient handling of spatial information in a collaborative network through efficient and effective SDIs, since well functioning SDIs makes it possible to share and effectively use geographic information. The area of SDI thus provides an entry point for discussing collaboration between inter-organizational networks with a spatial angle, which will be of use when we enter the more general analysis of awareness in the below chapters.

This section will therefore provide insight in the definitions, role and nature of the area of SDI, display the components and the hierarchy of SDIs and discus the special role of national data sets and national SDIs of which information in cadastral systems are part.

2.4.1   SDIs facilitate sharing

Looking for a simple definition of SDIs, we find Van Loenen (2006) definition of SDIs as "a framework continuously facilitating the efficient and effective generation, dissemination, and use of needed spatial information within a community or between communities". Figure 2.12 illustrates the process from generation of data, over the sharing of data, to the actual use of the data. The mutual connection between the data producer and the data user illustrates that the data flow in a sharing process can go both ways, the producer becomes user, and the user becomes producer.
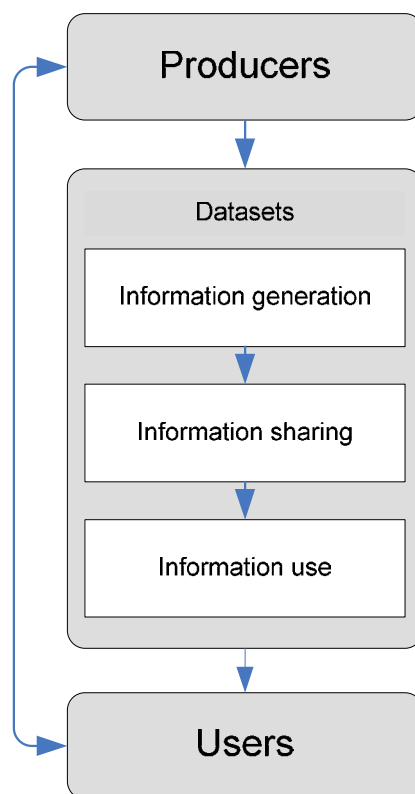
Figure 2.12 The geographic information process (developed from Van Loenen 2006)

In simple terms, SDIs thus facilitate sharing. The value of spatial data hence comes from its use; and in this term, sharing is essential (Onsrud and Rushton 1995b). Calkins and Weatherbe (1995) define sharing of spatial data as "the electronic transfer of spatial data/information between two or more organizational units where there is independence between the holder of the data and the prospective user".

Sharing spatial data is a wise thing to do. Spatial data sharing thus offers a number of benefits both relating economy, use and data quality: Spatial data are expensive to collect and maintain. Sharing of data reduces cost, boosts productivity and leads in general to higher cost efficiency (Nedovic-Budic and Pinto 1999). Sharing of data furthermore supports decision making by exceeding the coverage of data and allowing integration of new data sets, which return additional and cross-organizational spatial analysis (Craig 1995). Data sharing also increases the quality of data, by multiplying the number of individuals that can check and correct data (Rajabifard et al. 2003). In summary, the sharing and use of data "produce significant human and resource savings and returns" (Williamson 2003).

2.4.2 SDI as an enabling platform

While SDIs in the past mainly was "implemented as a mechanism to facilitate access and sharing of spatial data hosted in distributed GISs" (Williamson 2006), SDIs nowadays "promotes partnerships among public and private spatial information organizations, widens data and services, and increases complexity beyond the capacity of individual partners (Williamson et al. 2008). As Masser et al. (2007) puts it, the role of SDIs are enhanced beyond the sharing of data. Through a chain of web services, SDIs today also facilitate sharing processes, services and other value added products. The below definition of SDI from the US Federal Geographic Data Committee (2007) illustrate this expanded view on SDIs that has come to be seen as:

> *"… the technology, policies, criteria, standards and people necessary to promote geospatial data sharing throughout all levels of government, the private and non-profit sectors, and academia. It provides a base or structure of practices and relationships among data producers and users that facilitates data sharing and use. It is a set of actions and new ways of accessing, sharing and using geographic data that enables far more comprehensive analysis of data to help decision-makers choose the best course(s) of action."*

However, the role of SDI is still changing. An emerging paradigm within the field of SDI is on how SDIs should facilitate the spatial enabling of government. The future vision of SDI describes how the SDI of tomorrow should facilitate the integration of existing government spatial data initiatives by providing services structured and managed in a way that they are seen by third parties as a single enterprise (Masser et al. 2007).

Three interrelated strategic challenges are pointed out when making existing SDIs more appropriate for spatially enabling government and society in general: Governance of SDIs, data sharing, and creation of enabling platforms (Masser et al. 2007). Regarding governance of

SDIs, top priority must be given more inclusive and acceptable models of governance, since SDI formulation and implementation include large number of stakeholders from government, the private sector and academia (Rajabifard 2007). Regarding data sharing, the institutional aspects of organizational and inter-organizational sharing should be emphasized. Regarding creation of enabling platforms, compatibility and interoperability should be called to special attention.

In overall, the above review of the changing role of SDIs in society adds yet another facet to the importance of inter-organizational collaboration in the field of spatial data handling. The below sections will by using a number of models on SDI emphasize further on the changing role of inter-organizational collaboration in regard to spatial data handling, and will furthermore illustrate how the concept of awareness are being put into context in one of the SDI models.

2.4.3   Models of SDIs

As mentioned, besides providing a fundamental understanding of the importance and nature of spatial information, the focus on SDI gives insight into the community's varied views on spatial data handling. As was the case of SDI definitions, there hence exist several understandings of the components of SDIs and how these components relates to each other under different circumstances.

Rajabifard's product-based model

One of the first widely used models in the spatial data environment was the five-component product-based model developed by Rajabifard et al. (2002). In the model, SDIs enable data sharing between particular stakeholders for a special purpose – a product. The framework focuses on transfer of data and consists of people, data, and three technical components – access networks, policies and standards. Figure 2.13 displays the connection between these components.
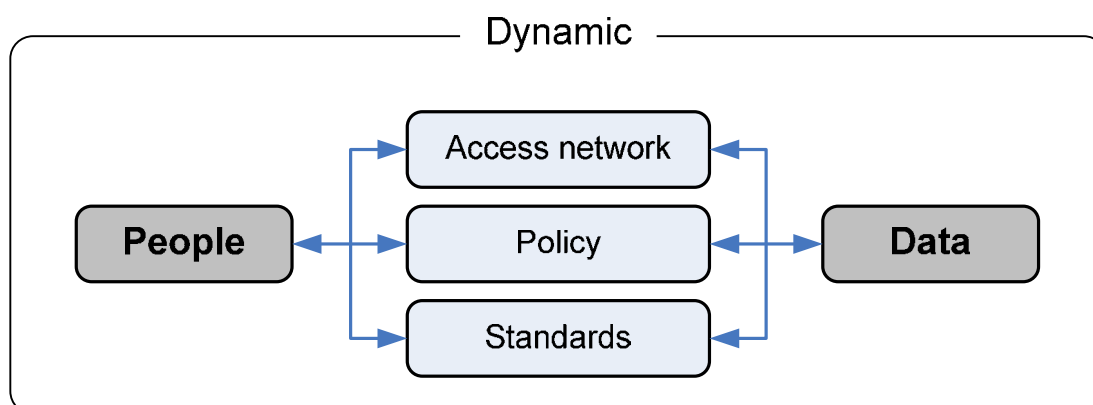
Figure 2.13 Nature and relations between SDI components (adapted from Rajabifard et al. 2002)

The model follows up on the notion on SDIs as essentially a framework that facilitates sharing of data between producers and users, and thus displays the technical components of what binds people and data together. However, while Rajabifard in his comments on the model (Rajabifard et al. 2002) do acknowledge the people-aspect to encompass organizations, the model do not have any specific external focus. Furthermore, the model does not display the fact that people or organizations also affect the generation of spatial information. In the model, data flows through the network but is not affected by the network.

Van Loenen's data-central model

We have in the introduction referred to the work of Van Loenen. Besides contributing to the overall understanding of awareness, he also comes up with a SDI model that puts data in centre of SDIs and focuses more on the organizational aspects of SDIs than what we see in the above model developed by Rajabifard (Van Loenen 2006).

Van Loenen's model focuses on seven components, which he displays in the circular model in figure 2.14.
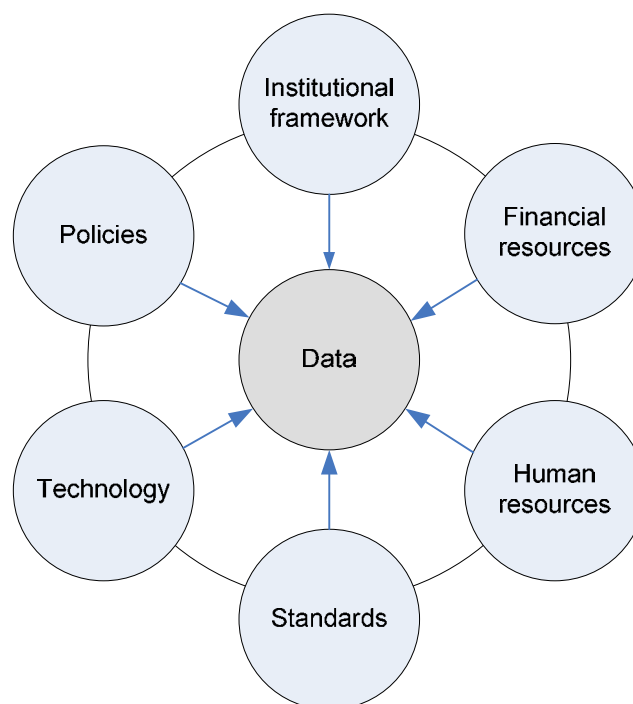
Figure 2.14 Components of an SDI (adapted from Van Loenen 2006)

In this circular model where data is the point of turn, Van Loenen's emphasizes that all the components affect data, both in the way data is being produced and in the way, data is being used. We find that Van Loenen still focuses on the technical components (policies, technology and standards), but instead of just focusing broadly on people, as in Rajabifard's model, Van

Loenen's model takes three specific organizational components into account: Institutional framework, financial resources and human resources.

While Van Loenen's model thus more rigorously focus on the organizational aspect of SDIs and on the fact that all the components may affect the production and use of data, the model still not take the inter-organizational aspect or the broad societal use of data into direct account.

Rajabifard's process-based model

In term of a broad societal use of data, we will therefore again turn to Rajaifard. Rajabifard hence do acknowledge that while much of the sharing of spatial data happens in a specific environment, for a specific purpose (product-based sharing), the focus today are in some areas of SDIs moving towards what he calls "establishing long-term process-based spatial data-people networks" (Rajabifard et al. 2002:14). Figure 2.15 displays this understanding.
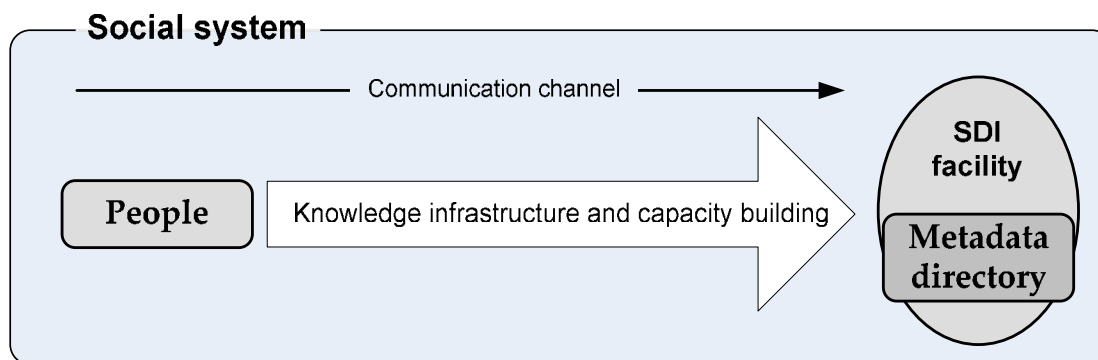
Figure 2.15 The process-based SDI model (adapted from Rajabifard et al. 2002)

The process-based model in figure 2.15 displays how the goal for any coordinating agency in a social system should be to create better communication channels and knowledge structures for enabling society to make use of the vast amounts of spatial information available, instead of just supporting ad-hoc relations between data sets – the changes from a product-based model to a process-based model.

Together, the above three models illustrate three different ways of understanding data handling within SDIs. The models exemplify the complexity of SDIs, and the varied aspects that affect the handling of spatial information. While none of the models demonstrates the specific inter-organizational focus of this thesis, especially the two latter models underpin the argument of this chapter on the fact that handling spatial information not only is a technical matter but also by large are influenced by institutional mechanisms.

2.5   Summary

In summary, the above chapter underlines the importance of the overall focus of this thesis:
There is an increasing necessity for research within the area of institutional aspects of inter-
organizational collaboration in order of supporting sound administration of land. Firstly, we lay
the foundation for understanding the overall management of land by looking into the overall
land management paradigm where we found that land administration functions are highly
interrelated. Secondly, we found that the development within ICT, the growing areas where
land information is being used, and a general change in government focus towards governance,
e-land and even spatial enabled government call for inter-organizational collaboration when
handling land information. Thirdly, we found that the underlying foundation for the land
management paradigm – SDI – is heavily influenced by institutional mechanisms.

In the next chapter, we will briefly introduce the area of inter-organizational networks, in order
of providing an overall knowledge of this field useful for the next chapter's focus on awareness
between organizations.

3   Inter-organizational networks

3.1   Introduction

The overall understanding behind this thesis is that awareness is an essential driver for the developing of collaboration in inter-organizational networks and hence is of great importance in many cadastral systems since cadastral systems typically are characterized by a network structure. However, what are networks actually characterized by and why do organizations engage in networks at all? In order to answer these rather fundamental question this short chapter will introduce the domain and nature of inter-organizational networks, before we in the next chapter will go further into the aspects that together with awareness more specifically seem to affect data sharing in inter-organizational networks.

3.2   The domain of inter-organizational networks

Several authors describe the domain of inter-organizational networks. We e.g. finds Kumar and Dissel's work (1996), where the authors define inter-organizational networks handling information as "information and communication technology-based systems that transcend legal enterprise boundaries". The authors underpin that the level of cooperation and coordination in inter-organizational networks exist somewhere between organizations acting as free agents in a market and as a structural authority existing in vertically integrated hierarchies. Inter-organizational networks may therefore be "considered as planned and managed cooperative ventures between otherwise independent agents". Alter and Hage's (1993) definition on the domain of inter-organizational networks support this view as they define the domain of inter-organizational networks as "nonhierarchical collectives of legally separated units". Gray (1985) also comment on the domain of inter-organizational networks as she suggest that inter-organizational networks are a "functional social system which occupy a position in social space between the society as a whole and the single organization". In brief, the domain of inter-organizational networks thus exist between legally else separated organizational units.

3.3   The reasons for engaging in inter-organizational networks

When discussing the reasons for engaging in inter-organizational networks in cadastral systems one could say that the organizations in the systems do not have any choice of working together,

and always already do. Most often law determines the structure of the system. However, it is important to have in mind that the non-regulated daily collaboration between administrative personnel in different organizations is very important both in the general running of the system and in the continuing development of the system. Therefore, while the political administrative structure cadastral systems work within defines the general framework of the collaboration with other organizations, the ongoing development of the system is most often performed by administrative personnel that daily consider the pros and cons of collaborating with other organizations. It is thus important to have in mind that there exist just as many arguments for not collaborating as there is for collaborating. Collaboration is a complex process that often includes advantages, but has several possible drawbacks (Linden 2002).

If we first explore the causes that triggers collaboration with a specific focus to the public administration that cadastral systems exist within, Vigoda and Gilboa (2002) argues that the development of inter-organizational networks often is triggered by outside events. As suggested by Cigler (1999), it is often disastrous events that trigger the developing of inter-organizational networks. Events that often are rooted in fiscal or perceived stress. Cigler (1999) however also mentions less dramatic causes for collaboration, such as a political constituency for collaboration, early and continued support by elected officials, visible advantages of collaboration for participating organizations and the existence of a policy entrepreneur (Craig 1995). And as in the case of cadastral systems, the external pressure from politicians, institutions, industry or the public for new services and increased multi-faceted data-flows serves as important triggers in the systems.

In order to point these aspects out more rigorously, table 3.1 presents a list of the typical determinants for engaging in inter-organizational networks.

Determinant for collaboration	Description
Necessity	Collaboration mandated either by a higher authority or through legislation, regulation, or litigation
Asymmetry	Collaboration in order to exert control and power over other organizations. Exists often in environment of scarce resources
Reciprocity (exchange theory)	Collaboration in order to pursue common beneficial goals
Efficiency	Collaboration as a mean to improve the input-output ratio internally in the organizations
Stability	Collaboration in order to fulfill a desire for predictability and reliability

Legitimacy	Collaboration in order to justify activities and products e.g. to highlight social responsibility, or enhance external image

Table 3.1 Determinants for collaboration (Azad and Wiggins 1995)

Regarding the public sector, Azad and Wiggins (1995) emphasize that the most often used determinant to explain inter-organizational relationships here is the exchange theory. The exchange theory deals with the fact that organizations – especially in the public sector - often exist in environments where resources are limited. Therefore they are often dependent on other organizations for resources, which are important to their functioning and/or ongoing development (Alexander 1995). When working together, organizations are able to create something they were not able to do on their own (Linden 2002). In the public area, this may be the development of an integrated service including different departments, e.g. a health program including both the school and healthcare sector, or in the case of land administration systems a "one-stop-portal" providing information on both ownership, geography, planning etc. Azad and Wiggins (1995) however point out that often several of the above determinants exist side by side and may change over time in inter-organizational relationships.

3.4 Obstacles of relating in inter-organizational networks

Since we will go further into the obstacles of relating in inter-organizational networks later on focusing more specifically on data sharing, we will not deal much with this aspect here. However, table 3.2 provides a fruitful introduction to the subject and present an initial picture of the complexity there exist when we, as in the case of cadastral systems, focus on the rising of inter-organizational awareness as a mean to develop the role of the organizations in the system. While lack of awareness might be one of the basic reasons for lack of inter-organizational development, a number of other hurdles exist on the road towards inter-organizational collaboration.

Individual hurdles
Power related concerns
Fear of loosing control, autonomy, quality, identity, resources to other
Lack of trust and confidence to other organizations
Turf concerns
Organizational hurdles
Immediate costs, remote benefits
Differing goals and benefits between the organizations
Low credit or reward from management from engaging in inter-organizational networks
Budget systems that not appraise collaboration
No clear benefits for the organization
Different rules, cultures and values between the organizations
Systemic hurdles
Constitutional separation of powers and fragmentation
Narrow categorical funding programs

Table 3.2 Hurdles for the development of inter-organizational collaboration (Linden 2002)

The above table thus displays the complex nature of collaboration and the many reasons that may exist for not going into a collaborative relationship with other organizations. Furthermore, it is clear that a number of the above hurdles for collaboration closely relate themselves to the motivation and foundation for developing awareness between organizations, e.g. the lack of trust. A number of the factors therefore possibly will be of use when setting up an evaluation model for investigating awareness in land administration systems.

3.5   Summary

The above sections briefly introduce the area of inter-organizational networks. Firstly, we defined inter-organizational networks as "nonhierarchical collectives of legally separated units". Secondly, we discussed arguments for engaging in inter-organizational networks. Finally, we briefly illustrated a number of the hurdles that exist for *not* engaging in inter-organizational networks.

4 Awareness and other aspects to affect inter-organizational relationships

4.1 Introduction

The above two chapters have provided a basis understanding of the area of research that we exist in. Chapter 2 gave insight in spatial information, how cadastral systems fitted into the overall land management paradigm, the importance of collaboration, and offered an overall understanding of the components that exist in SDIs. Chapter 3 briefly introduced the general area of inter-organizational networks.

This chapter will go into a presentation of three aspects that like awareness also seem to affect inter-organizational relationships – willingness, trust and interdependency. The three aspects are closely related to awareness since they apparently both affect awareness and are being affected by awareness.

We thus remember how we in the introduction used Alter and Hage (1993) to argue that awareness promoted willingness to collaborate and developed trust among organizations. Alter and Hage saw willingness and trust as the basic conditions for an everlasting development of inter-organizational networks because it changed the normal perceptions of cost and benefits. Willingness and trust made organizations "concerned with their own prosperity and survival, share resources and work with other organizations…"(Alter and Hage 1993).

Regarding interdependency, both Hall (1996) and Van de Ven and Ferry (1980) argued that awareness is essential in the acknowledgement of an organization's interdependency of other organizations.

The aim of this review is to describe the role of awareness in connection with other aspects that affects inter-organizational relationships and thus provide an overall picture of the role and nature of awareness than we will see by only investigating awareness. Furthermore, the review of the aspects will provide a foundation for the following chapters understanding of different phases of awareness. An understanding that is essential in the aim of building and testing an evaluation model for land administration based on awareness.

4.2   Nedovic-Budic and Pinto's model
on data sharing

However, before going into the review of willingness, trust and interdependency, we will shortly introduce an overall model of data sharing in order to present a structure for understanding the role of the aspects in an inter-organizational setting.

There exist several different models presenting different aspects of data sharing in an inter-organizational environment (e.g. Kevany 1995;Pinto and Onsrud 1995;Wehn de Montalvo 2003). However, in this chapter we will take the point of departure in Nedovic-Budic and Pinto's model (1999) focusing on the theoretical constructs of the *context, motivation, coordination* and *outcome* of spatial data sharing, because of the model's ability to incorporate several different components in one model. Furthermore, we will see that the components of this model are particularly useful when understanding the role of awareness and the associated aspects of willingness, trust and interdependence.

4.2.1   An overview

Through a comprehensive review of a large number of resources, Nedovic-Budic and Pinto (1999) build a model focusing on the theoretical constructs of the context, motivation, coordination mechanisms and outcomes of spatial data sharing in an inter-organizational sense, see figure 4.1.
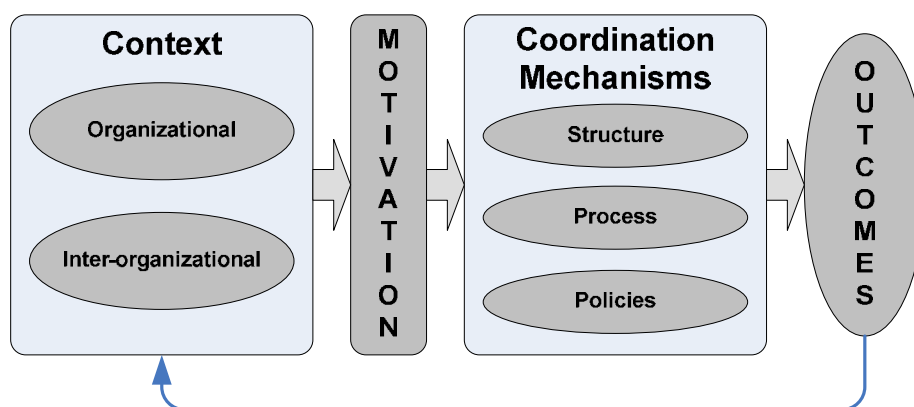
Figure 4.1 Model on the constructs of context, motivation, mechanisms and outcomes of data sharing (adapted from Nedovic-Budic and Pinto 1999)

Context is the organizational factors and interdependencies that influence coordination and decisions about joint GIS and database activities. The authors ague that the relationships between organizations have to be examined with respect to their context since the function of

the systems are a result of the reality the organizations exist within, i.e. the inter-organizational relationship and the model of government.

Motivation is the link between the context that the organizations exist within and the actual coordinating mechanisms. Motivation is what makes organizational units to get actively involved in relationships with other organizations.

Coordinating mechanisms refer to the actual means by which organizations together handle spatial information focusing on inter-organizational structures, policies, and the processes by which this is undertaken.

Outcomes are the effects the given inter-organizational relations have to social, economic and environmental aspects in society in term of adding new value or ways to use the spatial information in play. The model displays that the outcomes not is the end in themselves, but that they again affect the context the organizations exist within.

4.2.2   The model and awareness

Regarding awareness, especially the context and motivation components make the Nedovic-Budic and Pinto-model interesting. These two components thus lead organizations to go into actual coordination mechanisms that lead to a given outcome.

As regards cadastral systems, context is important because we find that the function of cadastral systems is under influence by a number of factors on both the internal and external level. From the review of cadastral systems in the introduction and in chapter 2, we e.g. learned that cadastral systems are under heavily influence by overall policies on land, the structural and historical context, and the affect different organizational cultures may have on the overall understanding of spatial information.

Motivation is what makes organizations move from status quo to a change in relations. Since we in this thesis regard awareness as a precondition for developing inter-organizational relationships, we can therefore say that awareness is one of the main factors of motivation for organizations to develop closer relationships.

Regarding willingness, trust and interdependency, we will in the below review see that they also act as motivation factors. Together with awareness, they make organizations move on to the stage of inter-organizational coordination. However, we will also see that the nature of the aspects largely is affected by the internal and external organizational context the aspects exist within.

The below section will begin a closer investigation of the first of the three aspects that like awareness also seem to affect inter-organizational relationships – willingness.

4.3   Willingness

According to Alter and Hage (1993), awareness promotes willingness to collaborate. Furthermore, Nedovic-Budic and Pinto (1999) present willingness as the "bottom line of successful inter-organizational endeavors". Willingness seems, as said, hence central when investigating awareness, inter-organizational relations, and spatial data sharing. Among the research of willingness, Wehn de Montalvo's research (2000;2002;2003) is of particular interest because of its specific focus on data sharing between organizations.

Wehn de Montalvo (2003) argue that willingness are essential to spatial sharing:

> *"Spatial data initiatives are reliant on the willingness of different organizations to engage in spatial data sharing in order to be effective in overcoming bottlenecks in the availability of spatial data."*

Because of a wish to investigate willingness empirically and to encompass the whole community involved in data sharing, Wehn de Montalvo uses the Theory of Planned Behavior as a foundation for her studies of willingness. Using this theory, Wehn de Montalvo (2000) suggests that the willingness of organizations to share data is affected from three overall determinants: Attitude, social pressure and perceived control.

1. *Attitude* regards the consequences and possible outcomes organizations believe may result from spatial data sharing.

2. *Social pressure* consists of the external pressure organizations may experience in order to engage in spatial data sharing.

3. *Perceived control* take the skills, capabilities and other factors of organizations into account that effect organization's willingness to engage in spatial data sharing.

Using these concepts, Wehn de Montalvo builds a complex model on the aspects that affect the willingness to share spatial data across organizational boundaries.

The model in figure 4.2 displays the components in Wehn de Montalvo's model on willingness. When using the model it must be taken into consideration that the model is developed in the context of the South-African spatial information community. However, Wehn de Montalvo (2000) argues that the model also can be applied in other developed and developing countries because of its broad and general theoretical foundation.
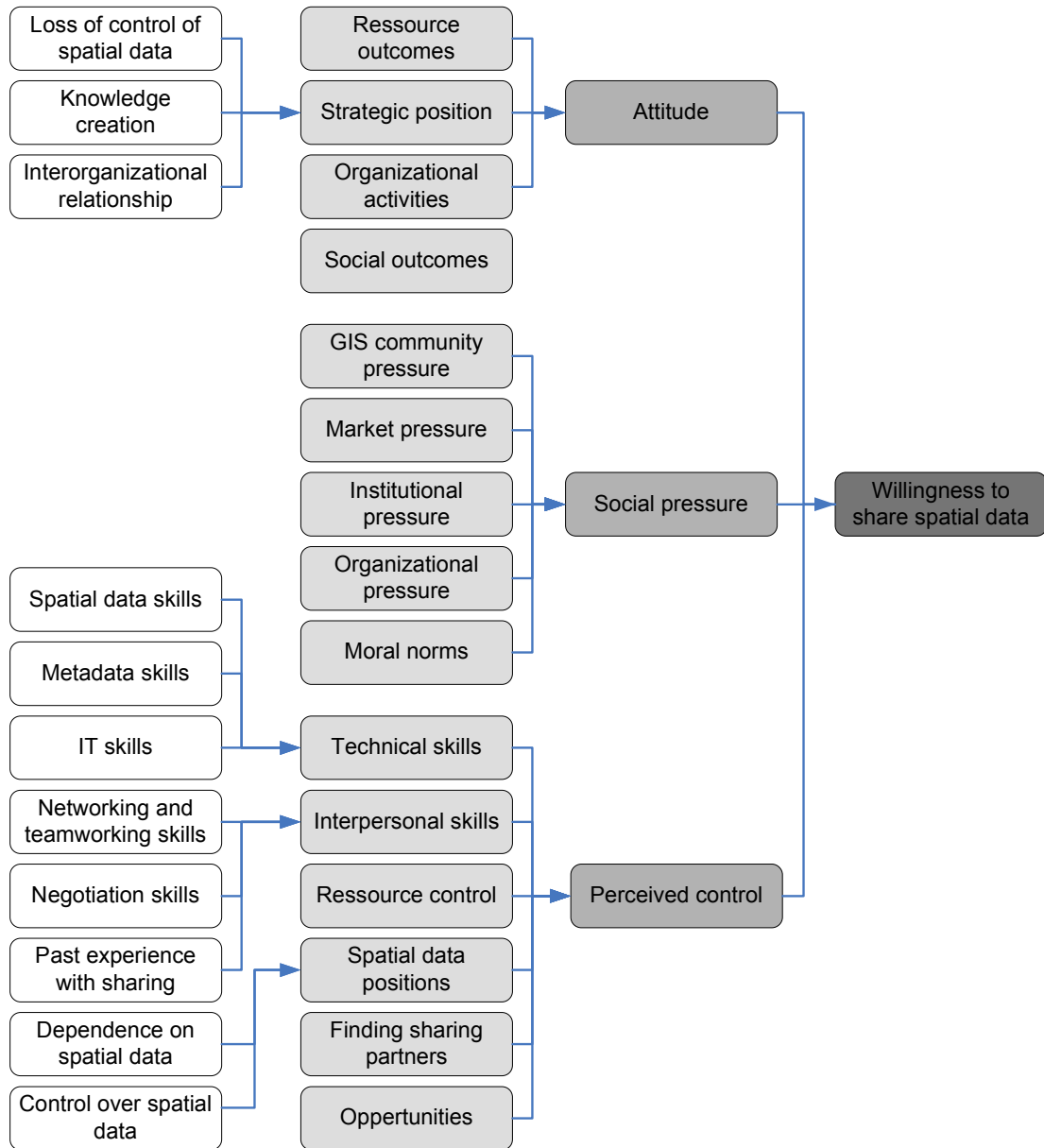
Figure 4.2 Model of willingness to share spatial data across organizational boundaries (Wehn de Montalvo 2000)

As willingness hence alone seems to be vital concerning data sharing, it is also of interest to discuss how the above determinants seem to affect awareness among organizations. From an awareness point of view, all three determinants thus seem to be of interest.

In the context of internal awareness, the determinant of attitude seems to be of special interest. The attitude towards possible resource outcomes, strategic positions, organizational outcomes and social outcomes hence seem to be important when an organization consider whether to spend resources on building awareness on other organizations resources, needs,

goals and visions. If an organization's attitude to the mutual benefits when relating with other organizations is negative, the organization will probably not spend the resources on build awareness on other organizations.

When we discuss external awareness, the determinant of social pressure is of special interest. With the costs of data sharing in mind (Masser 1998), it seems invariably that the development of external awareness in cadastral systems need external pressure to initiate and promote the inter-organizational collaboration process. Wehn de Montalvo outlines five aspects of social pressure, GIS community pressure, market pressure, institutional pressure, organizational pressure and moral norms. However, since cadastral systems are a governmental institution, we may add political pressure.

Regarding the last determinant of perceived control, the factors included here seem to affect both internal and external awareness since they provide the tools for conducting the actual sharing. Taking the technical skills as an example, a sound common understanding of the tools for handling spatial data sharing in practice among the organizational entities in a given domain seems vital when developing awareness. Without this understanding, the common "language" is missing and any solution orientated awareness building will probably fall short.

The below section will proceed on to trust as the second factor that are highly related with awareness.

4.4   Trust

Alter and Hage (1993) argues, as said, that awareness promote trust. As a staring point for investigating trust we find Gidden's (1990) who defines trust as "confidence in the reliability of a person or a system". The reason for regarding awareness as a necessity for developing trust hence seem that if organizations do not recognize other organizations, they cannot reach a level where they begin to establish trust with these organizations and establish closer relationships. Trust thus seems important as a base for developing inter-organizational relationships. On neither the personal nor the organizational level, relations will develop if the partners do not trust each other (Coulson 1998).

In this section, we will therefore look into the nature of trust, how trust can be graduated into phases that may be used when analyzing awareness, and how we can analyze levels of trust in organizations through structural analysis.

4.4.1   Personal and organizational trust

In Gidden´s definition of trust, we observe that he suggest that trust can exist on both the personal and organizational level. Since we operate on the inter-organizational level, organizational trust is of most interest here.

Regarding trust on the organizational level, we. e.g. find Sydow (2000), who defines inter-organizational trust (opposite to trust on the interpersonal, familiar level) as "the confidence of an organization in the reliability of other organizations, regarding a given set of outcomes or events". Sydow (2000) notes that inter-organizational trust "makes work within organizations easier and collaboration among organizations possible".

The inter-organizational trust is interesting here because some researchers suggest that the complexity caused by raising interdependency (see section 4.5) may be reduced if there exist inter-organizational trust. Lane (2000) thus argues that inter-organizational trust supports the formation of collective action by reducing the internal complexity of the system. In other words, actions by other organizations become to some degree predictable if there exist trust among the organizations.

While inter-personal trust largely develops from face-to-face experiences (Sydow 2000), inter-organizational trust develops in other ways. Inter-organizational trust may grow from institutional-based trust, which is based on traditions, professions and licenses or memberships in certain associations (Sydow 2000).

In public administrations, where legalization often plays an important role (as in the case of cadastral systems) institutional trust also arise if formal rules already "contribute to a higher degree of reliability" among the actors (Sydow 2000). Furthermore we find in public administrations that inter-organizational trust is likely to evolve to a high level because these organizations are permeated by a culture to live up to a social obligation and exercise societal responsibility (Lane 2000).

4.4.2   Alliance and trust development

Child and Faulkner (1998) analyses different stages of inter-organizational trust by dividing alliances among partners into three phases: Formation, implementation and evolution, and argue that the following three stages of trust evolve in steps: Calculation, mutual understanding and bonding.

Phase of alliance development over time	Formation	Implementation	Evolution
Key element in trust development	Calculation	Mutual understanding	Bonding

Table 4.1 Alliance development and evolution of trust (Child and Faulkner 1998)

The formation-phase includes the development from which "future partners conceive an interest in the possibility of forming an alliance, select potential partners, and negotiate an agreement (usually a contract)" In the implementation-phase the partners establish projects, appoint people to the projects, install systems and begin operations. The evolution-phase refers to the ways

that the relations between partners will further following its establishment (Child and Faulkner 1998).

Child and Faulkner describe calculation as the first stage of trust in alliances. In the formation-phase, partners form alliances out of a range of possibilities. Trust is important in this matter because partners have to trust that their partners "have the ability, competence and motivation to deliver on the promises, and that there are sufficient deterrents based on law and reputation for them not to let you down" (Child and Faulkner 1998).

The next stage of trust is mutual understanding, which happens in the implementation-phase of alliances. In this phase, the people that work together in the alliance have the opportunity to get to know each other and begin to understand and predict the thinking of each other. The stage of trust develops from calculation to mutual understanding (Child and Faulkner 1998).

If the stage of mutual understanding is developed and potential crises of distrust overcome, the people of the organizations can develop into the last stage of trust – bonding. In this evolutionary phase, where the alliance have proved successful, the people have developed such a high degree of trust that the alliance is likely "to mature into an organization with an increasing sense of its own identity and culture" (Child and Faulkner 1998). This encourages the management of the alliance to take further steps in developing ongoing relationships and new programs and projects. Child and Faulkner emphasize that the bonding between partners especially is facilitated through personal relations between the leaders of the cooperating organizations.

As was the case with willingness, we find several similarities with awareness. Especially the phase of formation (alliance forming and selecting potential partners) seems to have several matches with internal awareness when establishing the initial interest towards other organizations.

4.4.3   Structural properties to affect trust

Because of the importance of trust in the development of relations between organizations and the likely connections to awareness, it is furthermore of interest to characterize the structural properties that enhance trust in inter-organizational networks in order of a later study of trust in cadastral systems.

Narrowness of the inter-organizational field

Frequency and openness of communication

Multiplexity of relationship

Number of network organizations

Inter-organizational trust

Homophility of network organizations

Balanced autonomy and dependence

Open-endedness of relationship

Boundaries of the inter-organizational field
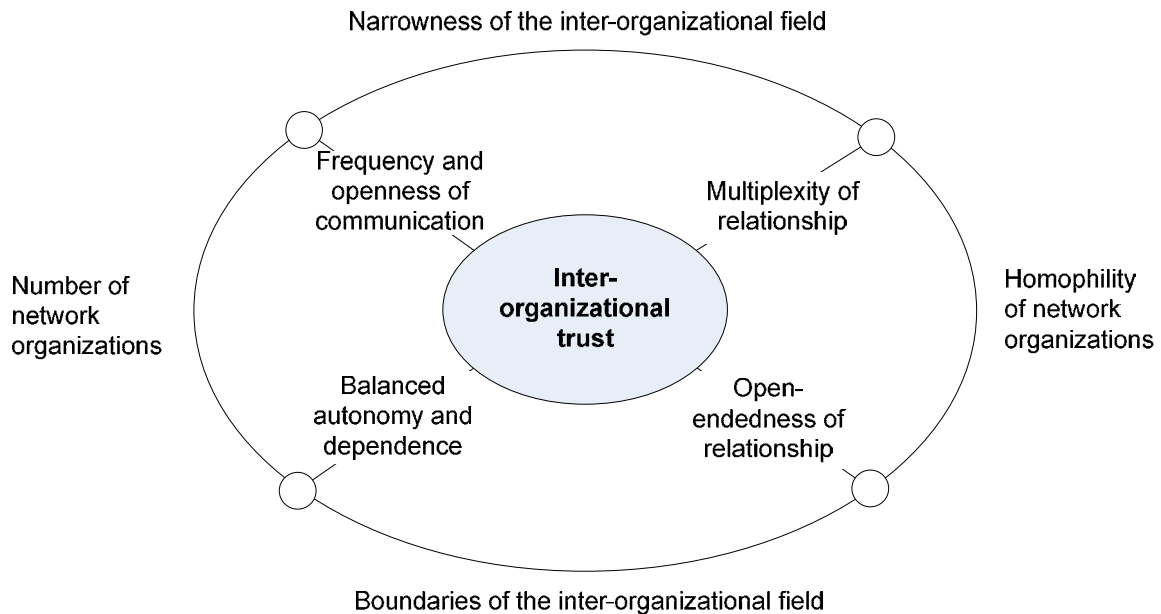
Figure 4.3 A range of structural elements affect inter-organizational trust (adapted from Sydow 2000)

Sydow lines up seven structural elements that effects inter-organizational trust (2000), see the above figure 4.3.

1. *Frequency and openness of communication.* Repeated and open exchange of information increases the possibilities for developing trust.

2. *Multiplexity of network relations.* The wider variety in exchange of exchanged content, the wider chance for developing trust.

3. *Open-endedness of the relationship.* Relationships with no final time-span tend to encourage the development of trust.

4. *Balanced relation between autonomy and dependence.* Trust among the partners in a network develops easier if the partners experience equality in the different facets of the relationship, exchange of information, power etc.

5. *Number of network organizations.* The formation of trust is more likely in networks with a small numbers of partners.

6. *Homophility of network organizations.* Belonging to the same sub-system, sharing interpretative schemes, norms and facilities enhance the possibilities for developing trust.

7. *Structure of the network field (narrowness and boundaries).* Narrow and well-defined networks usually have large extent of trust because of the little alternative scope of not being part of the network.

Sydow (2000) points out that the above properties only reveal opportunities for building trust, they do not guarantee nor determine a certain level of trust.

4.5   Interdependency

The last factor we will investigate is interdependency. We remember that Hall (1996), and Van de Ven and Ferry (1980) argued that awareness is essential in the acknowledgement of an organization's interdependency of other organizations. An organization must recognize other organizations and their role in the network before it can decide whether to develop a mutual dependency in problem solving or in the development of new services or products. Interdependency can thus be defined as social and/or economic mutual dependency between two or more entities (Oxford English Dictionary, 2nd edition, 1989).

Building on the work of McCann (1983) both Azad and Wiggins (1995), and Gray (1985) discuss different phases of relationships between organizations – collaboration, cooperation and coordination. They both argue that organizational interdependency rise when we move along these phases. While some authors randomly talk about collaboration, cooperation and coordination when discussing inter-organizational relations, the above-mentioned authors distinct the three concepts from each other and graduate the aspects according to the intensity or degree of inter-organizational relations and interdependency.

The below sections will go through the phases organizational relationships and touch closer on how interdependency are related to awareness.

4.5.1   Collaboration

The first phase, which Azad and Wiggins (1995), and Gray (1985) present is the problem-setting phase or collaborative phase. The authors assert that problem setting is concerned with identification of the stakeholders within a domain and mutual acknowledgement of the issues that join them or the problems they have in common. The authors stress the importance of direction setting. If the actors in an inter-organizational environment cannot agree on who has a legitimate stake in an issue and exactly what the joint issue is, the development of further relations is obstructed.

The authors also declare that there exist a close connection between levels of relationships and the understanding of interdependency. Through the direction-setting process one of the most important outcomes is thus an "appreciation of the interdependency that exist and the need for joint 'appreciation' among stakeholders of the nature and substance of their interdependence" (Azad and Wiggins 1995).

4.5.2   Cooperation

The next sequential phase in the relationships among organizations in inter-organizational networks is the direction-setting phase or cooperative phase. In this phase, the stakeholders begin to guide their individual interests towards each other and begin to identify, appreciate

and sense the common purpose they share. The stakeholders enters this phase by articulating values, goals and visions, that along the process "serve to correlate the stakeholders' activities towards mutually desirable ends" (Azad and Wiggins 1995).

In addition, Alter and Hage (1993) also give some words on cooperation, even though they not hierarchically line up the relationships between organizations, as the above authors. Alter and Hage thus suggest that cooperation includes "both a behavior component (willingness to work together) and an attitude (absence of selfishness)". Alter and Hage (1993) defines from this cooperation as "the quality of the relationship between human actors in a system consisting of mutual understanding, shared goals and values, and an ability to work together on a common task". With this definition, Alter and Hage thus sums up the direction-setting phase very well as a phase were the stakeholders in an inter-organizational network go from the identification of the partners in the network, to a phase where the partners have met and begin to outline a common future.

4.5.3   Coordination

The last of the three phases outlined by Azad and Wiggins (1995), and Gray (1985) is the structuring-phase or the coordinative phase. In this phase the stakeholders begin to create the actual long lasting structures and measures that can "sustain their collective appreciation and problem-solving activities" (Gray 1985). To enter this phase the stakeholders must agree on the concrete problems that exist in the domain and they must go into negotiations on building a regulative framework that is acceptable by all partners. "Specific goals are set, tasks are elaborated and roles are assigned to stakeholders" (Gray 1985).

Other researchers also discuss coordination. We e.g. find Alexander (1995) that cites Gray (1989) for arguing that "collaboration is an interactive process, which, if successful, may produce coordinated action as result". Gray herself uses Mulford and Roger's (1982) definition on coordination as "the process whereby two or more organizations create and/or use existing decision rules that have been established to deal collectively with their task environment".

4.5.4   Implementation

As the above three phases gives a thorough presentation of the stages in organizational relations, the stages seem to stop before the actual "action" takes place. The authors thus only present that the coordinative phase is where the organizations in common build up the framework for the given problem solving. The stakeholders only specify goals, elaborate tasks and assign roles. The authors not go into the actual implementation phase. We however feel that a description of the relations between inter-organizational networks that starts with the acknowledgement of interdependency in order to solve a shared problem not is completed until the actual problem is solved or hands-on tasks have been put in place. We therefore suggest a

fourth phase – the implementation phase, where each organization or new inter-organizational bodies put projects in place to solve shared inter-organizational problems identified by the stakeholders in common.

4.5.5 Overview

In summary, table 4.2 provides an overview of the four phases, collaboration, cooperation, coordination and implementation.

Collaboration	Cooperation	Coordination	Implementation
Problem setting	Direction setting	Structuring	Problem-solving
Recognition of interdependence	Coincidence of values, goals and visions	High degree of ongoing dependence	Inter-organizational projects are carried out
Identification of a requisite numbers of stakeholders	Dispersion of power among stakeholders	External mandates	
Perceptions of legitimacy among stakeholders		Redistribution of power	
Legitimate/skilled convener		Influencing the contextual environment	
Positive beliefs about outcomes			
Shares access power			

Table 4.2 Facilitating conditions for levels and stages of inter-organizational relations (developed from Azad and Wiggins 1995)

As was the case with the above sections on willingness and trust, the presentation of interdependency reveals, as stated by Hall (1996), and Van de Ven and Ferry (1980), a close relation to awareness.

4.6   General model on awareness

While the above sections have helped to concretize some of the aspects related to awareness, the concept still tends to be intangible. Before summarizing on the findings in this chapter, this section will therefore graphically try to explain the basics of awareness. However, in order to do this we first need a theoretical introduction to the concepts at play. In order to specify modes of awareness among social objects (being individuals, groups or organizations), Benford et al.

(1994) from the interactionist school of social psychology thus use of the concepts of *aura, focus* and *nimbus.*

Aura, focus and nimbus respectively define the place or medium of interaction (aura), how aware you are of an object (your attention – focus) and how much an object is aware of you (your presence – nimbus). While aura only describes that interaction between participants happens in an environment, focus and nimbus acknowledge that awareness between two objects not necessarily is symmetrical. Benford et al. (1994) explains it as follows: "A's awareness of B need not equal B's awareness of A".

In describing the level of awareness between two participants, Benford et al. (1994) assert that the more another object is within an object's focus, the more aware the object is of it, and contrary the more another object is within an objects nimbus, the more aware it is of this object.

In other words, this means that in an aura of knowledge-sharing, focus characterize the receiver's control and nimbus characterize the transmitter's control. The flow of information thus depends on both the transmitter's nimbus and on the receiver's focus (Benford et al. 1994).

Benford et al. (1994) defines as a result of this "the level of awareness that object A has of object B in medium M as some function of A's focus in M and B's nimbus in M".

Benford et al. (1994) however not only specify modes of awareness in general terms. They also put ten different modes of mutual awareness on display, by limiting the discussion to a two party interaction and displaying focus and nimbus as binary functions – the object is either completely in or out of focus/nimbus, see figure 4.4.
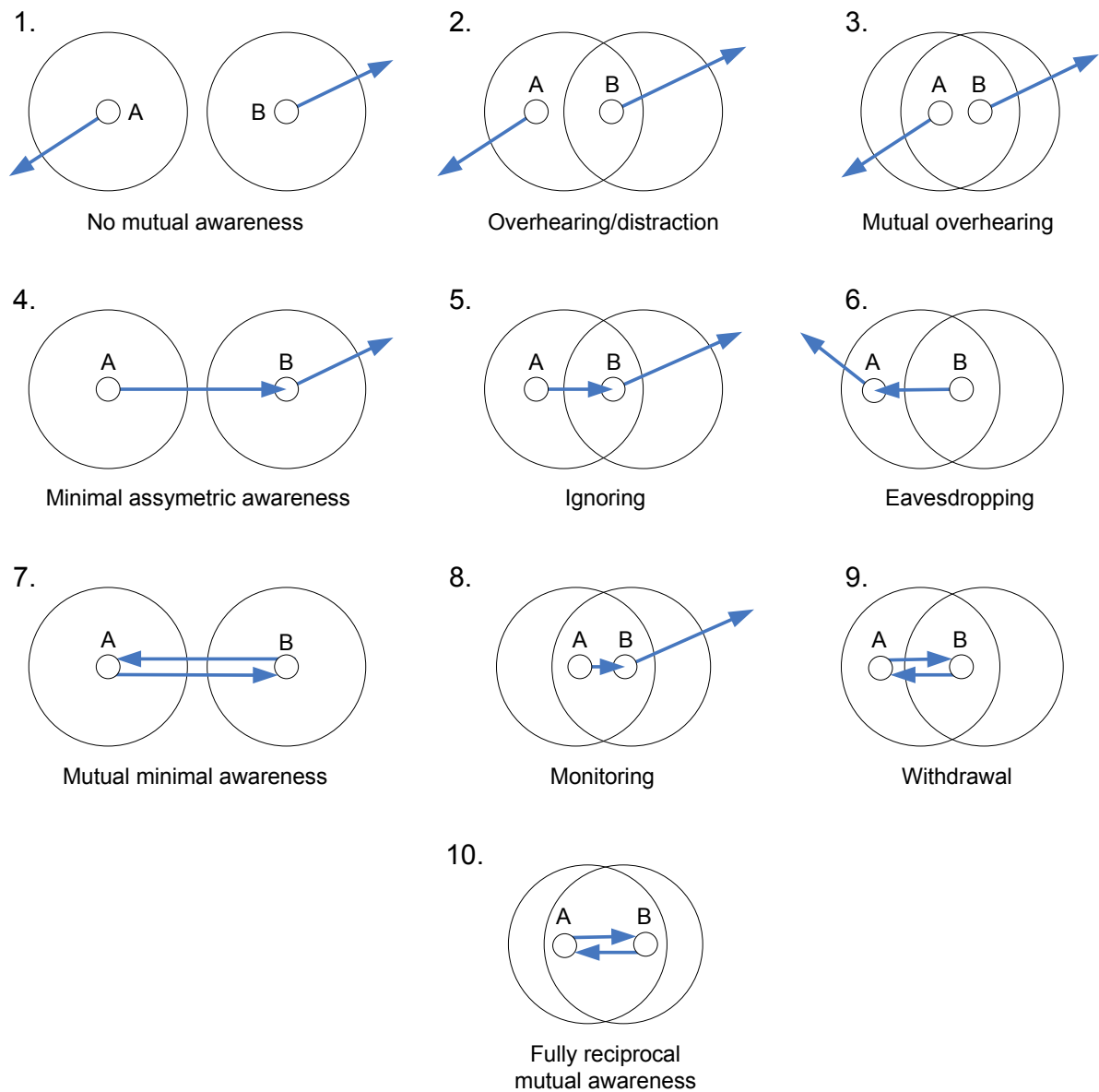
Figure 4.4 Modes of mutual awareness. The arrow displays focus. The circle displays nimbus (Benford et al. 1994)

The above presentation of the understanding of awareness in the field of psychology thus offers a sophisticated theoretical model of different aspects of awareness. In spite of the different foci in this field and in the field of organization theory, the above definition of awareness and the different aspects of mutual awareness, offer a very useful entrance to a specification of the degree and nature of awareness in inter-organizational networks.

4.7   Summary

The aim of the above sections chapter was both to provide general information on the aspects that together with awareness affect inter-organizational relations, and to provide background information for the development of an awareness-phase-model in the next chapter.

The above review of the three aspects, willingness, trust and interdependence argue that these aspects together with awareness are highly important when developing relationships between organizations.

If we should follow the suggestions by Alter and Hage (1993), and Van de Ven and Ferry (1980) on how awareness, in the sense of organization's knowledge of other organizations, affect the three aspects willingness, trust and interdependence we would see a sequence like the one in figure 4.5.
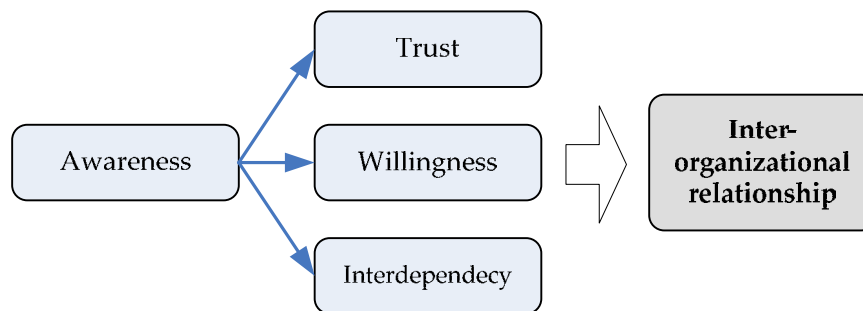
Figure 4.5 According to Alter and Hage (1993), and Van de Ven and Ferry (1980) awareness affects willingness, trust and the organizations understanding of mutual interdependency

However, the question is whether it is possible to scale the aspect this way. Reading the reviews of the aspects, we find that the aspects are highly correlated. Awareness in the sense of organization's wish to acquire knowledge of other organizations is e.g. not only affecting trust but is also dependent on trust of other organization – the higher degree of trust one organization have to other organizations, the more dedicated they will be of developing awareness of this organization.

We may therefore instead understand the relation between awareness, willingness, trust and interdependence as being inter-related, see figure 4.6.
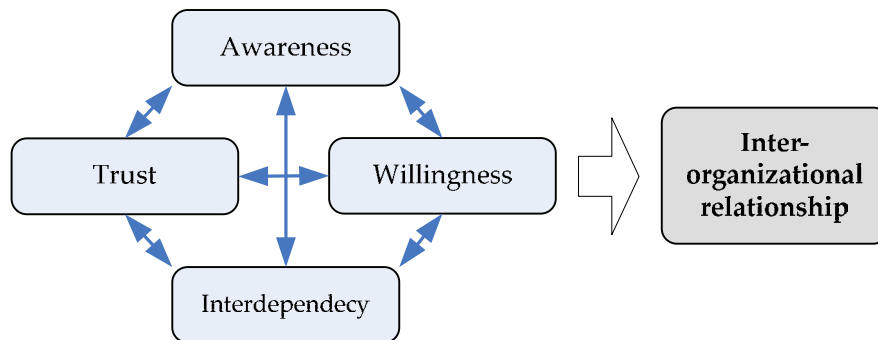
Figure 4.6 Awareness, trust, willingness and interdependency might be inter-related

While the above reviews have provided useful insights in the aspects that according to some researchers are closely connected to awareness when developing relationships in inter-organizational domains, the most significant outcome of the presentations comes in the support for the next chapter's investigations of an awareness-phase-model. Without outlining the actual awareness-phase-model, we can already now say that we have discovered several aspects that are useful in building such a model.

First, we found that the above reviews of the phases of trust and interdependency underpin the existence of scales or phases of relationship between organizations in a network, which suggest that we will be able to transfer this knowledge to the area of awareness.

Secondly, we found that the relations between organizations apparently not stops when we reach a phase of coordination or structuring between the organizations, but also enters a phase of actual problem-solving, and goes further into an evolutionary phase, where the concrete problem solving found a broader level of relationship.

Lastly, we found that the models on awareness from the interactionist school of social psychology displayed a very useful view on what actually is at stake when discussing inter-organizational relationships from an awareness point of view.

5   Models on awareness

When we discuss awareness in the context of cadastral systems, we focus from an organizational viewpoint on two kinds of awareness – internal - and external awareness. We remember from the introduction chapter that internal awareness deals with the relationship between organizations in an inter-organizational network, while external awareness deals with organization's recognition of external needs.

While we in the above chapter mostly have been focusing on inter-organizational relations and inter-organizational awareness, since the existing literature on the subject has this focus, we will find in this chapter that an understanding of internal awareness will provide the basis for discussing both internal - and external awareness.

This chapter aims, through the concepts and understandings of phases of inter-organizational relationships developed in the above chapter, to develop an understanding of awareness on both the internal and external level. In the chapter, we will first develop a general model, later the general model will be adjusted to an analysis of cadastral systems.

5.1   General model on internal awareness

5.1.1   Phases of relations as a foundation

In the above chapter, we have argued that there exist five phases in the relationship between organizations that want to solve inter-organizational problems or develop new services that acquire a mutual effort. The phases were collaboration, cooperation, coordination, implementation and evolution, see table 5.1.

Collaboration *Problem-setting phase*	Problem setting is concerned with identification of the stakeholders within a domain and mutual acknowledgement of the issues that join them. The actors must agree on who has a legitimate stake in an issue and exactly what the joint issue is.
Cooperation *Direction-setting phase*	The stakeholders begin to guide their individual interests towards each other and begin to identify, appreciate and sense the common purpose they share. The stakeholders enter this phase by articulating values, goals and visions that along the process "serve to correlate the stakeholders' activities towards mutually desirable ends" (Azad and Wiggins 1995).

Coordination *Structuring phase*	The stakeholders begin to create the actual long lasting structures and measures that can "sustain their collective appreciation and problem-solving activities" (Gray 1985). To enter this phase the stakeholders must agree on the concrete problems or possibilities that exist in the domain and they must go into negotiations on building a regulative framework that is acceptable by all partners. "Specific goals are set, tasks are elaborated and roles are assigned to stakeholders" (Gray 1985).
Implementation *Problem-solving phase*	The stakeholders put projects in place to solve shared inter-organizational problems or develop possibilities identified by the stakeholders in common.
Evolution *Relation-maintaining phase*	The stakeholders recognize the need of more permanent relations in order to maintain future relations. The outcome may be establishment of permanent committees or regular meetings with exchange of experience on partnerships.

Table 5.1 Five phases describe inter-organizational relations

The above phases identify how relationships between organizations are closely related to the awareness of stakeholders, common goals and problems, and the need to develop permanent structures for further relationships.

Since it seems appropriate to use awareness as a condition for the development of organizational relationships, the following matrix transforms the general concepts from the phases of relationships (table 5.1) into a general model on stages of internal awareness, see the below table 5.2. As mentioned in the introduction, it is of course important to be aware that the model displays an ideal process of inter-organizational relations.

5.1.2   Internal awareness model

Table 5.2 presents the internal awareness model in its general form.

Overall step	Stage of awareness	Description	Catalyst
Motivation	**Existence awareness**	Awareness of other organizations in the inter-organizational networks	**Pressure ←→ Communication**
	Collaboration awareness *Problem-setting*	Awareness of shared role of organizations in the inter-organizational networks	
	Cooperation awareness *Direction-setting*	Awareness of capabilities and resources in the inter-organizational networks	
		Awareness of shared values, goals and vision among the organizations in the inter-organizational networks	
		Awareness of need for partnerships in the inter-organizational networks to reach shared goals and visions	
Coordination	**Coordination awareness** *Structuring*	Awareness of shared problems and/or new possibilities in the inter-organizational networks	
	Implementation awareness *Problem solving*	Awareness on how to solve problems and develop new possibilities in the inter-organizational networks	
Outcome	**Evolution awareness** *Maintaining relations*	Awareness of success and need for further common projects to maintain the established relations in the inter-organizational networks	

Table 5.2 General internal awareness model

Table 5.2 – the general internal awareness model – shows that when organizations in an inter-organizational network develop collaborative relationships this ideally happens through three overall steps – a motivation step, a coordination step and an outcome step (see the review of Nedovic-Budic and Pinto 1999 in section 4.2).

In the *motivation step,* the stakeholders are "getting to know each other". What other organizations exist in the domain and why are these organizations interesting? The organizations initially develop awareness of each other (existence awareness). The starting point for any relationship is thus recognition of each other's mere existence and a focus on each other, see figure 5.1.
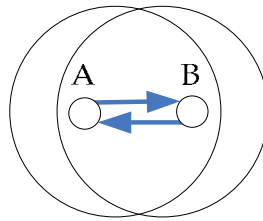
Figure 5.1 Development of awareness implies that the organizations are aware of each other's existence and are focusing on each other (nimbus and focus)

Hereafter, the stakeholders develop awareness of the roles they share, e.g. as providers of cadastral information (collaboration awareness). Hereafter, the stakeholders develop firstly awareness of each other's capabilities and resources, secondly awareness of the shared values, goals and vision and thirdly awareness of the need for partnerships to reach shared goals and visions (cooperation awareness).

In the *coordination step*, the organizations are "getting ready to work with each other". They identify common problems or possibilities that exist and how these may be solved or developed. Initially, the organizations develop awareness of the shared problems and/or new possibilities that the organizations want to deal with in common (coordination awareness). Then the organizations develop awareness of how to solve these problems (implementation awareness).

In the last step, the *outcome step*, the organizations hopefully have identified a solution to one or more of their common problems or developed new possibilities. The organizations are now "identifying with each other". The organizations develop awareness of success and need for further common projects to maintain the established relations (evolution awareness). The outcome of this awareness may be establishment of permanent committees or regular meetings with exchange of experience.

5.1.3   Transition mechanisms

However, the stages of awareness do not evolve by themselves. Organizations need drivers for engaging in inter-organizational collaboration. The internal awareness model therefore also argues that certain catalysts must be present to evolve the degrees of awareness. Several of these have been touched upon in the previous chapters e.g. trust and willingness. Looking further into this aspect focusing on public organizations e.g. Vigoda and Gilboa (2002) argues that the developing of inter-organizational networks often is triggered by outside events. As suggested by Cigler (1999) (1999), it is often events rooted in fiscal or perceived stress that trigger the developing of inter-organizational collaboration. Cigler (1999) however also

mentions less dramatic causes for collaboration, such as a political constituency for collaboration, early and continued support by elected officials, visible advantages of collaboration for participating organizations and the existence of a policy entrepreneur.

Table 5.2 therefore proposes that the catalysts for evolving awareness in an inter-organizational network are pressure for change that affects the communication between the organizations. A type of communication that happens both through informal and formal channels. An informal channel may be the exchange of information through reallocation of staff, discussion in cross-organizational working groups, general information gathering etc. Formal channels are coordinating bodies and coordinating meetings on the strategic levels between the organizations etc. While informal channels of information provide the foundation for developing awareness, the most important development of awareness on all levels in an organization comes from formal channels of information exchange. Coordinating bodies especially seem to play an important role in developing awareness, since they act as agents of overall exchange of views, roles and super ordinate goals and visions, see section 6.4 for more information.

However, while communication is fundamental in developing awareness it is only a tool. If the organizations are not serious about developing relations with other organizations, the communication will be in vain. Especially in the motivation phase, where the organizations are "getting to know each other" it is crucial that the members of the organizations build a feeling of cohesion among each other's roles, values, goals and interdependency. A number of possible barriers affect this feeling. Besides the lack of inter-organizational communication, particularly willingness (Wehn de Montalvo 2002) and trust (Pinto and Onsrud 1995) seem to be important factors. This paper will however not go further into a discussion on these barriers since the aim here is to develop a better understanding of awareness not the factors that obstruct the development of awareness.

5.2   General model on external awareness

The focus in this thesis is on the possibilities for organizations in cadastral systems to develop towards multi-purpose systems, in which external awareness is of special importance. Therefore, while the above sections have described internal awareness, this section will look into external awareness. External awareness in the context of spatial information is concerned with making *spatial* information, expertise and services available to other governmental organizations and to society, in order to support and underpin the value of the spatial information that exist in the organizations. Table 5.3 – the general external awareness model – discusses the steps of external awareness in an inter-organizational domain from a general viewpoint before going into a discussion of the specific context of cadastral systems in the next section.

Overall step	Stages of awareness	Description	Catalyst
Motivation	**Need defining awareness**	Awareness of society's need and interest of the information, expertise and services that the organizations posses and/or can deliver	Pressure ↔ Communication
Motivation	**Collaboration awareness** *Problem-setting*	Awareness of the role of the inter-organizational network in society	Pressure ↔ Communication
Motivation	**Collaboration awareness** *Problem-setting*	Awareness of organizational interdependency in order to reach shared goals and visions	Pressure ↔ Communication
Coordination	**Coordination awareness** *Structuring*	Awareness of shared problems and/or new possibilities	Pressure ↔ Communication
Coordination	**Implementation awareness** *Problem solving*	Awareness on how to solve problems and develop new possibilities	Pressure ↔ Communication
Outcome	**Evolution awareness** *Maintaining relations*	Awareness of success and need for further common projects to maintain the established relations	Pressure ↔ Communication

Table 5.3 General external awareness model

It is clear that the models on general internal and external awareness, presented in table 5.2 and 5.3, are very much alike. However, what make the models different from each other are the motivation steps. In the model on internal awareness the motivation step focuses on building awareness between organizations to "get to know each other", the motivation phase in the external awareness model focuses on making the organizations "getting to know the others".

For organizations in land administration, the first stage of awareness is therefore on awareness of the need in society of the spatial information, expertise and services that the organizations posses and/or can deliver (need defining awareness). Organizations do not develop multi-purpose service-orientated land administration systems if they not are aware of a demand for their spatial information.

The next logical stage is an awareness of the role that the organizations play in society and an awareness of the interdependency one organization have to other organizations that possess adjacent information. While awareness of the demand for information may be seen as a precondition for developing external awareness, the organizations involved in developing multi-purpose systems, e.g. the land registry and the cadastral mapping agency, still have to develop

collaborative structures and SDIs for the sharing and distribution of spatial information. This stage is called collaboration awareness, as was the case in the model on internal awareness.

The coordination and outcome steps are identical in the internal and external models on awareness and will therefore not be emphasized here.

5.2.1   Awareness in the context of cadastral systems

The above general models on awareness are very generic. They can be basis for investigating internal and external awareness in all kinds of inter-organizational domains. However since, we here are focusing on the domain of cadastral systems it is important to attempt to make the models as specific to this domain as possible.

We argue that the focus in the coordination step is what make models from different domains diverge from each other. While the motivation step is all about getting to know each other, it is in the coordination step the actual "action" happens in the relationship between organizations. It is here problems are being solved and new ideas developed. Hence, it also is here the most specific levels of awareness are needed. Figure 4.1 uses this argument to focus on awareness in the specific context of cadastral system by pointing out a numbers of areas in which decision makers must have developed awareness in order of carrying out projects. It can be observed that the coordination step in the above specific model, focus on the factors on spatial data handling outlined by Nedovic-Budic and Pinto (1999) in section 4.2, since they very well sums up on the important factors when generating, sharing and using data in cadastral systems.

Coordination step			
	Structures	**Processes**	**Policies**

Coordination awareness	- role in partnership
	- location (physical and virtual) of problem solving innovation
		- obligations of the organizations in the network
		- rights of the organizations in the network regarding the use of data in the system
		- procedures regarding the generation, sharing and use of data
		- flow of data in the network
			- uniform concepts of property[1]
			- uniform standards of data[1]
			- uniform standards of metadata[1]
			- agreement on responsibilities[1]
			- agreement on ownership
			- agreement on contributions
			   ▫ Funding of database maintenance
			   ▫ Pricing for data distribution
			   ▫ Charges for user support
			   ▫ Hardware
			   ▫ Software

	Structures	**Processes**	**Policies**

Implementation awareness	- N/A	- procedures regarding the generation, sharing and use of data[2]
		- flow of data in the network[2]
			- uniform concepts of property[2]
			- uniform standards of data[2]
			   ▫ Data models
			   ▫ Data formats
			   ▫ Data quality
			   ▫ Categories of spatial data
			   ▫ Contents of data layers
			   ▫ Metadata
			   ▫ Data dictionaries
			   ▫ Output requirements
			   ▫ Data transfer
			- uniform standards of metadata[2]
			- agreement on responsibilities[2]
			   ▫ Database maintenance
			   ▫ Data usage
			   ▫ Distribution of data
			   ▫ User support

Table 5.4 Areas of which decision makers should be aware of in coordination step in order to be able to make overall decisions on aspects regarding data sharing in cadastral domains (developed from Nedovic-Budic and Pinto 1999). [1]In these areas, the decision makers should possess an overall knowledge. [2]In these areas, the operators should possess a thorough knowledge.

When looking closer into the factors it is important to have in mind that the two stages of awareness in the overall step of coordination awareness are different. There is need for a much more detailed knowledge level in the stage of implementation-awareness than in the stage of coordination-awareness, since stage of implementation awareness implies actual problem solving and/or development of ideas. Because of this, the models suggest a need for different levels of awareness in the stages of coordination-awareness and implementation-awareness. When we move to the phase of implementation-awareness, we find that the level of needed knowledge rise, and we see find that the factors include more operational tools than strategic. The move from coordination awareness to implementation awareness hence suggest a move from a stage of problem-solving where the strategic and management levels in an inter-organizational network have agreed on the overall framework to solve problems, to a level where the management and operational level of an organization must put actual procedures in place to solve problems.

In summary, we see from the above description that the further in a problem-solving stage organizations exist, the more specialized and specific knowledge they need. And that really is what inter-organizational awareness is all about, namely to be aware of other organizations in the organizational domain, the nature of the problems that might exist in the organizational domain and the tools there exist for solving these problems.

5.3   Summary

By drawing on the findings in the previous chapter on phases of inter-organizational relationships, this chapter has developed two general models on awareness – one on internal awareness, another on external awareness. In order of making the models as precise as possible, the coordination stage in the models is adjusted towards the context of cadastral systems.

By combining the findings in the development of the two models on awareness, it is now possible to define the term awareness in context of organizational awareness in land administrations system's development towards multi-purpose systems.

Internal awareness involves the stages of recognition that allows organizations to make sound decisions in solving problems or developing solutions regarding handling of spatial information, expertise and services between the organizations.

External awareness involves the stages of recognition that makes organizations recognize why and how they alone and together can make their spatial information, expertise and services available to society in order to support a social, economic and sustainable development.

Regarding the structure of the models of awareness, the review has demonstrated that the internal and external awareness models are very alike. As figure 5.2 illustrates, the content of motivation step is the only thing that separates the two models from each other. A fact that display the importance of this step in the development of inter-organizational relationships.
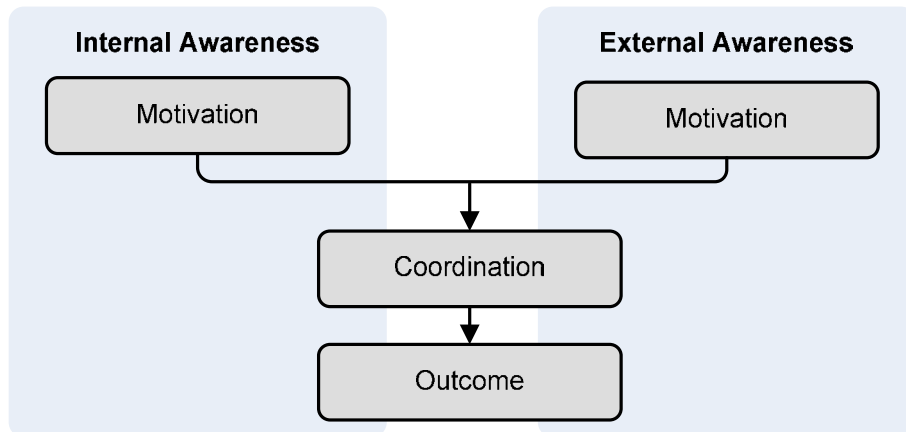
Figure 5.2 The coordination and outcome steps are identical in the two awareness models

Lastly, it is important to recognize that the road towards multi-purpose systems seems to demand first internal awareness and then external awareness. It seems as if it is necessary for organizations first to develop the motivation step of internal awareness, before the motivation step of external awareness. Land administration organizations, must first know each other, before they can fulfill a multi-purpose position in society.

6   Additional tools for investigating awareness

The above two chapters provide information on the nature and role of awareness in inter-organizational relationships and provide a detailed understanding on two different kinds of awareness – internal and external-awareness. However, these chapters provide only overall tools for investigating awareness. The present chapter will therefore present a number of additional, more specific tools, which we in supplement to the above models and understandings, can use when investigating awareness in the case studies in chapter 8-11. The tools presented in this chapter, will together with the aspects of trust, willingness and interdependency and the models on internal and external awareness, be summarized and operationalized closer in the next chapter – chapter 7.

Regarding this chapter's presentation of additional tools for investigating awareness, four factors seem to be of special interest when we look at the built awareness-phase models.

Firstly, having the management focus of this thesis in mind it is interesting to develop an understanding on what tools the management have for making organizations develop awareness on other organizations and what factors that affect this process. Focusing on this process as a process of communication, we will focus on why communication from the management is essential when setting the course of an organization, and on how successful management communication may be analyzed.

Secondly, the review on trust in section 4.4 emphasized that structural analysis was important in investigating trust. Is structural analysis also useful as a tool for analyzing awareness? To answer this, we will look into the field of structural relations among organization, investigate the concepts that exist within this field and present how these might relate to awareness.

Thirdly, a useful tool for investigating awareness seem to be down written visions in organizations since these offers a window into the focus and tools that the management use for advocating internal and external awareness in the inter-organizational domain. As a response to this, we will present a tool for analyzing visions.

Lastly, participation in inter-organizational coordination bodies seems to advance both internal- and external awareness because of these bodies' role as forums for exchange of ideas, culture and knowledge in general. We will therefore provide tools for analyzing inter-organizational coordination bodies in the context of awareness building.

We will begin by reviewing management communication in the context of awareness.

6.1 Management communication

From the introduction to this thesis and in chapter 5 on the internal - and external awareness models, we learned that awareness is intimately linked with knowledge. Especially in the motivation step of the awareness models, it seems as if knowledge is the foundation for building awareness between organizations and towards the needs in society. However, focusing on the individual organization, knowledge is only a mean for building awareness if it is communicated in the right ways throughout the organization. Through communication, employees can be made aware of other organizations and on how they together with other organizations can help fulfilling the (public) organizations' role in society.

Since the investigations on awareness in this thesis, as said, have a management focus, the studies on communication will also apply this focus. The below section will thus focus on why communication from the management is essential when setting the course of an organization, and on how successful management communication may be analyzed.

6.1.1 An overview on communication

In general, communication may simply be defined as the process whereby persons or groups send messages to each other. However, as figure 6.1 displays, communication is in reality a much more complicated process.
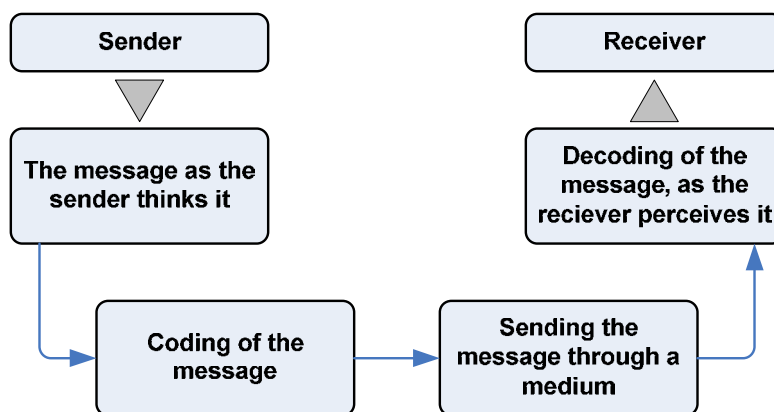
Figure 6.1 The communication process (Lev 2002)

The model visualizes communication as a process that includes a sender and a receiver of information. The sender initiates the process by coding the message through verbal and non-verbal symbols. The choice of coding affects the next stage where the message is send through a medium. E.g., a choice of non-verbal coding means that the sender has to choose a medium appropriate for this (e-mail, reports etc.). Lastly, the receiver must decode the message and try to interpret what the sender wants to communicate. Communication is hence a dynamic process that changes over time and may include several pitfalls. E.g. the coding process can go

wrong, the medium may not be suitable, or the demanded decoding do not match the receiver's requisitions (education, experience etc.) (Lev 2002).

6.1.2   Why focus on communication?

As said, communication is fundamental when distributing the knowledge founding internal - and external awareness in an organization. Communication to the single employee is hence supporting the organizational learning process that lies in the phases of awareness. Through (proper) communication management can steer, control, and coordinate. The management needs information on what happens in the organization, and the management can steer an organization in a desired direction through communication, e.g. if a cadastral organization wants to advance its external awareness because of its changing role in society. However, stepping away from the focus on awareness, communication is in general acknowledged as an essential factor for organizational success. Communication supports the formulation of clear goals and helps the employees navigate in the organizational environment (Lev 2002).

6.1.3   Analyzing communication

A review of various management communication literature sources, e.g. articles published in Management Communication Quarterly, reveals that communication analysis often is a complicated and lengthy affair (see e.g. Kuhn and Jackson 2008) and that various tools may be used in this process, e.g. SYMLOG described by Keyton and Wall (1989), and transaction analysis described by Heltbech et al. (1994). Furthermore, literature describes that various factors affect communication, e.g. power, culture, trust, physical and organizational structures etc. However, since we have to keep things relatively simple here and because of our management focus, we will focus on the fact that several authors argue that communication in general is enhanced if the mediums of communication from the management is as diverse as possible. Lund and Petersen (2007), and Petersen (2000) e.g. argue using The Danish medical company Novo Nordisk as a case, that communication from the management must be using several mediums to be effective – internet, intranet, staff magazines, brochures, meetings, face-to-face dialogue etc. In summary, by making the mediums for information as multi-faceted, accessible and regular as possible the management has in general a better chance of communicating a message to the employees in an organization and making it accepted among the employees, than if the management only are using few mediums.

6.2   Structural relations

We now move the focus from the communication within the organization to the relations between organizations. One of the most common entries to an analysis of inter-organizational networks is hence an analysis of the structural relations in the network (see e.g. Nylehn 1997).

In order to understand this field, it is useful to present some of the different organizational structures that exist. Researchers thus suggest (e.g. Eisenberg and Goodall 2001;Hall 1996) that inter-organizational relations have three basic structural forms (see figure 6.2): a) A pair wise or dyadic form, b) a form with one central organization, and c) a symmetric network form. However, other literature (e.g. Alter and Hage 1993;Monge and Contractor 2003) emphasizes that in reality networks are often asymmetric – not all organizations in the network are connected and information is not always mutually exchanged, see figure d.

a. Pair wise
relationship

b. Inter-organizational set

c. Symmetric inter-
organizational network

d. Asymmetric inter-
organizational network
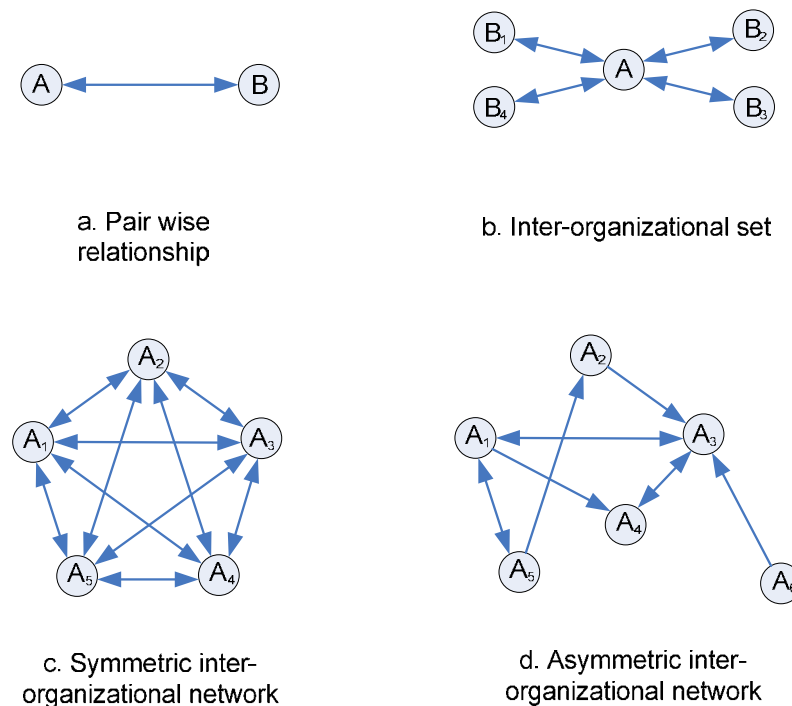
Figure 6.2 Different forms of network structures (developed from Hall 1996)

Arguing that network structures and awareness are highly interrelated (especially with regard to internal motivation awareness), figure d helps to illustrate that awareness between two objects not necessarily is symmetrical. A fact that underpin the idea that the existence of awareness can be inhomogeneous in inter-organizational networks. In other words, the level of recognition of other organizations is usually not the same from organization to organization. As we will see in the below review, the structural position of the single organization in the network and the aspects of links from one organization to the other organizations also help to explain one organizations awareness of other organizations.

6.2.1   Linkages and awareness

In order of being able to describe different types of linkages and inter-organizational network closer, we will use a typology developed by Monge and Contractor (2003). When analyzing awareness in inter-organizational networks, a number of types of linkages and descriptions of

networks seem to be of interest. For instance, the number of nodes, ties and the density of an inter-organizational network seem important when discussing awareness. Eisenberg and Goodall (2001:291) thus point out that shared meanings about major organizational issues are easier distributed in structural dense networks, than in structural sparse networks.

The below three tables from Monge and Contractor (2003) outline different ways to describe organizations (table 6.1), ways to characterize the links between actors in networks (table 6.2), and ways to characterize the single actor in networks (table 6.3). When Monge and Contractor (2003) mentions networks, it is important to bear in mind that actors can be every organizational component of an organization ranging from individuals and teams to organizations and inter-organizational networks.

Measure	Definition
Indirect links	Path between two actors is mediated by one or more others
Frequency	How many times, or how often the link occurs
Stability	Existence of link over time
Multiplexity	Extent to which two actors are linked together by more than one relationship
Strength	Amount of time, emotional intensity, intimacy, or reciprocal services (frequency or multiplexity often used as measure of strength of tie)
Direction	Extent to which link is from one actor to another
Symmetry (reciprocity)	Extent to which relationship is bidirectional

Table 6.1 Measures of ties (Monge and Contractor 2003)

Measure	Definition
Degree	Number of direct links with other actors
In-degree	Number of directional links to the actor from other actors (incoming links)
Out-degree	Number of directional links from the actor to other actors (outgoing links)
Range (Diversity)	Number of links to different others (others are defined as different to the extent that they are not themselves linked to each other, or represent different groups or statuses)
Closeness	Extent to which an actor is close to, or can easily reach all the other actors in the network
Betweeness	Extent to which an actors mediates, or falls between any other two actors on the shortest path between those actors
Centrality	Extent to which an actor is central to a network.
Prestige	Based on asymmetric relationships, prestigious actors are the object rather than the source of relations.

Table 6.2 Measures assigned to individual actors (Monge and Contractor 2003)

Measure	Definition
Size	Numbers of actors in the network
Inclusiveness	Total number of actors in a network minus the number of isolated actors
Component	Largest connected subset of network nodes and links
Connectivity (Reachability)	Extent to which actors in the network are linked to one another by direct or indirect ties
Connectedness	Ratio of pairs of nodes that are mutually reachable to total number of pairs of nodes
Density	Ratio of the number of actual links to the number of possible links in the network

Centralization	Difference between the centrality scores of the most central actor and those of all other actors in a network is calculated, and used to form ratio of the actual sum of the differences to the maximum sum of the differences
Symmetry	Ratio of the number of symmetric to asymmetric link in a network

Table 6.3 Measures used to describe networks (Monge and Contractor 2003)

The above tables provide a typology for the structural aspects and linkages in an inter-organizational network by presenting a number of measures in networks. If we look at the measures, it is clear that nearly all of the aspects affect the degree of awareness in a network in some sense. The below section will argue for the relation between some of the linkages and the degree of awareness in an organization.

Measure of ties

In general, all descriptions of ties from one organization in the network to other organizations seem to be of importance when analyzing awareness. These ties are (from table 6.1) frequency, stability, multiplexity, strength, direction and symmetry. It hence seems logical that the more often stable, multifaceted, important linkages that happen back and forth between two organizations the more aware the organizations get of each other – the more focus the organizations have on each other.

Measures assigned to individual actors

If we combine the measures of ties in a network with measures assigned to individual actors (table 6.2), we get a description of the single organization's importance and position in the network. The measures assigned to the individual actors were degree, in-degree, out-degree, range, closeness, betweeness, centrality and prestige. Again, the relation to the degree of awareness is noticeable. The more organizations communicate with each other the higher degree of awareness the single organization will have of the other organizations. The awareness of other organizations will be even further extended if the organization has a central position in the network where it is close to the other organizations and benefits from a prestigious position where it is "the object rather than the source of relations" (Monge and Contractor 2003). The better nimbus between two organizations, the more awareness the organizations have on each other.

Measures used to describe networks

As the above two sections describe the single organization and the relations between single organizations, table 6.3 describes the measures that relates to the entire network – size, inclusiveness, connectivity, connectedness, density, centralization and symmetry. Once more, it is possible to see a relation to awareness. A small, dense network, where a large number of organizations have links to each other, will probably experience a higher degree of awareness than a relatively big, dispersed, asymmetric network. Again, this can be included in the term of nimbus between organizations.

6.3   Visions and strategies

Moving to the field of organizational visions, down written official visions and strategies of an organization seem to be a very concrete tool when analyzing both internal and external awareness. Visions and strategies can provide a look into the organizations focus areas and views on other organizations in the inter-organizational domain. Visions and strategies also act as a meter on the management's efforts in rising awareness among the employees in an organization. Linden (2002) puts it like this: "Great groups think they are on a mission from god." A statement that deals with one of the many ways of improving awareness in organizations, namely by making groups of people identify a higher purpose. The aim is thus to establish a line of sight – making people see a connection between their work and some larger purpose or impact by others (Linden 2002).

Outspoken and down written visions and strategies are thus central as indicator of both internal and external awareness towards a certain organization, organizational network or position in society. However, what characterize efficient vision and strategies in a company or an organization in term of developing a cooperated awareness of a topic and in matter of presenting this awareness to the stakeholders? The below section 6.3.1 will investigate this.

6.3.1   Analyzing visions and strategies

When analyzing characteristics of visions and strategies, we will use the typology and methodology developed by Bordum and Hansen (2005) in their analyses of visions and strategies in the 50 biggest Danish companies. While Bordum and Hansen focus on visions and strategies in private companies, we focus on visions in public organizations. The model is however so general that the model may be used in both areas.

Bordum and Hansen (2005) define visions and strategies as part of what they call goal setting management communication. Goal setting management communication is the pre-condition for any organization of individual action in an organization. It is about developing a united approach to the function and the development of a company or an organization.

Vision and strategies must provide focus, motivation and purpose for the organization and act as a guiding star for the future, while it still is realistic and trustworthy (Bordum and Hansen 2005:245).

Through 12 parameters, Bordum and Hansen provide an analytical tool for analyzing whether an organization in a communicative persuasive way informs about its visions, missions and basic values. Table 6.4 outlines a number of the most interesting parameters.

Parameter	Thesis
Where are the vision, mission and basic values published? How visible are the statements?	The more communicative important and the more visible the statements are, the more an organization focus on the statements.
Who is the sender of the statements? Moreover, do the statements indicate an authoritative sender?	The more authoritative the sender of the statements is, the more an organization focus on the statements.
What stakeholders do the statements mention? Are some stakeholders prioritized?	Mention of a shareholder displays that this stakeholder is especially prioritized as a receiver of the information in the statements
What are the themes of the statements?	The themes in the statements displays what the organization sees as important in their statements
Do the statements contain argumentation and clarification?	Arguments and clarification of the statements displays whether an organization are serious about the content and implementation of the statements
Do the organization commit it self in the statements?	Commitments must be followed by a real expectation of action by the stakeholder that the statements can be fulfilled
Are the communication contents of the statements convincing?	The above parameters do together display the communicative successfulness of the statements in an organization

Table 6.4 Parameters for analyzing visions, missions and basic values in organizations (developed from Bordum and Hansen 2005)

The above table illustrates that the instrument for analysis of visions and strategies not is normative in the way of describing if the visions are good or bad. The parameters only focus on the failure or success of communication and it is important to be aware of the fact that what might fail in one organization might be effective in another. In an analysis of statements, it is therefore always important to have the stakeholders in mind. What do they expect from

the organization? Furthermore, the analyses do not only focus on whether the goal setting communication is communicated towards the employees in the organizations of cadastral systems, but also on the focus and the content of the communication.

6.4   Inter-organizational coordination bodies

The last of the additional tools for investigating awareness in cadastral systems will argue that in an awareness sense, participation in inter-organizational coordination bodies seems to advance both internal- and external awareness. Using the definition on coordination in section 4.5.3 by Mulford and Roger (1982), we may define an inter-organizational coordination body as an organized group of people established to deal collectively with their task environment.

From a theoretically viewpoint, Masser et al. (2007) argues that the establishment of inter-organizational coordination bodies supports collaborative partnerships in the spatial information community by developing shared visions and making organizations feel a sense of common ownership. Obermeyer (1995) furthermore argues that inter-organizational information sharing is achieved through a framework of inter-organizational alliances, grown from negotiation between relative equals. Pinto and Onsrud (1995) supports these arguments, by stating that lack of collaborative arrangements restricts the ability of agencies to effectively share spatial information, integrate systems and constrains the widespread use of GIS.

However, multiple empirical examples throughout the world also support the effectiveness by inter-organizational coordination bodies when building alliances and expanding on the societal use of spatial information. The examples exist on both the regional, national and local level. On the regional level, we e.g. find INSPIRE that by bringing national spatial data together focuses on building an SDI on the European level focusing on "the need for quality geo-referenced information to support understanding of the complexity and interactions between human activities and environmental pressures and impacts" (EC INSPIRE Information Desk 2008). On the national level, WALIS in the Australian state of Western Australia is a good example of an inter-organizational coordination body coordinating across-government access and delivery of the geographic information held by WA Government agencies (ACIL Tasman 2004;WALIS office 2006).

In summary, both a theoretical and empirical viewpoint seems to support awareness in the sense that when organizations meet they become aware of both each other and the environment they exist within. Inter-organizational coordination bodies act as agents of overall exchange of views, roles, and super ordinate goals and visions

The question now is what variables to focus on in the coming case studies when analyzing the existence and possibilities for impact of inter-organizational coordination bodies in cadastral systems. The literature suggests that especially two factors are important. Firstly, the body needs to have a substantial formal mandate, as the unified position and status of the body defines its overall impact (Masser 2005). Secondly, a broad representation is demanded both horizontally

and vertically. Horizontally all organizations in the area should be included in the body in order of building understanding and acceptance by all the stakeholders (Masser et al. 2007). Vertically, the bodies should not focus only on meetings on the management level. Also the technical levels of the organizations should have arenas for awareness development.

6.5   Summary

In summary, the above sections outline four factors that seem to affect awareness, and therefore may be used as indicators of awareness when investigating inter-organizational collaboration in land administration systems.

Firstly, we found that the presence management communication seems to affect awareness in the sense that efficient management communication can help employees become aware of other organizations, help employees realize how the organization can help fulfilling the organizations' role in society.

Secondly, we found that network structures might indicate the level of awareness in an inter-organizational domain, since the structure, strength, direction etc. of the organizational links on both the individual and organizational level seem to affect awareness.

Thirdly, we found that official visions and strategies of an organization possible could help to indicate awareness, since visions apparently can help pinpointing organization's focus areas and views on other organizations in the inter-organizational domain, as well as acting as a meter on the management's efforts in rising awareness among the employees in the organizations.

Lastly, we found that participation in inter-organizational coordination bodies seem to indicate a high level of awareness, since inter-organizational coordination bodies act as agents of overall exchange of views, roles, and super ordinate goals and visions.

7 Evaluation framework and methodology

7.1 Introduction

In chapter 4, 5 and 6 we have discussed a number of organizational factors that generally seems to affect awareness and presented two overall models on awareness. This chapter will bring this information together and present a methodology for investigating awareness in inter-organizational networks. A methodology that will form the basis for the case studies in the next chapter investigations of cadastral systems. This chapter will thus act as a bridge between the theoretical considerations in the previous chapters and the empirical investigations in the next chapters. Firstly, the chapter will develop the actual evaluation framework. Secondly, the chapter will address the methodology for the case studies.

7.2 Evaluation framework

As stated in the introduction, awareness is impossible to measure by itself. Instead, it must be measured through a number of factors that can indicate the presence of awareness. The factors to indicate awareness on an overall level have already been thoroughly discussed in the previous theoretical chapters, e.g. willingness and network structures. However, the presentations in these chapters are not very useful when going into specific analysis of awareness. The factors to affect awareness are scattered throughout a number of sections and chapters. Furthermore it has not yet been discussed what the relation is between the factors and the two models on awareness. A uniform methodology is still missing.

The aim of the below sections on the evaluation framework will therefore be threefold. Firstly, the sections will combine the factors of interest in one overall figure in order of creating an overview of the elements in the evaluation framework. Secondly, the sections will build a more operational evaluation framework including a presentation of the background of each factor in relation to awareness, and a presentation of each factor in relation to awareness building in cadastral systems. Thirdly, the sections will discuss the relations between the evaluation framework and the two models on awareness, developed in chapter 5.

7.2.1 Overall model of factors to affect awareness

Regarding the display of the factors of interest when analyzing awareness in land administration systems, the model in figure 7.1 that both encompass internal and external awareness, will guide this presentation.
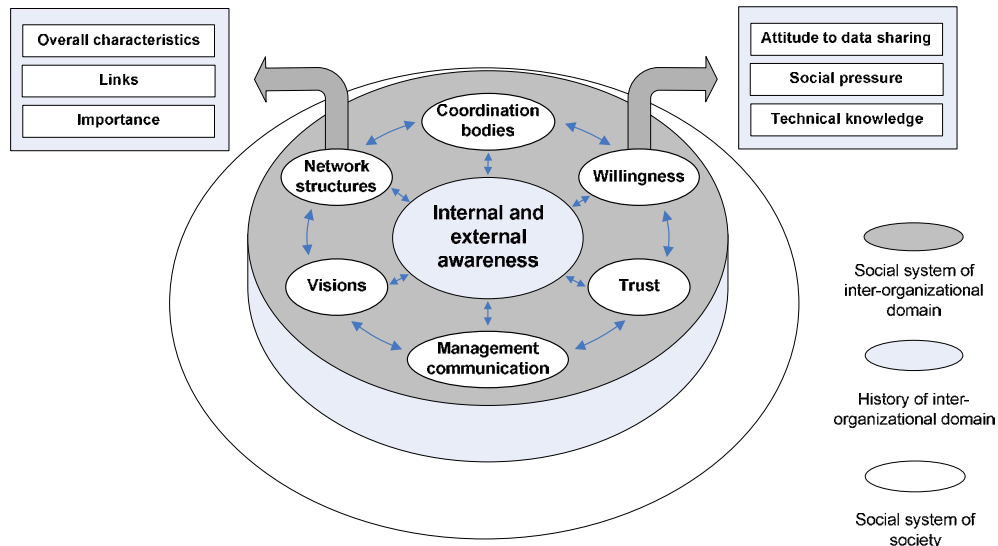
Figure 7.1 Overall analytical model

In a short description of the model, we find in the center the focus of this chapter – the stages of internal and external awareness. In chapter 4 and 6, it has been discussed that six main factors seem to affect the stages of internal and external awareness in cadastral systems: Coordinating bodies, willingness, trust, management communication, visions and network structures.
The arrows that connect these six factors indicate that the factors are interdependent. The arrangement of the factors in the dark grey colored area indicates that all of the factors exist within the social system of a certain inter-organizational domain. In other words – the focus area is limited to a defined inter-organizational domain, in this case a cadastral system.

However, the inter-organizational domain cannot be observed as a snapshot in time. To understand the relation between the organizations in a domain, we must observe the history shared by the organizations. In the model, the inter-organizational domain is thus built on a foundation of history, which is illustrated by the light grey color.

Furthermore, while the specific area of investigation is a specific domain, the social system of society is also of great interest. The domain might be in focus, but it would be misleading to think that the domain lives its own isolated life. Of course, every decision made in the domain is affected by the social system of society that it exists within. A number of economic, social and political trends in society are affecting the inter-organizational domain and its historical foundation. Pricing policies will e.g. affect the willingness to share data.

7.2.2   Factors affecting awareness

While the above section illustrates the overall model of investigating awareness in the forthcoming case studies, table 7.1 sums up on each factor with reference to its effect on awareness. As this section discuss awareness in general, each factor's impact on respectively internal and external awareness is pointed out in the next section.

Factor		Explanation
Willingness	**Attitude to data sharing**	A positive attitude towards the use and sharing of spatial data promotes awareness
	Social pressure	Pressure for sharing of spatial data and development of spatial services promotes awareness. The pressure may come from GIS community, the organization's market, institutions (e.g. member organizations, politicians), other departments, the organization itself
	Technical knowledge	A comprehensive technical knowledge (structures, processes and policies) on spatial data issues, dispersed symmetrically among all organizations, promotes awareness
Trust		Frequent, multiple, open-ended, relations between small, homophile, balanced, well-defined organizations promotes trust which promotes awareness
Network structure	**Overall characteristics**	Small, dense networks, where a large number of organizations have links to each other, will have a higher degree of awareness than a relatively big, dispersed, asymmetric network
	Network links	The more stable, multifaceted, important links that exist between two organizations the more aware the organizations become of each other
	Importance	Important organizations have better opportunities for developing awareness than less important organizations
Inter-organizational coordination bodies		High mandated, broad represented inter-organizational coordination bodies are essential in promoting awareness
Management communication		Multi-faceted, accessible and regular communication on other organizations and the organization's societal role from managers are essential in promoting awareness towards all organizational levels in an organization
Visions and strategies		Visible, clear, committing, convincing awareness promoting visions and strategies are essential tools in the development of awareness

Table 7.1 Factors to affect internal and external awareness

The factors are summarized below.

Willingness

Alter and Hage (1993) argue that awareness and willingness are highly interrelated. Concerning an approach to investigate willingness, Wehn de Montalvo´s (2000) multi faceted approach to the field suggests that the willingness of organizations to share spatial data is affected from three sides: Attitude to data sharing, social pressure and perceived control (of which technical knowledge seem to be of special interest in cadastral systems). As regards, attitude to data sharing, theory suggest that a positive attitude to data sharing promotes awareness. On the topic of social pressure, theory suggests that pressure for sharing of spatial data and development of spatial services promotes awareness. The pressure may come from GIS community, the organization's market, institutions (e.g. member organizations, politicians), other departments, or the organization itself. Lastly, about technical knowledge, theory suggests that a comprehensive technical knowledge in the spatial data areas of structures, processes and policies, dispersed symmetrically among all organizations, promotes awareness.

Trust

Alter and Hage (1993) also argue that awareness and trust are highly inter-related. Concerning trust, Sydow (2000) argues that trust can be enhanced through a number of structural elements, e.g. frequency and openness of communication, and the homophility the organizations. Therefore trust will by large be analyzed through network analysis (see below).

Network structures

Besides investigating trust, the theoretical review of network structures put forward that the more stable, multifaceted, important linkages that happen back and forth between two or more organizations the more aware the organizations in general are of each other. The analyses of network structures will therefore focus on three areas: Overall characteristics, network links and importance. The investigations of the overall network characteristics focus on the size of the network, since it is argued that small, dense networks, where a large number of organizations have links to each other, will have a higher degree of awareness than a relatively big, dispersed, asymmetric network. The investigations of links focus on the network links between organizations, since it is argued that the more stable, multifaceted, important links that exist between two organizations the more aware the organizations become of each other. Lastly, the investigations of importance focus on each organizations importance in the domain, since it is argued that important organizations have better opportunities for developing awareness than less important organizations.

Inter-organizational coordination bodies

In order of developing awareness of other organizations, literature (e.g. ACIL Tasman 2004) and interviews also state that the presence of inter-organizational coordination bodies is important. When organizations meet, lessons are learned. The analysis on inter-organizational coordination bodies in an awareness sense will focus on the mandate of the body, the representation and the outcome of the bodies.

Management communication

While inter-organizational coordination bodies mainly focus on the awareness between organizations, it is equally important to build awareness among the employees within organizations. Communication from the management to the single employee is supporting the organizational learning process that lies in the stages of awareness. Since the overall focus of the analyses in the thesis is on the management level, the approach to investigate communication will use Lund and Petersen (2007), and Petersen (2000) arguments on multi-faceted, accessible and regular communication as means for effective management communication.

Visions and strategies

Lastly, the method for analyzing awareness in organizations will focus on official written visions and strategies of the organizations, since it is very concrete tools when analyzing awareness. Visions and strategies can provide a look into organization's focus areas and views on other organizations in the inter-organizational domain. Visions and strategies also act as a meter on the management's efforts in rising awareness among the employees in the organizations. A model developed by Bordum and Hansen (2005) supports the analyses of visions. From the model, it can be argued that visible, clear, committing, convincing visions and strategies are essential tools in the development of awareness.

In addition, it can be observed that interdependency not will be investigated as an independent factor, even though literature suggests that it affects awareness. Because of the fact that the interdependency-phases of collaboration, cooperation and coordination are investigated in the awareness models, it is argued that interdependency indirectly is being investigated. In cadastral systems, it is furthermore not a question on whether the organizations are interdependent, but more a question on the strengths of each phase of interdependency. For these reasons, the phases of interdependency are used to describe awareness, instead of acting as an independent factor of analysis.

7.2.3   Relation between factors and awareness models

As the above two sections, especially the latter, sums up on the different factors than seem to affect awareness in cadastral systems, there has not yet been established any concrete relations

from these factors to the two overall models on internal and external awareness. E.g., it has not been illustrated how trust between organizations affects the different stages of respectively internal and external awareness. However, from a methodological point of view these links are important when carrying out the case studies, since testing the two awareness models is the actual reason for conducting the case.

A starting point for establishing these links is a closer investigation of the overall factors that affect awareness in relation to the awareness models. In an investigation of these relations, it becomes clear that each of the factors seem to affect the stages of the internal and external awareness models in a specific way. E.g. will the factor "attitude to data sharing" probably affect both the awareness stages of motivation, coordination and outcome in both awareness models, because the attitude to data sharing will constrain all of these stages. Another example is the factor "visions" that probably mainly will affect the motivation stages in the awareness models, because of the overall guiding role played by company visions.

Table 7.2 and 7.3 illustrate what happens if one complete two tables that combine the possible main impact of each of the overall factors that affect awareness with the stages of awareness in both the internal and external awareness model. It should be mentioned that this way of assessment does not relate to any empirical countable method, but it may be seen as the most obvious and best possible way of organizing the assessments when using the factors for structuring the interviews in the case studies and when concluding on the case studies in the forthcoming chapters.

Lastly, remembering that the coordination and outcome steps of the internal and external awareness models are identical (see section 5.3), the same is the case in table 7.2 and 7.3.

Factors / Internal awareness Model		Willingness			Trust	Network structure			Int.org. coordination bodies	Man. communi.	Visions and strat.
		Attitude	Social pressure	Technical knowledge		Overall charact.	Links	Importance			
Motivation	Existence awareness	✓	✓			✓	✓	✓	✓	✓	
	Collaboration awareness	✓	✓			✓	✓	✓	✓	✓	
	Cooperation awareness	✓		✓		✓	✓	✓	✓	✓	✓

Coordination	Coordination awareness	✓		✓	✓					✓	✓
	Implementation awareness	✓		✓	✓						
Outcome	Evolution awareness	✓	✓		✓			✓			

Table 7.2 Combination of the main impact of the overall factors that affect awareness with the stages of awareness in the internal awareness model

External awareness model / Factors		Willingness			Trust	Network structure			Int.org. coordination bodies	Man. communi.	Visions and strat.
		Attitude	Social pressure	Technical knowledge	Trust	Overall charact.	Links	Importance	Int.org. coordination bodies	Man. communi.	Visions and strat.
Motivation	Need defining awareness	✓	✓	✓		✓	✓	✓	✓	✓	✓
	Collaboration awareness	✓				✓	✓	✓	✓	✓	✓
Coordination	Coordination awareness	✓		✓	✓					✓	✓
	Implementation awareness	✓		✓	✓						
Outcome	Evolution awareness	✓	✓		✓				✓		

Table 7.3 Combination of the main impact of the overall factors that affect awareness with the stages of awareness in the external awareness model

One might argue that it is hard to separate each factor's influence on the steps of awareness, and each factor therefore should be given a weight in relation to its impact on the steps of awareness. This would indeed make the model more robust. However, it can also be argued whether this in fact is necessary when following the aims of this thesis. Table 7.2 and 7.3 thus provide an overall scheme for using the displayed factors for building an evaluation method that not is exact, but can works as an introduction to possible problems regarding inter-organizational collaboration in the context of awareness.

7.3 Methodology for evaluations

As the above sections have built a theoretical evaluation framework model for investigation awareness in cadastral organizations, the below sections will put this framework in an empirical context by presenting the methodology for the investigations of awareness in a number of cadastral systems on the international scene.

7.3.1 The case study method

The overall methodology for this investigation will, as mentioned, be based on case studies. This method is often used in investigations of land administration systems and the method has been recommended by researchers in the academic community for studies on cadastral systems (see e.g. Williamson and Fourie 1998) as well as in the broader context on SDI and GI (see e.g. Onsrud et al. 1992).

The more specific methodological advantages of the case study method for the present investigation of awareness in cadastral systems is disclosed by the following definition by Yin (2003) on the scope for case studies:

> *"A case study is the empirical enquiry that*
>
> - *investigates a contemporary phenomenon within its real-life context, especially when*
>
> - *the boundaries between phenomenon and context are not clearly evident."*

More quantitative founded analysis thus not seems to fit the scope of the broad system analysis that is going to be executed in this thesis.

The case study design in this thesis will be a multiple case study design, where the study will investigate and consider several cases in the confirmation or rejection of the overall research question on whether awareness can be the area for investigating inter-organizational collaboration in land administration systems. The reasons for choosing a multiple case study design is that this design is more scientific robust and the conclusions are more powerful than a single case study.

Figure 7.2 illustrates the multiple case study design that will be used in this thesis.
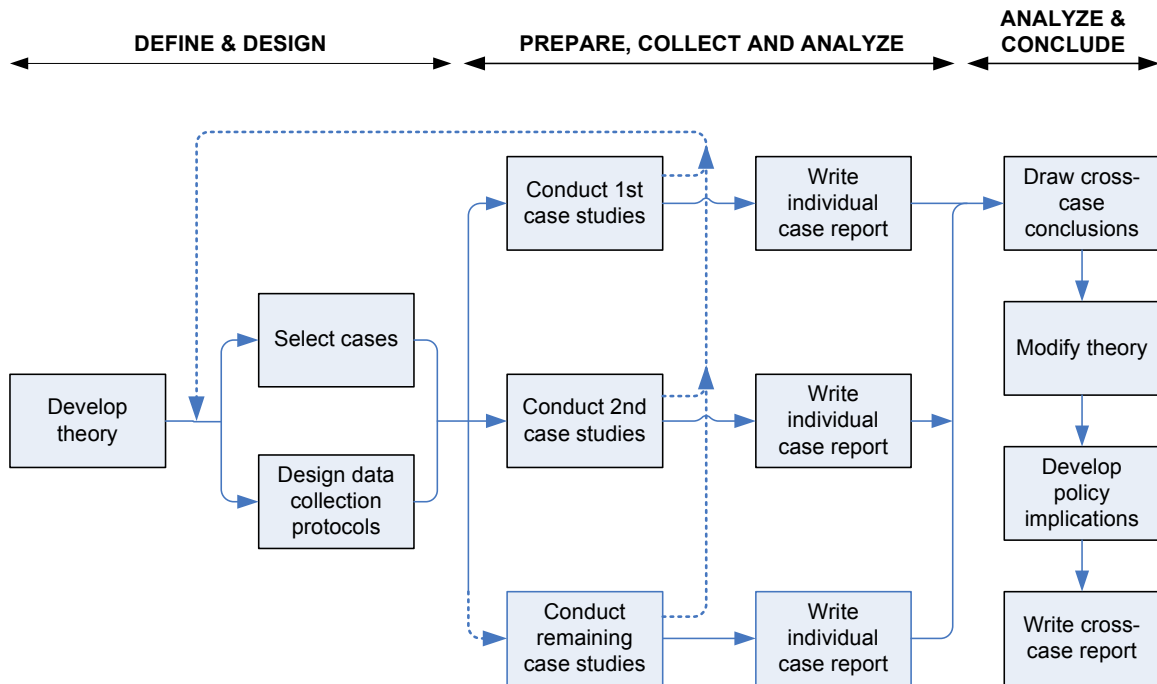
Figure 7.2 Multiple case study method (Yin 2003)

Essentially, the figure illustrates the overall methodology of this thesis. In the past chapters, we have been developing a theoretical framework on awareness. This framework is now going to be tested and evaluated. Figure 7.2 displays the general process from theory building to conclusion in a multiple case study design. Generally, the methodology for the rest of the thesis will follow the same procedure. After conducting the case studies, an overall concluding chapter will analyze and conclude on the cases.

Furthermore, regarding the case study design, the figure illustrates that the selection of cases, the data collection and the report of the individual case studies are of interest. The below sections will go through these aspects.

7.3.2   Case selection

The selection of cases is a crucial first step in the case study method. The case selection process must be thoroughly carried out in order to prevent non-viable cases or cases that represent other instances than expected (Yin 2003). In this regard, it is important once more to sum up on the overall aim of the case studies in this thesis. The aim is hence not to test how each of the factors in the above evaluation model relates to the development of awareness in cadastral systems. The case selection process is not aiming at testing one or more variables. Instead, the goal is to make an overall investigation of whether the combined factors from the evaluation framework can be used in a non-comparative evaluation of each system's development towards multi-

purpose systems seen from an awareness angle. Since the focus not is on the single variable but on the overall system, the case selection process will also be founded on this principle. The case selection process will thus focus on investigating case studies from different kinds of cadastral and administrative systems in order of testing the broad use of the evaluation and awareness models developed in this thesis.

A traditional way of distinguishing cadastral systems is through their system of registration – deed or title systems. However, here the case selection will also focus on different organizationally structured systems because of the general focus in this thesis on the importance of inter-organizational collaboration in relation to the development of multi-purpose systems. In this regard, it seems interesting to investigate both systems that can be characterized as structural dense and structural sparse, see section 6.2.

Based on this criterion and a period of study in Melbourne, Australia, the following cadastral systems have been chosen for testing the use of the evaluation framework and the awareness models developed in this thesis, see table 7.4.

System	Characteristics
The Western Australian cadastral system	Highly integrated organizational network structure administered by one ministry. Torrens system.
The Dutch cadastral system	Highly integrated organizational network structure administered by one ministry. Deed system.
The Victorian cadastral system	Medium integrated organizational network structure administered by one ministry. Torrens system.
The Danish cadastral system	Low integrated organizational network structure administered by two ministries. Title system.

Table 7.4 Characteristics of the chosen case study systems

7.3.3   Case study reports and focus

Another vital step in the case study methodology is the conduction and report of the individual cases. The work of this phase is central for the credibility and reliability of the overall conclusion drawn from the cross-case conclusions (Yin 2003:67). In the present case studies, each case will have its own chapter that report on the findings in the case.

The chapters will be divided into three sections. Firstly, an overall introduction of the specific cadastral system, secondly, an analyses of the factors in the evaluation framework (see section 7.2.1), and thirdly, the report will conclude on the findings, see table 7.5.

Introduction and overview	- Country profile
	- Overall cadastral system
	- Administration and system
	- Historical development
The system from an awareness perspective	- Network structures
	· Network characteristics
	· Links
	· Importance in the network
	- Visions and strategies
	- Inter-organizational coordination bodies
	- Management communication
	- Willingness
	· Attitude
	· Social pressure
	· Technical knowledge
	- Trust
Overall conclusion	- Summary
	- The investigations and the awareness model
	- The system in an multi-functional context

Table 7.5 Overview of the report of the individual cases

From table 7.5, the content of the section "Overall conclusion" is of special interest. The focus in the tests is to test whether the interviews based on the evaluation framework will make it possible to put the different organizations that form the cadastral systems into the models on internal and external awareness, and evaluate the cadastral systems' ability to engage in a multi-purpose context. Because of the mentioned relative nature of awareness, the figures in table 7.6 will be used to specify the approximate levels of awareness in the awareness models.

Low level of awareness	☒☐☐
Medium level of awareness	☒☒☐
High level of awareness	☒☒☒

Table 7.6 The levels of awareness will be separated into three stages

7.3.4 Data collection

The data collection in the case studies will happen in two stages.

Firstly, a thorough general knowledge will be developed on the given cadastral system. This knowledge will primarily be developed from literature studies, secondarily on interviews with key figures in the system, or from related settings, e.g. academia.

Secondly, a number of interviews will be carried out. Typically 6-10 persons from each system will be interviewed, depending on the organizational fragmentation of the given system. Three main criteria are chosen for the selection of interviewees:

- The interviewees should primarily come from the policy and management group, in order of providing answers as close to the overall organizational policies as possible. Technicians from the operational parts of the organizations have been deselected as the main source of information because of the policy orientated focus of this thesis.

- The interviewees should be split up among management persons in both internally and externally orientated part of the organization, e.g. the operational parts and the market-orientated parts, in order of being able to focus on all stages of the awareness models.

- At least one interviewee must be associated the inter-organizational coordination body (if existing), in order of being able to focus on this aspect in the evaluation model.

Summary of the interviews exist in appendix 2 on CD-ROM (for examinators only).

7.4 Summary

Based on the two aims in the introduction regarding the focus on building a non comparative evaluation scheme, and the relative nature of awareness, the above sections firstly display an overall model on the factors of importance when analyzing awareness, and secondly an evaluation framework for investigating awareness in the case of cadastral systems. The evaluation framework will be tested through four case studies: Victoria (Australia), Western Australia (Australia), The Netherlands, and Denmark. The focus of case studies will be on the evaluation framework's ability to place a cadastral system into the models on internal and external awareness.

The below chapter will begin the case study analysis by investigating the Australian state Victoria.

8   The Victorian cadastral system

8.1   Introduction and overview

Victoria is in many ways world leading in spatial information management, particularly in the state-local relationship, and in the management on land and property dealings (Rajabifard et al. 2005). The cadastral system in Victoria is along with a number of other land administration functions administered within one department, and the overall development of the land management is controlled through a series of strategies, jointly outlined by government, academia and industry. However, from the case of the Victorian cadastral map, we will see how problems of awareness in the Victorian system, seem to constrain the development of a future multi-purpose system.

8.1.1   State profile

Victoria

Area   227,420 km^2

Population   5,037,700 (est. Sep. 2005)

Capital   Melbourne

(Australian Bureau of Statistics 2005)

Victoria is the smallest of Australia's mainland states. Located in the southeastern corner of Australia, Victoria is Australia's most densely populated and urbanized state. In September 2005, Victoria's population reached an estimated 5,037,700 people - making it the second most populous Australian state after New South Wales. About 75% of Victoria's population are residents of the state capital Melbourne (Australian Bureau of Statistics 2005). Formed in 1901, Victoria is a relatively new state, as with the rest of the Australian states. The state has a diverse industry sector, which includes rich offshore resources – coal, gas and petroleum, a high agricultural output and a large fishing industry (Rajabifard et al. 2005).

8.1.2   Overall cadastral system

Victoria's cadastral land administration system is based on the Torrens system of land registration first used in 1862 and still in operation (for a review on the Torrens system see Wallace 1999). In Victoria, land is broadly classified as Freehold Land, which is in private ownership, or Crown Land, which is a general term for all land owned by the state of Victoria and controlled by government. Crown Land includes approximately one third of the land in Victoria and includes National and State parks, forests, fauna and flora reserves, and reserves set aside for public purposes (Newnham et al. 2001).

8.1.3   Administration and structure

The department that administers land in Victoria is the Department of Sustainability and Environment (DSE). DSE is one of ten Victorian State Government departments. The department was established in December 2002 in order to bring together the state's responsibilities for sustainability of the natural and built environment (Department of Sustainability and Environment 2006a).

In the DSE, the cadastral system is split between a number of agencies and offices, see figure 8.1.

The Land Victoria agency holds the Office of the Surveyor General and the Office of Titles. The office of the Surveyor General administers the legislation regarding the cadastral surveys carried out by private, licensed surveyors, and is responsible for registering survey plans in the Land Registry. The Office of Titles has the responsibility of managing titles in Victoria.

Another important office in the DSE, regarding the administration of the cadastral system, is the office of Spatial Information Infrastructure (SII) in the Strategic Policy and Projects Group. SII is responsible for developing, managing and disseminating Victoria's fundamental spatial information, including the eight 'framework' datasets that form the basis of the State's spatial data infrastructure (cadastre/property, geodesy, transport, address, administrative, elevation, hydrology and imagery).

Furthermore, the private company Logica plays a big role in the cadastral system since it handles the updates and maintenance of the DCDB.
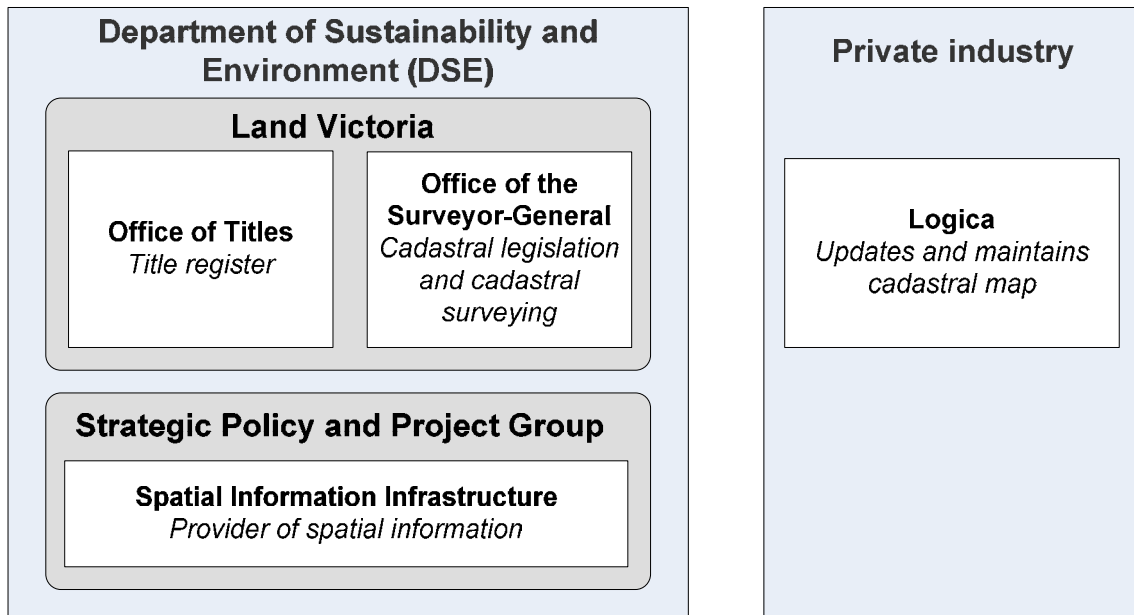
Figure 8.1 The Victorian cadastral system both encompass institutions from the public and private sector

8.1.4   Historical development

Regarding the administrative structure of the Victorian land administration system, the land administration system was until 1996 split up in multiple departments. However, in 1996 a governmental restructuring brought together many of the State's core land administration functions into one agency – the Land Victoria. This new agency included geospatial information, mapping, survey, valuation, Crown land management and freehold title creation and registration. The Land Victoria operated within the Department of Natural Resources and Environment's land management framework (Newnham et al. 2001).

In 2004, another restructuring took place. The name was changed from the Department of Natural Resources and Environment to the Department of Sustainability and Environment, and the Land Data component of Land Victoria was separated from the Land Victoria framework into the Strategic Policy and Projects Group in DSE, and renamed SII. The goal was to strengthen the overall spatial data infrastructure of both the DSE and other departments using spatial data. (Spatial Information Infrastructure 2004).

While the restructuring of the general land administration system in Victoria has been substantial in the last decade, culminating with the separation of SII in 2004, we find an even more complex history in the development of the DCDB in Victoria. It is relevant to look deeper into the development of the Victorian DCDB, as the case study found that this development exemplifies many of the problematic, organizational relationships that exist in the Victorian Cadastral system.

In Victoria, as in many other Australian states, the responsibilities of the cadastral system have historically been divided between the Land Titles Office and the Office of the Surveyor-

General. The Land Titles Office has the responsibility for the titles and deeds associated with all freehold and have been responsible for examining records of cadastral surveys. The Office of the Surveyor-General has on the other hand the responsibility for the cadastral activities concerned with Crown land and for the quality of cadastral surveys in association with the Boards of Surveyors

In the matter of creating a Victorian DCDB, this process has thus been complicated. While the focus of the Land Titles Office mostly has been on individual land transactions in support of an efficient land market, there has historically not been any pressure from the Land Titles Office to create a cadastral map covering the whole state. The only existing overview of subdivisions of freehold lands were charted in Land Titles Offices on low scale spatial integrity index maps often copied from approximate valuation maps. Prove of ownership in the cadastral system has instead been based on the individual accurate cadastral surveys attached to the deed. (Williamson et al. 1998)

The digitalization of the individual surveys and existing cadastral maps was therefore not carried out to support the Land Titles Office in Victoria. Instead the digitalization was carried out because of a pressure from different utility and mapping companies, especially Melbourne Water, which needed a cadastral map in their over overall planning. This meant that until 1994 two DCDBs existed in Victoria. One finished in 1990 by Melbourne Water Corporation covering the metropolitan areas, and another finished in 1994 by Survey & Mapping Victoria covering rural Victoria. After much negotiation an agreement was signed in 1994 to bring the two databases together under government ownership at no cost (Wan and Williamson 1995).

Another fact that is important to be aware of is the downsizing of the Office of the Surveyor-General due to an increased use of private cadastral surveyors, and the privatizing of the DCDB-update process. A development that means that the numbers of surveyors has decreased in the Office of the Surveyor-General from 70 employed in 1991 to 14 employed today.

8.2   The Victorian cadastral system from an awareness perspective

The following section will investigate the Victorian cadastral system from an awareness perspective by using the framework from section 7.2. As mentioned above, the focus of interest will be the different organizational entities' relation to the use and the future development of the DCDB.

8.2.1   Network structure

Overall characteristics

The Victorian cadastral system is characterized by a high degree of physical centralization – both the Office of Titles, the Office of the Surveyor General and the SII are situated in the same building in central Melbourne.

Network links

The reorganizing of land Victoria in 2004 has meant that the cadastral system today is being administrated from two different offices, Land Victoria and the Strategic Policy and Planning Group. The network links from the Office of Titles and the Office of the Surveyor General towards the SII and vise versa mostly exist on an ad hoc level in informal, project orientated task groups – the interviews suggest that there is no established, cadastral orientated, coordination groups. A detail that complicates the immediate reach ability in the system. Furthermore, several respondents argue that the administrative separation has decreased the general innovation and increased the well known "silo"-mind in the cadastral system. Regarding symmetry in the links, there exist strong indications of structural asymmetry in the Victorian cadastral system.

With regard to size and connectedness, especially the Office of the Cadastral General seems to take up an isolated role in the cadastral system. Especially the role towards SII seems to be deficient. A number of respondents argue that this mainly is due to problems of co-operation between the former Surveyor General and the present manager of SII. On the other hand does the SII benefit from a very central position in the Victorian Cadastral system, because of close links to the political establishment and its influential position in the Victorian Spatial Council.

Importance in the network

On the aspect of importance in the network, which theory suggest affects the individual organizations' awareness, the analysis propose that especially the Office of the Surveyor General and the SII experience an asymmetrical relationship. The SII seem to have a far more central role in the network than the Office of the Surveyor General. The isolated role of the Office of the Surveyor General may prove problematic in an external awareness perspective, since many of the external services demanded from a survey accurate DCDB in the Victorian cadastral system, rely on changes in legislation from the Office of the Surveyor General.

8.2.2   Visions and strategies

The Victorian cadastral system is subject to the overall strategy, the Victorian Spatial Information Strategy (VSIS) that concerns the complete Victorian land administration system. The VSIS in

effect goes from 2004-2007 and is the fourth strategy that governs the development of Victoria's strategic framework for spatial information.

The vision of the VSIS is to build a "single, authoritative, comprehensive, and coordinated spatial data infrastructure" that supports and enable "Victoria's economic, environmental and social objectives and aspirations" (Department of Sustainability and Environment 2006b).

The VSIS points to nine other documents that elaborate on parts of the spatial information environment. However, this analysis focuses solemnly on the VSIS and not its subdocuments, because of the specific focus on the spatial community in Victoria.

Parameter	Comments
Accessibility and visibility	• Accessible through Land Victoria's homepage (Home > Spatial > Spatial Policy > VSIS)
Sender	• Department of Sustainability and Environment • Prepared by SII in cooperation with participants from government, industry and academia • Directed by two overall Government strategies • Endorsed by cabinet 2003
Stakeholders	• Establish the Victorian Spatial Council that will undertake a management and leadership role on spatial information and strategies in Victoria. • Other stakeholders are only mentioned as "Data custodians".
Themes	Four overall themes are mentioned and reviewed in the VSIS: • Institutional arrangements for developing spatial information • Requirements for creating and maintaining spatial information • Mechanisms for making spatial information accessible and available • Strategic development of technology and applications
Presentation	• Each of the 11 subsections in the VSIS describe the section generally and deepen the section under the following headings: Policy, Benefits, Strategies, Indicators, Accompanying documents
Commitment	• Annual reporting on published milestones • Measurements of performance against targets established in work plans

Use	• Used intensively by SII
	• Partly by Office of Titles
	• Not used by the Office of the Surveyor General
Additional comments	• Comprehensive section on general importance of spatial information to society
	• Awareness among custodians and users of spatial data is highlighted in the VSIS. Awareness is defined as making the wider community aware of spatial information as well as ensuring that current users are aware of the breadth of spatial information available to them.

Table 8.1 Parameters for visions and strategies in the VSIS

The strengths of the VSIS in an internal and external awareness perspective is its ability to, on the one hand to describe the need and use of spatial information in a general context, and on the other hand to concretize the different factors that enable a practical use of spatial information. Furthermore, it is positive that the strategy is supported from high levels in government. Moreover, it is strength in an external awareness sense that the VSIS focus on awareness as one of the focus areas in Victoria's spatial information industry and pinpoint a number of strategies for this process ranging from publishing and research to sponsorships of conferences. However, the awareness focus is weakened by the fact that the promised clarifying guidelines on awareness not have been developed.

The weaknesses of the VSIS in an internal and external awareness perspective are its lack of actual responsibilities for stakeholders in the community – the level is very general. The general level of the VSIS also reflects in the differentiated use among the stakeholders in the cadastral system. While the managers in the SII not surprisingly (in term of its role in the preparation of the VSIS) argue that it uses the VSIS intensively, both the managers in the Office of Titles and the Office of the Surveyor General declare that the strategy is too general for use in these offices. Both offices seek a more cadastral related strategy.

In conclusion, the Victorian Spatial Information Strategy (VSIS) gives a good overall introduction to the importance of spatial information and SDI – an introduction that can prove valuable in term of developing the motivation stage of the external awareness model (see figure 5.2). However, the VSIS is not used by several of the organizations in the cadastral system because of its general focus that not encompass specific cadastral issues or stakeholder responsibilities – a fact that off course devaluate its role as an awareness setting document. In term of relating this discussion to the external awareness model (see figure 5.2) it is also striking that while some of the organizations seek a more cadastral related strategy, this is not prioritized with regard to funding, instead the focus lays on problem solving – the important motivation steps which visions seems to support are rated a low priority. Furthermore, it is clear that the visions not focus very much on the societal use of spatial data since the important awareness chapter, as the only chapter not has been emphasized.

8.2.3   Inter-organizational coordination bodies

In the area of spatial information in Victoria, two coordination bodies are established on basis of the implementation of the above-discussed VSIS, see figure 8.2. The first body is the Victorian Spatial Council (VSC), the other is the Victorian Government Spatial Committee (VGSC) (Department of Sustainability and Environment 2006b).

Victorian Spatial Council

The overall goal of the VSC is to coordinate the spatial information development in Victoria through a coordinated approach to spatial information policy and management, as well as leading the implementation of the VSIS. The 13 members in the VSC, comes from government, industry and academia.

- Private Sector – 2 members
- Academia – 2 members
- Spatial profession – 2 members
- State Government – 2 members
- Local Government – 2 members
- Australian Government – 1 member
- Emergency Management Sector – 1 member
- Catchment Management Authorities – 1 member

The VSC reports directly to the Secretary of the Department of Sustainability and Environment, and is supported by a Secretariat located in the SII (Victorian Spatial Council 2005).

Victorian Government Spatial Committee

The VGSC sets the overall strategic direction for spatial information policy and decision-making within the Victorian public sector. All of Victoria 11 departments, as well as the Victoria Police and Victorian road management administration (VicRoads), are member of the committee. The VGSC take its requirements and decision to the VSC as well as reporting to the Information and Communication Technology Policy Committee.
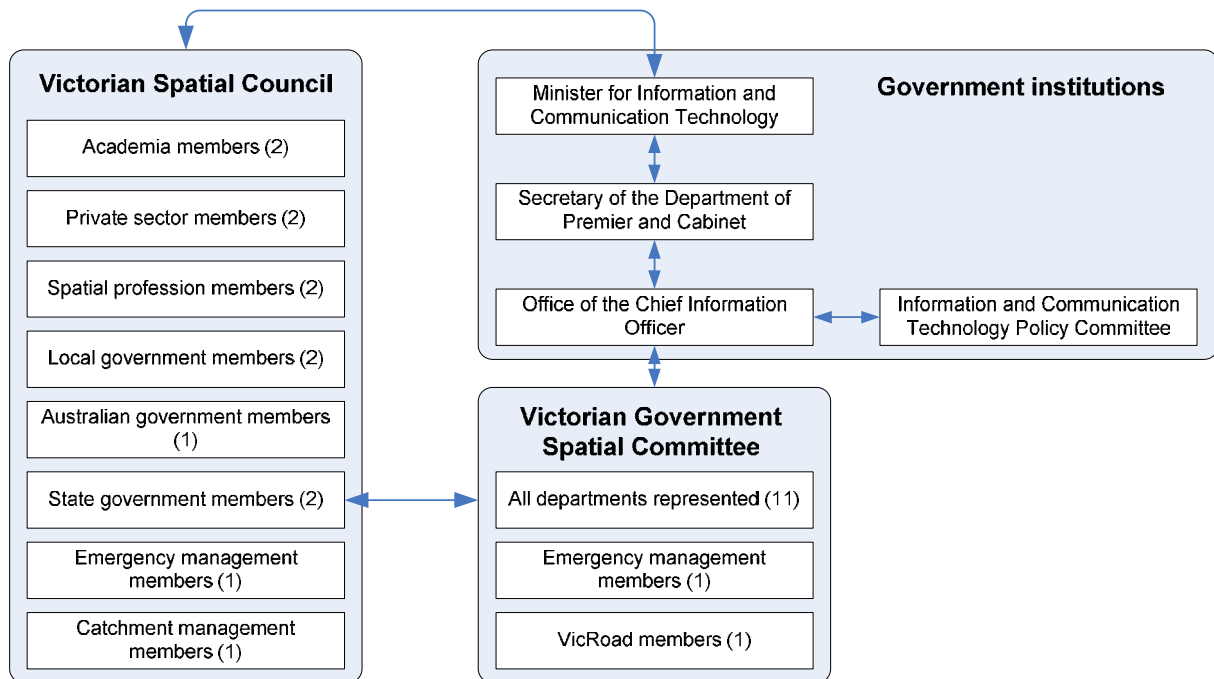
Figure 8.2 Structure of the two spatial coordination bodies in Victoria, the Victorian Spatial Council and the Victorian Government Spatial Committee (Thompson 2006;Victorian Spatial Council 2005)

From an awareness viewpoint, it is positive that there exist a forum for discussion in the field of spatial information in Victoria, which through VSC cover both government, industry and academia, and through VGSC covers multiple departments. However, the coordination bodies do not focus much on the cadastral level. The respondents state that there is a lack of overall coordination and forums for exchange of opinions and experience on the cadastral level. Most coordination on the cadastral level happens informally on office level and through ad hoc meetings. A single respondent also had the impression that since the SII runs the secretariat, they by large controlled the agenda and the membership of the VSC.

The immediate internal and external awareness advantage from two cross-sectoral and cross-governmental coordination bodies in the area of spatial information in Victoria is apparently devaluated on the cadastral level by too wide focus and a lack of representation from the core cadastral area.

8.2.4   Management communication

Because of a lack of focus on this factor during the interviews it is not possible to conclude on this factor in the analyses of the Victorian cadastral system.

8.2.5   Willingness

Attitude to data sharing

Regarding attitude towards the use and sharing of spatial data in the Victorian cadastral system in relation to the development of a survey accurate map both the Office of Titles and the Office of the Survey General sees many positive outcomes from this. The internal workflow will improve and the offices will be able to develop new and better services to its costumers. The Office of the Survey General focus in this regard especially on the fact that a closer cooperation with the Office of Titles will help improve the relation to the surveying branch and that it will be easier to incorporate new technology and improve the existing standards.

While the Office of Titles and the Office of the Survey General shares a common positive attitude towards each other, the asymmetry is again evident in the relation from the SII. The collaborative attitude seems to be substantial better towards the Office of Titles than towards the Office of the Survey General.

All of the groups in the Victorian cadastral systems share a positive belief on the outcomes to society by developing a survey accurate cadastral map, focusing on engineering companies and local government. However, the positive view on social outcomes is not merely altruistic. Especially the SII and the Office of Titles focus on building business solution to costumers.

Social pressure

Lack of political interest is regarded as a problem among all the organizations in the Victorian Cadastral system. The lack of political interest on the spatial area in Victoria exist both in the specific area of the cadastral map and in the spatial area in general. The organizations suggest that the lack of political interest comes from the problems in building business cases in the spatial areas and in a general lack of interest among the politicians. The political interest are instead on more voter-friendly issues such as hospitals, schools etc. In addition, frequent replacements among the members in government influence on this. The result is that the lack of political interest makes it hard to get sufficient, continual funding.

Whereas the political interest in the cadastral mapping base and other spatial issues not is very big, a series of groups in the market area pushes the development for a survey accurate cadastral map. It is especially the big engineering companies, the CAD-developers and the water utility organizations push for an upgrade of the quality of the cadastral map.

Technical knowledge

All three interviewed managers in the Victorian cadastral system show a comprehensive technical knowledge regarding structures, processes and policies in the cadastral area. However, looking

more closely at the employees in the organizations the picture is not as clear. In general, it seems like the average knowledge among the employees is lowest at the Office of Titles because of the general focus on title transactions here. However, it is pointed out that the sub-division area that deals with the cadastral map, have a good all round technical knowledge and an extensive focus on service development.

The analyses suggest that the attitude to data sharing and the technical knowledge in general seem to be high among the organizations in the Victorian cadastral system, however still with an asymmetry between the SII and the Office of the Survey General. In general, the positive levels of attitude to data sharing and technical knowledge hence seem to promote awareness in the system. On the other hand, the lack of interest in the cadastral area from the politicians seems to have a negative effect on the willingness to engage in awareness building activities because of the resulting lack of money for new projects. The positive pressure from the market does not seem to compensate for the shortage of political support.

8.2.6   Trust

Following the scheme for evaluating trust in inter-organizational environments, the case study of the Victorian cadastral system suggests that the system both have elements that affect trust in the system positively and negatively.

The elements that encourage trust in the Victorian cadastral system relate to the general structure of the network and to the class of organizations in the network. Theory thus suggest that inter-organizational relations with an in-final time span, a large degree of homophily, a small number of organizations and well-defined boundaries are likely to build trust in an inter-organizational environment. Elements that all characterize the Victorian Cadastral system.

However, a number of elements also seem to affect trust in a negative direction in the Victorian cadastral system. Several of the already conducted analyses thus propose that the following elements affect trust negatively: Frequency and openness of communication, multiplexity of network relations, and a balanced relation between autonomy and dependence. While the analyses indicate that the structural relations between the SII and the Office of Title encourage trust (e.g. powerbase), the analyses and specific statements again suggest an asymmetric relationship between the SII and the Office of the Survey General. The communication is low, and the powerbase is very unequal, e.g. specified in the unequal number of employees in the two organizations. A good example to illustrate the distrust between the two organizations can be found within the different understandings of how the survey accurate measurements from the surveyors are used in upgrading the map base. Whereas the Office of the Survey General argues that the measurements not are used by the SII and therefore is a waste of time, the SII argues that they in fact are using the measurements for quality upgrading and that the surveyors have got this wrong for the last decade due to bad information from the Office of the Surveyor General.

While the analyses suggest that the general structures of the Victorian cadastral system promote trust between the organizations in the system, the condition of the closer inter-organizational relations seems to have an inhibitory effect on trust in the system. Whereas the degree of trust appears good between the SII and the Office of Titles, the tense relationship between the SII and the Office of the Survey General seems to impact adversely on the level of trust.

8.3 Overall conclusion of awareness in the Victorian cadastral system

8.3.1 Summary

Before going into an awareness analysis of the Victorian cadastral system, table 8.2 sums up on the above analyzed factors.

Parameter	Partial conclusion
Network structure	+ The geographical structure is very centralized ÷ Few formal and stable links due to re-organizing ÷ Asymmetrical relationship between the SII and The Office of the General Surveyor
Visions and strategies	+ Good overall introduction to the importance of spatial data in an SDI ÷ Not used by several of the organizations because of the general, non-cadastral focus ÷ Chapter on the means for rising awareness of spatial data in the community is not emphasized
Inter-organizational coordination bodies	+ The two coordination bodies cover government, industry and academia ÷ The coordination bodies do not cover the cadastral area, where the coordination is ad hoc and informal, and mostly is project orientated
Management communication	+ -- ÷ --

Willingness	+ High degree of positive attitude to data sharing and inter-organizational cooperation between the Office of Titles and Office of the Survey General
	+ High degree of technical knowledge regarding data sharing among all the organizations
	+ Pressure from the market to develop better cadastral map base
	÷ Low to medium degree of positive attitude to data sharing and inter-organizational cooperation between the SII and The Office of the General Surveyor
	÷ Low political interest and focus on the cadastral area
Trust	+ In-final time span, a large degree of homophility, a small number of organizations and well-defined boundaries
	÷ Asymmetric relation between the SII and The Office of the General Surveyor regarding frequency of communication, multiplexity of network relations, and the relation between autonomy and dependence

Table 8.2 Summary of the awareness analysis in Victoria

8.3.2   Conclusions from the awareness models

The below completion of the two models of awareness from the empirical studies of the Victorian cadastral system suggests an imbalance in the awareness in the system. The office of title seems to have the potentials for the highest levels of awareness, while especially the SII scores relatively low in several stages of awareness, see table 8.3 and 8.4

Internal awareness					
Overall step	**Stages of awareness**	**Description**	**SII**	**Office of Title**	**Office of the Survey General**
Motivation	**Existence awareness**	Awareness of other organizations in the cadastral system	☒☒☒	☒☒☒	☒☒☒
	Collaboration awareness *Problem-setting*	Awareness of shared role of organizations in the cadastral system	☒☒☐	☒☒☒	☒☒☒
	Cooperation awareness *Direction-setting*	Awareness of capabilities and resources in the cadastral system	☒☐☐	☒☒☐	☒☒☐
		Awareness of shared values, goals and visions among the organizations in the cadastral system	☒☐☐	☒☒☐	☒☒☐
		Awareness of need for partnerships in the cadastral system to reach shared goals and visions	☒☐☐	☒☒☒	☒☒☐
Coordination	**Coordination awareness** *Structuring*	Awareness of shared problems and/or new possibilities in the cadastral system	☒☒☐	☒☒☐	☒☒☐
	Implementation awareness *Problem solving*	Awareness on how to solve problems and develop new possibilities in the cadastral system	☒☒☐	☒☒☐	☒☒☐
Outcome	**Evolution awareness** *Maintaining relations*	Awareness of success and need for further common projects to maintain the established relations in the cadastral system	N/A[1]	N/A[1]	N/A[1]

Table 8.3 Internal awareness in Victoria's cadastral system

[1] Because of a lack of focus on this stage during the interviews it is not possible to conclude on this stage in the analyses of the Victorian cadastral system.

External awareness					
Overall step	**Stages of awareness**	**Description**	**SII**	**Office of Title**	**Office of the Survey General**
Motivation	**Need defining awareness**	Awareness of society's need and interest of the spatial information, expertise and services that the cadastral system posses and/or can deliver	⊠⊠☐	⊠⊠⊠	⊠⊠⊠
	Collaboration awareness *Problem-setting*	Awareness of the role of cadastral system in society	⊠⊠☐	⊠⊠⊠	⊠⊠⊠
		Awareness of organizational interdependency in order to reach shared goals and visions	⊠☐☐	⊠⊠⊠	⊠⊠⊠
Coordination	**Coordination awareness** *Structuring*	Awareness of shared problems and/or new possibilities	⊠⊠☐	⊠⊠☐	⊠⊠☐
	Implementation awareness *Problem solving*	Awareness on how to solve problems and develop new possibilities	⊠⊠☐	⊠⊠☐	⊠⊠☐
Outcome	**Evolution awareness** *Maintaining relations*	Awareness of success and need for further common projects to maintain the established relations	**N/A[1]**	**N/A[1]**	**N/A[1]**

Table 8.4 External awareness in Victoria's cadastral system

[1]   Because of a lack of focus on this stage during the interviews it is not possible to conclude on this stage in the analyses of the Victorian cadastral system.

Concerning the suggested imbalance in the Victorian cadastral system, the above awareness models indicate that the problems are significant both in the steps of internal and external motivation, and in the common step of coordination awareness.

Firstly, looking at the motivation step in the internal awareness model, we find several constraining conditions that indicate an uneven level of awareness especially for the SII in the stage of cooperation awareness. In summary, the strategies and the coordinating bodies developed and run by the SII are not focusing on the cadastral system. Furthermore, the network structure from the SII towards the core cadastral organizations is weak and does not seem to promote trust towards the SII. Moreover, the attitude to data sharing does not seem to focus much on cadastral data and problems in this field. The overall picture of the motivation step seems to be better in the Offices of Titles and in the Office of the Survey General, however with the Office of the Survey General playing a more isolated role.

Secondly, looking at the motivation step in the external awareness model the SII seems again to play a special role. The visions largely prepared by the SII are not focusing much on external awareness, and the means of the SII for getting information on the role and use of cadastral data seems to be limited due to the mentioned structural and coordination body related factors. The external awareness of both the Offices of Title and in the Office of the Survey General seems much higher. Both offices seem to have a clear understanding of the position they play in society and the interdependency of the organizations in the cadastral system when looking at the attitude to data sharing. The organization's missing representation in the overall coordination bodies do not seem to affect the external focus due to a number of external contacts in the offices and an overall high understanding of their product's advantage in society.

Lastly, using the case of the Victorian DCDB the different parts of the cadastral systems all together seem to share a medium level of coordination awareness. All departments acknowledge the need for building a survey accurate cadastral map, and the departments furthermore seem to share a relatively high level of technical knowledge that will make it possible to carry the project out in reality.

In summary, the Victorian cadastral systems' abilities to develop future orientated cadastral system seem challenging. Especially the motivation step in the internal awareness model seems to be problematic. Because of a relatively low level of cooperation awareness in especially the SII, the analyses suggest that it probably will be demanding to develop cross-organizational solutions or solve cross-organizational problems in the cadastral system. Of course, it all comes down to the role of the SII. While, the analyses suggest that the SII plays a major role on the policy, power and economic level in the Victorian cadastral system, it seems crucial that the SII shares the same level of awareness as the other parts of the cadastral system.

9   Western Australia

9.1   Introduction and overview

Western Australia is the leading state in Australia in terms of SDI development and cross-jurisdictional collaboration. A development largely driven by the coordination body of the Western Australian Land Information System (WALIS) that long has been recognized as having a primary role for facilitating access to geographic information and a coordinated approach in sharing this information across government agencies (WALIS office 2004).

In the below review on the Western Australian cadastral system, we will see how WALIS has played a fundamental role in creating a high degree of awareness in the Western Australian cadastral system. Awareness that has helped to develop a number of services for wider society. Services that are built on a close relationship of the departments in the organizationally integrated Western Australian cadastral system.

As was the case in the analysis of the Victorian cadastral system, the case of Western Australia take an overall point of departure in a specific project: The development of the Shared Land Information Platform. SLIP is a project led by the Department of Land Information (DLI), which provides a common access point to land information distributed across multiple government agencies. SLIP involves several focus areas, (Emergency Management, Natural Resource Management, electronic Land Development Process, and Interest Enquiry) as well as agencies seeking to make data available through SLIP and other stakeholders within government and the WALIS community (Department of Land Information 2008).

9.1.1   State profile

Western Australia

Area	2,529,875 km²
Population	2,003,800
Capital	Perth

(Australian Bureau of Statistics 2005)

Western Australia is Australia's largest state with a size approximately equivalent to Continental Europe. However, the population density is among the smallest in the world, largely concentrated around the capital city Perth in the Southwestern part of the State. Western Australia's economy is mainly based on the extraction and export of mining and petroleum commodities especially iron ore, alumina, natural gas, nickel and gold, which account for about 40% of Australia's total output of petroleum and minerals. Furthermore, the agricultural sector is important, especially in the southern parts of the State (The Western Australian Government 2006;Warnest 2005).

9.1.2   Overall cadastral system

As was the case with the State of Victoria, the Western Australian's cadastral system is a Torrens system. In Western Australia, land is also classified as Freehold Land, which is in private ownership, or Crown Land, which is a general term for all land owned by the state of Western Australia and controlled by government. In Western Australia, approximately 93 % of the land is Crown Land (Department of Industry and Resources 2008).

9.1.3   Administration and structure

The cadastral system in DLI is administered from the Office of Registration in the branch of Information Services. Information Services is one of five branches in the DLI, see the below information chart in figure 9.1. The Manager of Information Services holds the title of Surveyor-General. In head of the whole of DLI is the political elected Chief Executive, who is responsible for DLI´s performance. In addition, the inter-organizational coordination body WALIS is situated within the DLI organizational structure. The acting WALIS Director, reports directly to DLI´s Chief Executive in his capacity as the head of WALIS.
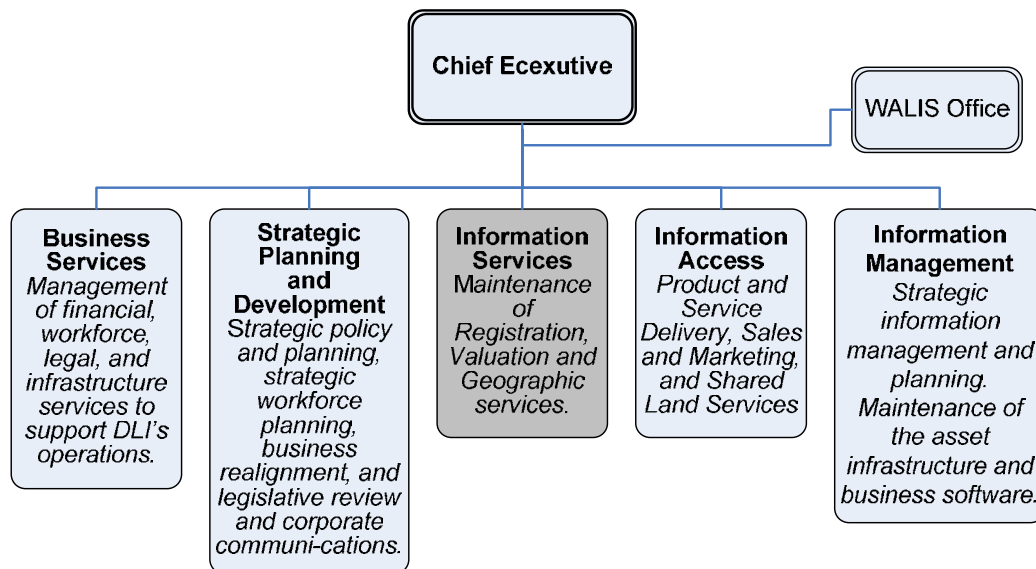
Figure 9.1 DLI - organization chart (Department of Land Information 2004)

In overall, the Western Australian system is organizationally constructed as a business chain model. Instead of focusing on the individual parts of e.g. the cadastral system, the focus is on each part's role in the delivery of services to society. For instance, the core cadastral system only deals with the actual registration tasks, while development of services and information delivery is managed within other branches of the organization.

9.1.4   Historical development

The Department of Land Information is one of the State's oldest government agencies, tracing its roots to the Survey Office of the Swan River Colony of 1829. Currently DLI is governed together with the departments of Housing and Works, and Consumer Protection and Heritage. (Department of Land Information 2003)

DLI was established in its current form in 2002 when merging the former Department of Land Administration and the Valuar General's office. This happened after the Cabinet acknowledged the importance of supporting Government land information in society, the need for large capital investments in land and property information systems, and the recognition of possibilities to fund these capital investment through commercial development of the State's land information assets (Government of Western Australia 2003).

DLI is these years working to become a Statutory Authority with commercial powers, which means that the department will have power to drive the commercial development of government's land information datasets and generate revenue from the services provided. The goal is that DLI becomes self-funded, and can reinvest revenue into customer service, new online services and improvements, and thus provide greater return to the State and community on its land information asset (Government of Western Australia 2005).

9.2 The Western Australian cadastral system from an awareness perspective

In reality the core parts of the cadastral system in Western Australia is located within one office in the Department of Land Information – the Registration Service. However, due to the business model of DLI it is necessary also to deal with the other branches. E.g., the branch of Information Access seems to play an important role with regard to the development of external awareness. The below investigation will therefore deal with multiple offices in the DLI

9.2.1 Network structure

Overall network characteristics

The network of DLI is dense and geographically highly integrated. All parts of the organization, besides the Valuar Office, are located in the same office building outside Perth. The core cadastral parts of the systems are as said located within the same branch of the organization – Information Services.

Network links

A number of stable and multifaceted links exist between the different organizational parts of the DLI. These links both seem to have developed because of the continual process focus in the system, and because all branches in the DLI conduct a number of regular meetings on all levels of the administration – a general management group, a strategic group, and a technical focus group.

Importance in the network

Whereas it is useless to talk about differences in the importance of the core cadastral functions because of their complete integration in the network, it is only fruitful to discuss this among the branches of the DLI. On this level, the investigations suggest that the links between the branches are highly symmetrical. A uniform management of the cadastral system limits budget fights and other power issues, which seems to promote a collaborative culture among the branches in the DLI. However, this culture has not been easy to build. According to the respondents, it has been a slow process of integration.

9.2.2   Visions and strategies

The Western Australian cadastral system is subject to the Strategic Plan 2005-2010 developed in the Department of Land Information. The plan is a one-page document consisting of: Vision, Mission, Strategic goals, Key strategies, Critical success factors and cooperate conduct. The overall mission is "A future where the use of land knows no bound" (Department of Land Information 2005).

Parameter	Comments
Accessibility and visibility	• Accessible through Land Victoria's homepage (Home > Publications >Strategic Plan 2005 – 2010)
Sender	• Department of Land Information
Stakeholders	• Offices in the Department of Land Information
Themes	The themes are described as "key strategies": • Data quality • Collaboration internally and externally • Delivery of services • Increase revenue • Implement new government arrangement • Improve internal workforce • Improve individual and cooperative support
Presentation	• Short, but focused and clear
Commitment	• None
Use	• Used in all offices in the Department of Land Information
Additional comments	• None

Table 9.1 Parameters for visions and strategies in the Strategic Plan 2005-2010

The content of the Strategic Plan from the Department of Land Information reflects the fact that the organization is the cadastral system in Western Australia. This means that the collaborative focus in the department more is on service delivery to the external environment than on the use of data in the internal parts of the organization. The extensive focus on external service delivery also reflects the department's move towards a Statutory Authority with commercial powers. In many ways, the plan more resembles a business plan than a set of public administrative guidelines. The focus is more on the delivery of services to costumers and on the increase of revenue, than on internal collaborative incentives.

From an awareness viewpoint the strengths of the Strategic Plan in Western Australia is the high focus on external users in society – other departments, citizens, industry and academia. The lack of focus on internal collaborative aspects does not seems to be a disadvantage from an internal awareness viewpoint, since the department, with a strong management, in reality is the only stakeholder in the cadastral arena.

The most obvious weaknesses of the strategic plan seem to be the lack of commitment in the plan. It is not emphasized which offices in the department that are responsible for which part of the strategy. The very short nature of the plan and the intensive use of "one-liners" may also counteract a more rigorous use of the plan. From an external observer the plan may not be perceived as much more than a pep talk. However, one respondent argue that in daily life the plan works good, especially as a checklist for how well new ideas fits with the overall strategy of the organization.

9.2.3   Inter-organizational coordination bodies

The State's prime spatial information coordination body is the highly successful WALIS. WALIS is based on the partnership of 27 State Government Agencies, several Local Government authorities and an increasing number of private sector organizations. Established in 1981, WALIS is the oldest Australian cross-governmental agency to manage spatial information (WALIS office 2004). While WALIS not is for the cadastral system only, the focus lay on this body as all the respondents in the case study has the attention on this coordination body.

WALIS covers a wide framework for coordination of the State's spatial information. The organization has six overall aims:

- Strengthening and expanding partnerships throughout the WALIS community (People)

- Providing geographic information to support business outcomes (Information)

- Implementing an infrastructure to enable full integration of geographic information (Technology)

- Developing, implementing and reviewing policy to support the requirements of the WALIS communities of practice (Policy)

- Establishing and maintaining a structure to lead the implementation of the WALIS community goals (Framework)

- Improve the WALIS community's ability to understand, use and access geographic information (Education)

(WALIS office 2004)

Furthermore WALIS coordinate the agency's capture or acquisition programs including digital spatial data, aerial photography, satellite imagery and topographic map production, which have resulted in big saving by eliminating duplication and allowed a prioritized acquisition of spatial data (Warnest 2005). Regarding the societal benefits of WALIS, the market research firm ACIL Tasman, put forward that WALIS contributes by approximately $15 million a year, to the Western Australian economy, and by at least another one million dollars a year, because it enables a more efficient collection and production of spatial data (ACIL Tasman 2004).

WALIS is administered by four bodies, the WALIS Executive Policy Committee, the WALIS Council, the WALIS Core Management Group, and the WALIS Advisory Committee (WALIS office 2004;WALIS office 2006), see figure 9.2.

- *The WALIS Executive Policy Committee* is directed by the Chief Executive of DLI, and all 27 General Directors of the WALIS member agencies sit in the committee. The Executive Policy Committee set the overall policy of WALIS and reports directly to the Minister for Land Information.

- *The WALIS Council* focuses on the coordination aspects of WALIS. It includes members from the WALIS agencies, the WALIS Advisory Committee and the Western Australian Municipal Association. The council meets every two month.

- *The WALIS Core Management Group* focuses on strategic policy issues, including overseeing the implementation of the WALIS Strategy. It includes director-level representatives from WALIS member agencies as well as representatives from the Department for Land Information, the Western Australian Municipal Association, the Advisory Committee and the Office of E-Government.

- *The WALIS Advisory Committee* represents business, education, local government and the community and focuses on high-level strategic advice to WALIS Council and the WALIS Core Management Group.

```
                    Minister for Land
                      Information

                    WALIS Executive
                    Policy Committee
                    Sets overall policy

    WALIS Council      WALIS Core        WALIS Advisory
    Coordination    Management Group       Committee
                     Strategy, policy,   Advice on strategy
                      implementation        and policy
```
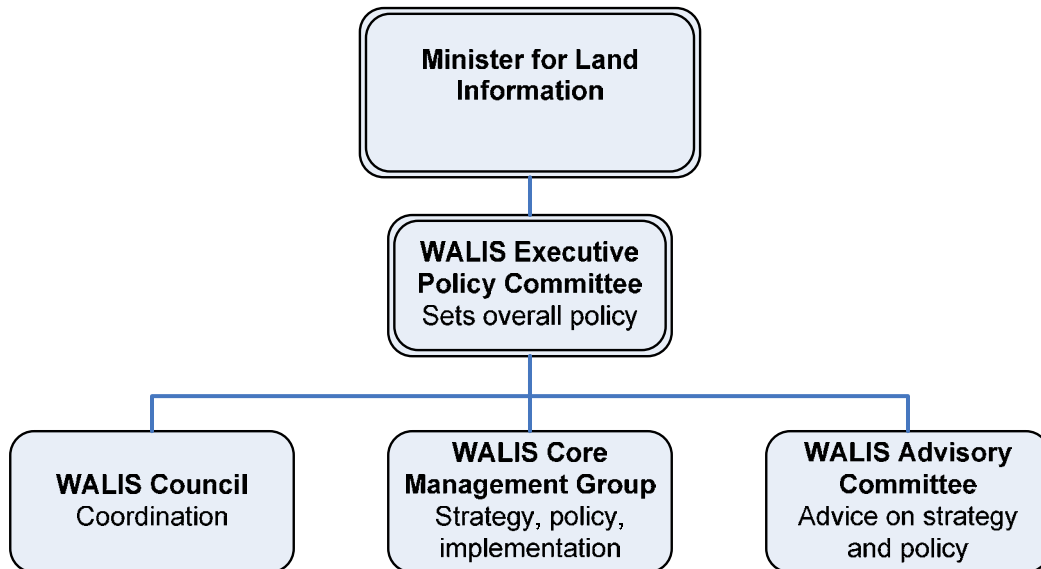
Figure 9.2 Structure of WALIS

In order to evaluate the role of WALIS in the cadastral system, WALIS seems to be an essential element especially in the external awareness building in Western Australia. All the respondents from the Western Australian cadastral system regard WALIS as the foundation for the success of the integrated and cooperative SDI that exist both in DLI and in the whole of Western Australia. While the respondents recognize WALIS as playing a leading role in the data acquisition in Western Australia, the focus from the respondents is on the awareness building ability of the body. WALIS make people get to know each other and share knowledge and experiences.

The success of WALIS is founded on several aspects. Firstly, the mandate of WALIS is very strong. It is widely supported by government, and is accepted as an integrated part of the overall administrative fabric. Secondly, the representation of WALIS is broad both horizontally and vertically. WALIS has a multi-faceted organizational composition and consist of groups from both the management and technical levels. Thirdly, the time factor is important. WALIS has existed for more than 25 years and have had a long impact on the collaborative culture in the Western Australian government administration.

9.2.4   Management communication

Besides the high multi faceted meeting activity in the DLI, the management is actively encouraging especially the external awareness building through a central website – the SLIP collaboration portal. Besides the use by other departments and ministries, the management encourages its own employees to use the portal for getting knowledge on the external programs the DLI is working on, and as a discussion mechanism on the progress of the SLIP program. The portal gives a good overview on the SLIP-program, presented in an enthusiastic tone, and the interviews suggest that the portal after some initial difficulties is working very well. Besides this, the management also uses meetings as a forum for exchange of information to the employees.

9.2.5   Willingness

Attitude

Not surprisingly, referring to the very integrated network structure and the high levels of external collaboration, the attitude towards the use and sharing of data is very positive among the respondents in the DLI both concerning the internal and external environment.

Internally, the focus that permeates the organization seems to be the one of the Chief Executive Grahame Searle. His statements on the extra value you get from bringing spatial data together, instead of having them isolated, seem to be the common guide of reference in the organization. Furthermore, the interviews suggest that the future changes in becoming a statuary authority also have had a positive affect on the internal attitude on the use and sharing of data. Several respondents thus argue that the future change in funding already now has made them more aware of their role in the business chain in DLI. Moreover, an extensive focus from the management on the development of value adding services across offices seems in recent years to have contributed very positively to the general attitude to data sharing and use of data in general.

Externally, seen from the perspective of DLI's relation to other departments, the attitude is equally positive. The SLIP collaboration may be seen as the ultimate proof in this regard. The development of SLIP has succeeded because of a deliberate lobby work by DLI founded on a long time wish for more cross departmental spatial data sharing and collaboration. Furthermore, SLIP appear to have had a positive affect on the other departments attitude towards data sharing, and among the politicians in Western Australia due to the intensive use of easy accessible prototypes that SLIP has introduced.

Social pressure

In general, the interviews suggest that the DLI itself has been the main driver for the development towards increased spatial data sharing both within the organization and among the whole WA administration. E.g. while the integration of the cadastral system in DLI on paper was initiated by a government founded administrative reform, the cadastral integration seem to be launched by heavy influence from the management in DLI, a good relationship to the state treasury and an overall focus by DLI that fitted into the governments overall strategy at that time. The recipe seems to have been hard work, seasoned with timing and good luck. The respondents thus all argue that the actual spatial data interest from the politicians in Western Australia is rather low. E.g., the existence of a Minister of Land more seems to be matter of signal than a deliberate focus in the area. The political focus is on the typical areas such as healthcare and education – not on spatial information.

The same picture is evident in the development of SLIP. The process is run entirely from DLI. The DLI have developed services from the other departments in the SLIP framework, the departments have typically not asked the DLI for services.

However, the immediate lack of social pressure does not seem to originate from a shortage of contacts from the DLI to the external environment. The managers in the DLI are continually visiting the Directors of the departments in the SLIP framework to check on satisfaction and progress, and a well-used electronic portal has been established in order to encourage communication from the other departments to the DLI.

Furthermore, the absence of demands from private users relates to a very productive and future orientated development branch in the DLI. According to the interviews, the users are all ready very well supported. However, in order to encourage costumer communication, the DLI have established a costumer committee in the cadastral area with key costumer representatives.

From an overall perspective, the interviews also suggested that the lack of interest in spatial data from especially politicians might be changing due to spatial services such as Google Earth.

Technical knowledge

The interviews suggest that the technical knowledge is well developed and symmetrical dispersed in the DLI. A reality that probably is founded by a number of reasons. Firstly, the big focus on both internal and external data handling means that a high degree of technical knowledge on all levels is necessary in the decision making process. Secondly, the managers in the core cadastral parts of the Information Registration Branch are by large educated as surveyors or cartographers. Thirdly, the general integration of the organizational elements drives an even dispersal of knowledge within the system. Fourthly, there exist a highly evolved culture for the use of prototypes as the foundation for cross-sector discussions and improvements of new products.

9.2.6   Trust

Multiple elements assist the possibilities for developing trust among organizational entities in the Western Australian cadastral system. An indication that is supported by a general very positive attitude from the respondents towards the organizational environment in the DLI.

Regarding the organizational elements to promote trust, the investigations and the statements especially emphasize the importance of the absence of professional rivalry among the organizational entities in the Western Australian cadastral system due to the business chain model of the DLI.

Furthermore, following the theoretical background on trust, we find that the interviews suggest the existence of a frequent, varied meeting activity among multiple parts of the DLI organization both seen from a vertical and a horizontal perspective. A meeting activity theoretically promoting trust because of the integrated nature of the organization and the homophily of the organizational parts seen from a cultural, organizational background.

9.3   Overall conclusion of awareness in the Western Australian cadastral system

9.3.7   Overall summary

Table 9.2 provides an overall summary of the analyses.

Parameter	Pros and cons
Network structure	+ Dense and geographically centralized + Many formal and stable links on multiple organizational levels + Symmetrical relationship between the organizational parts within the DLI
Visions and strategies	+ Focus on multiple external users ÷ Lack of commitment ÷ Very short nature, with many "one-liners"
Inter-organizational coordination bodies	+ Strong political and administrative mandate + Broad representation + Long history + Focus on external collaboration
Management communication	+ Web portal focusing on external collaboration
Willingness	+ High degree of positive attitude to the internal benefits of data sharing largely affected by a positive attitude from the management and the organizational transition to becoming a statuary authority + High degree of focus on external benefits from data sharing + High, equally dispersed degree of technical knowledge + High focus on costumer needs ÷ Low to medium political interest and focus on the cadastral area ÷ Low to medium focus from the market segment

Trust	+ In-final time span
	+ High degree of organizational homophility
	+ Small number of organizations and well-defined boundaries
	+ Symmetric, non-power related relations

Table 9.2 Summary of awareness analysis in Western Australia

The investigations in an awareness context

Transferring the above results to the awareness models we found that the cadastral system in Western Australia seems to have close to optimal conditions for developing both the phases of internal and external awareness. Table 9.3 and 9.4 thus display how the score of the DLI is set as "high" in all of the theoretically founded stages of internal and external awareness.

Internal Awareness			
Overall step	**Stages of awareness**	**Description**	**DLI**
Motivation	Existence awareness	Awareness of other organizations in the cadastral system	☒☒☒
	Collaboration awareness *Problem-setting*	Awareness of shared role of organizations in cadastral system	☒☒☒
	Cooperation awareness *Direction-setting*	Awareness of capabilities and resources in the cadastral system	☒☒☒
		Awareness of shared values, goals and vision among the organizations in the cadastral system	☒☒☒
		Awareness of need for partnerships in the cadastral system to reach shared goals and visions	☒☒☒
Coordination	Coordination awareness *Structuring*	Awareness of shared problems and/or new possibilities	☒☒☒
	Implementation awareness *Problem solving*	Awareness on how to solve problems and develop new possibilities	☒☒☒
Outcome	Evolution awareness *Maintaining relations*	Awareness of success and need for further common projects to maintain the established relations	☒☒☒

Table 9.3 Internal awareness in Western Australia's cadastral system

External Awareness			
Overall step	**Stages of awareness**	**Description**	**DLI**
Motivation	Need defining awareness	Awareness of society's need and interest of the spatial information, expertise and services that the organizations in the cadastral system posses and/or can deliver	⊠⊠⊠
	Collaboration awareness	Awareness of the role of the cadastral system in society	⊠⊠⊠
	Problem-setting	Awareness of organizational interdependency in order to reach shared goals and visions	⊠⊠⊠
Coordination	Coordination awareness *Structuring*	Awareness of shared problems and/or new possibilities	⊠⊠⊠
	Implementation awareness *Problem solving*	Awareness on how to solve problems and develop new possibilities	⊠⊠⊠
Outcome	Evolution awareness *Maintaining relations*	Awareness of success and need for further common projects to maintain the established relations	⊠⊠⊠

Table 9.4 External awareness in Western Australia's cadastral system

Regarding the overall positive outcome of the investigations some might argue that especially the positive assessments in the internal awareness model are obvious – the positive awareness image of the Western Australian Cadastral system derives by large from the integrated, mono-organizational nature of the system. Moreover, some might even argue that it would be more strange if the outcome where any different. However, without going too deep into this discussion here, we leaned from the Victorian case study that a geographically and administrative integration not necessarily give rise to a positive awareness environment. Even though the organizations in the Victorian system where located in the same building and the

Office of the Survey General and the Title Office where administered in by same department the situation was less than preferable.

This means, that when advocating for the existence of a high level of awareness in the Western Australian cadastral system this actually is quite remarkable. Especially seen in the light of the only recent organizational integration and re-organizing of the cadastral components in the DLI. Even though a part of the overall high level of awareness thus seem to derive from a geographically integrated nature of the DLI, most of the success most likely come from other aspects in the organization.

Regarding both the stages of motivation, coordination and outcome in the internal awareness model the high potential for developing awareness seems particularly to be driven by the organizational business chain model, the extensive focus on product development across traditional organizational boundaries and the positive focus on data sharing from the management.

On the external awareness model, particularly the cross-departmental focus in WALIS has had a big impact on the motivation for awarding the high level of awareness to the Western Australian cadastral system. The positive impact from WALIS is supported by the encouraging management view, the many communication channels, a general focus on costumer needs, and again by the organizational business chain model.

In addition, on the specific subject of the actual problem solving (coordination awareness) in both the internal and external awareness model this is encouraged particularly by the widely allocated technical knowledge in the cadastral system, supported by an intensive use of prototypes in the developments of new services.

In summary, the cadastral system in Western Australia are build on a foundation of organizational, managerial and views that by large seem to encourage optimal conditions for developing both internal and external awareness on sharing and use of spatial data.

10 The Netherlands

10.1 Introduction and overview

The Netherlands has one of the worlds most well functioning integrated cadastral systems. In the below awareness analysis we will see how a number of awareness supporting factors seem to support a wide focus on cadastral data in a collaborative environment, which make the organization rank high in all levels of awareness.

10.1.1 Country profile

The Netherlands

Area	41,526 km^2
Population	16,339,835 (August 2006)
Capital	Amsterdam

The Netherlands is a geographically low-lying and densely populated country. The Netherlands is a parliamentary democratic constitutional monarchy, located in Western Europe. It is bordered by the North Sea to the north and west, Belgium to the south, and Germany to the east. The country is highly developed and is known world wide for its industrial activity in food processing, chemicals, refining, and electrical machinery (CIA 2008).

10.1.2 Overall cadastral system

The Dutch cadastral system is in principle a negative deed system, which entails that one cannot rely on the content of the registers. All that is certain is that the latest entry in the register in fact is the latest entry. As opposed to the title system, the registrar does not enquire whether the intended legal consequences is registered (Postmus 1995). However, in reality the system is positive and have an inbuilt good faith protection because of the role of the Latin Notariat in the system, see below (Zevenbergen 2003).

10.1.3 Administration and structure

The Dutch cadastral system, the Cadastre and Land Registry, are since 1825 combined into one agency – Kadaster, administered by the Ministry of Housing, Physical Planning and Environment (VROM).

Kadaster consists as from 1 January 2006, of two offices, legal security and GEO that carry out the primary cadastral processes of the organization, see figure 10.1. The Office of Legal Security is responsible for land registration and for land consolidation. The Office of GEO is responsible for the surveying part of the cadastral recording, for topographical mapping and for triangulation. Support tasks (e.g. IT and HR) for these two Offices, are located in the Office of Services.

The daily control of Kadaster is in the hands of the Board of Management, which is supported by the Office of Strategy and Policy and the Office of Finances, Planning and Control. If it concerns matters of consumer interest, the User Council supports the Board of Management. In matters of societal trends, and organizational and economical matters, the Supervisory Board supports the Board of Management. Furthermore, the Board of Management is represented in the GI-board, which oversees cross-governmental strategy development. (Kadaster 2006b)
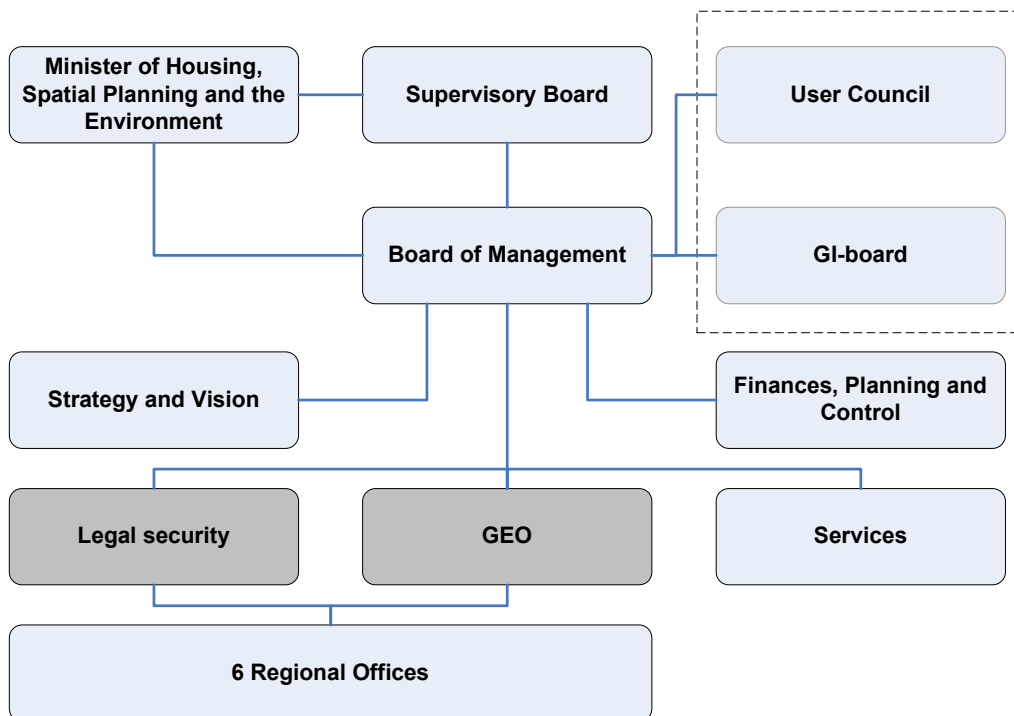
Figure 10.1 Organizational structure of the Dutch cadastral system (Kadaster 2006b)

Kadaster operates as an independent public body on a semi-private basis, with a limited political control (Besemer and Van der Molen 1996). The agency is obliged to fully recover its own costs, while offering citizens and professional users the lowest possible fees and prices for products and services (Osch and Lemmen 2004;Westerbeek 1999). Regarding the engagement in market activities by a monopoly as the Kadaster, an explicit legal base has been created. It is e.g. not allowed to enrich information with data from third parties (Jong 1998).

As mentioned, the Latin Notariat plays an important role in the Dutch cadastral system. Often the Kadaster is referred to as the back office of the system, while the private operated Notariat is referred to as the front office. The important role of the notary derives from the fact that delivery of immovable property, such as land property, requires registration of a notarial deed in the public registers. Before drawing up a deed, the notary investigates the titles of the real estate and certifies the vendors ownership (Koninklijke Notariile Broederschap 1985). It is thus the notary's responsibility (also economically) to ascertain that no errors exist, a fact that means that the negative Dutch deed system in fact becomes legally guaranteed due to the cooperation between the notarial profession and the Kadaster (Postmus 1995). Since Kadaster carries out all cadastral surveying, a system of licensed private cadastral surveyors is not in place (Van der Molen 2006).

10.1.4 Historical development

The Dutch cadastre dates back to 1811 when Napoleon Bonaparte decided to build a fiscal cadastre after the annexation of the Netherlands by France.

During the last almost 200 years, a number of decisions have paved the way for the development of the present Dutch cadastral system. In 1825, the legal land registers and the cadastre were, as mentioned, joined together in one agency for efficiency reasons. In 1838, it was decided that the cadastral land parcel numbers should be included in notarial deeds and in mortgages. In 1974, the cadastral agency was shifted from the Ministry of Finance to the Ministry of Housing, Physical Planning and Environment. In 1992, a revision of the Civil Code and a new Cadastre Act, gave the land registers and the cadastral maps a central position in society regarding security of tenure, facilitation of the land market, physical planning, development control etc. In 1994, it was decided by the Council of Ministers to transfer the agency into an independent, self-supporting public body. In 2002, the cadastral agency was merged with the Topographical Service of the Ministry of Defence, establishing the Cadastre, Land registry and Mapping Agency. Furthermore, following up on the governmental "Streamlining Key Data" program from 2000, the maps and registers of the cadastral agency were in 2002 appointed as a base register in order of being one of six core authentic registers in order of supporting the information infrastructure of the government. Until 2006, Kadaster consisted of a head office and six regional offices, which kept the land registers, survey boundaries, and maintained maps and disseminated information. However, in the beginning of 2006, Kadaster began a comprehensive centralization and restructuring of its organization, in order to create more uniformity in its services and in order to streamline its lines of communication and decision-making. (Jong 1998;Van der Molen 2006;Van der Molen 2005).

10.2 The Dutch cadastral system from an awareness perspective

10.2.1 Network structures

Overall network characteristics

The Dutch cadastral system consists of a relatively small, dense and central organization located in the same office building in Apeldoorn in rural, central Netherlands. Whereas the managerial parts of the land registry and mapping parts of the organization is located on the same floor, the rest of the offices of Kadaster (see figure 10.1) are located on one of the other floors. However, while the managerial parts of the Dutch cadastral system thus are highly centralized, the operational parts are, as mentioned, spread out in six regional offices. In spite of this, none of the respondents sees this as a problem in an awareness sense, mainly because of a lack of interest in internal and external awareness related issues from the operational staff in Kadaster.

Network links

Several factors positively affect the network links between the land registry and mapping parts of Kadaster. Besides a number of unofficial links due to the fact that the two offices sits on the same floor and in some occasions share rooms, the two offices also have two common monthly meetings with the Board of Management, which on official level work as an important, regular link between the cadastral parts of Kadaster.

However, while the internal links between the core cadastral offices seem to function very well, the links to the external environment appear to be even more structured in Kadaster. On the general level, the Office of Visions and Strategy have employed a person that solemnly cares for external public affairs, and the Supervisory Board advises the Board of Management on tendencies in society. On the governmental level, the GI-board provides information to the Board of Management. Lastly, the relations to the costumer level are enhanced through the User Council as well as through the numerous informal contacts that seem to exist in the product development arms in GEO especially.

Importance in the network

Internally, several respondents argue that the two cadastral offices in Kadaster very much enjoy the same importance because of the integrated cadastral workflow processes and the tight management control both from top and mid-level of the organization.

Externally, the picture is a bit more complicated because of the position of Kadaster as an independent public body. From an objective view, this administrative position indicates that Kadaster may be alienated in government. However, in reality this does not seem to be a problem. Kadaster enjoys a high prestige in the Dutch administrative structure, e.g. exemplified by the additional tasks that the organization is being imposed. Furthermore, Kadaster have multiple external links to government and other ministries both on the operational and managerial level. However, a drawback might be that Kadaster geographically is located relatively far from the political and administrative center in Den Haag.

10.2.2 Visions and strategies

Kadaster's Board of Management formulates its visions and strategies in Long Term Policy Plans that cover a 5-year period. The plans are updated every year. The existing plan covers the period from 2007-2011 (Kadaster 2006a).

Parameter	Comments
Accessibility and visibility	• Accessible through Kadaster's homepage (Home > Het Kadaster > Hoe werken we > Meerjarenbeleidsplan 2007-2011)
Sender	• Board of Management
Stakeholders	• Offices in Kadaster
Themes	• Continuity of existing tasks • Support the registration of GI in the Netherlands in order to support improvement and renewal of public services • Efficiency, effectiveness and innovation in the organization
Presentation	• Long, thorough, but not easily read • Extensive use of management terms
Commitment	• Only cooperate commitment
Use	• Used throughout all offices in Kadaster
Additional comments	• Focus on the external and internal environment's impact on the visions for the organization • Presented through a number of road shows and staff meetings

Table 10.1 Parameters for visions and strategies in the Dutch cadastral system

As was the case with the policy plan of Western Australia's cadastral system, the content of the Dutch cadastre's current Long Term Policy Plan, reflects the fact that the Dutch cadastral system

is integrated in the same organization. This means that even though the land registry parts and the mapping parts in the Dutch system are separated into two offices in Kadaster, the visions and strategies are conform for the two units.

From an awareness viewpoint, several aspects in Kadaster's visions and strategies illustrate the apparent existence of a high degree of both internal and external awareness. However, while the Long Term Policy Plan only indirectly emphasizes the internal awareness in the system, by pointing out developments, that demands the collaboration between the land registry and mapping offices of the system, e.g. a 3D cadastre, the external focus of the system is much clearer. Regarding the external focus of Kadaster it is thus evident from the Long Term Policy Plan that the organization would like to play a much more dominant role in the Netherlands that it does today, a fact that also is pointed out by several of the respondents from Kadaster and in several papers (e.g. Barnasconi 2006;Groothedde 2007). Kadaster thus intends to be the main supplier of GI in the Netherlands. Besides improving its traditional tasks of registering real property by linking this information to other public registers, Kadaster also wants to extend its registration to movable property and underground infrastructures such as pipelines and wiring, and it wants to be the center of the highly profiled authentic registers. The high external perspective is further underpinned by the fact that Kadaster every 3 years carry out a very big user survey in order of being able to deliver services in demand.

In summary, Kadaster's Long Term Policy Plan outlines a number of clearly outlined tasks that indicate a high degree of especially external awareness. However, seen from a communicative perspective the Long Term Policy Plan is not easily accessible because of its length and linguistically presentation. On the other hand, the management seems to have overcome these problems by carrying out a number of staff meetings throughout the country where the visions and strategy of the Long Term Policy Plan have been presented and explained.

10.2.3 Inter-organizational coordination bodies

Kadaster is member of the GI-board, which is the main inter-organizational GI coordination body in the Netherlands, see figure 10.2.
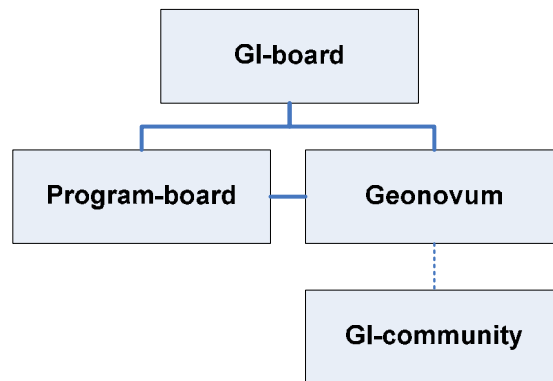
Figure 10.2 Organizational structure of the GI-board

The GI-board meets four times a year, discuss strategic matters, and consist of managers on director level from a range of public ministries and public organizations:

- VROM (Ministry of Environment, Spatial planning and Housing)

- LNV (Ministry of agriculture)

- V&W (Ministry of Traffic and Transport)

- EZ (Ministry of Economic affairs)

- BZK (Ministry of Internal affairs)

- Defensie (Ministry of Defense)

- Kadaster (Cadastre)

- VNG (Local governments)

- IPO (Provinces)

- UvW (waterboard)

- TNO-NITG (Geological Survey)

The GI-board board are supported by the small organization Geonovum that acts both as the operational arm of the board, and have its own tasks to carry out, e.g. standardization tasks and the establishment of a national GI-portal. Furthermore, the GI-board is supported by the Program-board that is focusing on policy issues.

Among the respondents in Kadaster, especially the GI-board and Geonovum are considered very important as a forum for building up external awareness to other public organizations on both the levels of motivation, coordination and outcome. The organizations thus develop projects together in a forum that handles issues on both the management and technical level.

10.2.4 Management communication

The main sources of information on building internal and external awareness among the land registry and mapping parts of Kadaster seem to derive from the board level. The tools of communication are at a glance what one would expect from a large multi-leveled organization – communication down the line through the mid-level of the organization, and an extensive use of an intranet for information management. However, it is also clear that the new board of management have tried to incorporate alternative ways of dispersing information and for activating the staff in discussing the future role of the cross departmental collaboration in the organization. The new Board of management has thus introduced an innovation lab that rewards innovative products or solutions, the possibilities for lunch meetings with the director, and more joint meetings (especially in the regional offices).

Regarding, the success of the communication, again focusing on the external awareness perspective, the Board of Management, seems to have had success with this task since several levels of the organization are telling the same "story" on the future development of Kadaster as a more and more important institution in the Dutch society. Both multiple persons on the mid-level of the organization share this story, as well as the unions and the work council that work as the main tubes to operational levels of Kadaster.

Having said that the communication all in all seem to be effective and varied, it must be emphasized that the Board of management are being criticized by the work council for not having enough face-to-face communication with the operational levels of Kadaster, and for not acknowledging that a large part of the older staff members not are comfortable by using the intranet as the main source of communication.

10.2.5 Willingness

Attitude

The attitude to data sharing in Kadaster is in general very positive – e.g., the management praise external data sharing both directly in the conducted interviews and indirectly through the overall strategy papers (see section 10.2.2), and internal data sharing between the land registry parts and the mapping parts are not considered a problem because of the joint workflow. However, the fact that Kadaster is an independent public body with a semi-private income structure, has, according to some respondents, until recently been an obstacle for an entirely free sharing of data. Not because Kadaster did not want to share data, but because especially other public organizations, sometimes found the pricing of cadastral data to expensive. The fact that Kadaster now is considered as a core authentic register, and have to deliver its data free to other public organizations, seems to have eliminated this problem.

Social pressure

At first glance, the establishment of the above-mentioned authentic registers attests high level of political interest towards Kadaster for improving the sharing of data. However, as both Besemer (2005) and several of the respondents point out, the political interest is not as comprehensive and coordinated as such an initiative indicates. As Besemer (2005) points out: "Some key elements are still missing from the geoinformation infrastructure; awareness has not yet spread across the upper echelons of the government departments in The Hague and, even now, progress is often slow." Furthermore, several respondents point out that the fact Kadaster itself takes a lot of data sharing initiatives, and in general not attracts much political attention because of its well-functioning systems, also limit the political pressure on the organization. Instead, the biggest pressure for data sharing by all accounts comes from Kadaster's GI consumers. The notaries, which are *the* main user of cadastral data, thus acts as the most important pressure group in order of getting improved access to cadastral data.

Technical knowledge

Technical knowledge does not seem to be a drawback regarding either internal or external awareness in Kadaster. On the internal level, several respondents point out that the long historical integration of the Dutch cadastral system in Kadaster means that the two offices have developed a very close relationship and that the cadastral workflow in reality often are experienced as very continuous. Furthermore, is the two cadastral office's product development departments located in the same room, which also helps increasing cross-organizational technical knowledge sharing. Regarding, the external level the respondent from the user council *did* point out that some discussions were subject to limitations when the new Board of management recently was put in place. However, today this is not experienced as a problem in the community. The problem also seems to be further limited since almost everybody on the mid-level in Kadaster has a surveying or engineering background.

10.2.6 Trust

When discussing trust in Kadaster with the respondents, trust related aspects between the land registry and mapping offices of Kadaster does not seem to be an issue. The two offices communicate well, have well working relations on the management level, experience power related equality and homophility seen from a cultural, organizational background, and are in general closely entangled on the operational level due to a very integrated, in-final work process.

The main problems with trust instead seem to lie on the external level. Kadaster, as an organization, do at times experience problems with external collaboration, e.g. to other ministries and municipalities, due to aspects that several of the respondents refer to as trust related. Especially the increased power base that Kadaster are building these years because of both an economical and service orientated success seems to intimidate other organizations.

10.3 Overall conclusion of awareness in the Dutch cadastral system

10.3.1 Overall summary

Table 10.2 gives a summary of the above awareness analyses of the Dutch cadastral system

Parameter	Pros and cons
Network structure	+ The management level is dense and geographically centralized
	+ Many formal and informal stable links on multiple organizational levels between the two cadastral offices
	+ Many formal and informal stable links towards the external environment on multiple organizational levels
	+ Symmetrical relationship between the cadastral offices within Kadaster
	÷ The operational level is decentralized
Visions and strategies	+ Highly mandated and well founded
	+ Focus on the future role of Kadaster in the Dutch society
	÷ Little focus on internal collaboration
	÷ Not easily accessible
Inter-organizational coordination bodies	+ Strong political and administrative mandate
	+ Broad representation of stakeholders on the external level
	+ Focus on external collaboration
Management communication	+ Intensive use of intranet
	+ Use of alternative attempts of user participation
	+ Successful "story-telling"
	÷ Critique of lack of face-to-face communication and acknowledgement of technology anxiety by older employees

Willingness	+ Positive attitude to resource benefits by data sharing
	+ Positive attitude to external benefits from data sharing
	+ Pressure from costumers for data sharing
	+ Equally dispersed degree of technical knowledge between the cadastral offices
	+ High focus on costumer needs
	÷ Low to medium political interest and focus on the cadastral area
Trust	+ Integrated internal work processes
	+ High degree of internal organizational homophility
	+ High degree of internal communication
	+ Symmetric, non-power related relations
	÷ Strong external powerbase

Table 10.2 Summary of the awareness analyses of the Dutch cadastral system

10.3.2 The investigations in an awareness context

Transferring the above investigations to the theoretically built awareness methodology, the outcome is that the cadastral system in the Netherlands seems to have close to optimal conditions for developing both the phases of internal and external awareness, see table 10.3 and 10.4.

Internal Awareness			
Overall step	**Stages of awareness**	**Description**	**Kadaster**
Motivation	Existence awareness	Awareness of other organizations in the cadastral system	☒☒☒
	Collaboration awareness *Problem-setting*	Awareness of shared role of organizations in cadastral system	☒☒☒
	Cooperation awareness *Direction-setting*	Awareness of capabilities and resources in the cadastral system	☒☒☒
		Awareness of shared values, goals and vision among the organizations in the cadastral system	☒☒☒
		Awareness of need for partnerships in the cadastral system to reach shared goals and visions	☒☒☒
Coordination	Coordination awareness *Structuring*	Awareness of shared problems and/or new possibilities	☒☒☒
	Implementation awareness *Problem solving*	Awareness on how to solve problems and develop new possibilities	☒☒☒
Outcome	Evolution awareness *Maintaining relations*	Awareness of success and need for further common projects to maintain the established relations	☒☒☒

Table 10.3 Internal awareness in the Dutch cadastral system

External Awareness			
Overall step	**Stages of awareness**	**Description**	**Kadaster**
Motivation	**Need defining awareness**	Awareness of society's need and interest of the spatial information, expertise and services that the organizations in the cadastral system posses and/or can deliver	☒☒☒
Motivation	Collaboration awareness *Problem-setting*	Awareness of the role of the cadastral system in society	☒☒☒
Motivation		Awareness of organizational interdependency in order to reach shared goals and visions	☒☒☒
Coordination	Coordination awareness *Structuring*	Awareness of shared problems and/or new possibilities	☒☒☒
Coordination	Implementation awareness *Problem solving*	Awareness on how to solve problems and develop new possibilities	☒☒☒
Outcome	Evolution awareness *Maintaining relations*	Awareness of success and need for further common projects to maintain the established relations	☒☒☒

Table 10.4 External awareness the Dutch cadastral system

Concerning the very high potentials for both the stages of motivation, coordination and outcome in the internal awareness model of the Dutch cadastral system, this is by large derived by the integrated and well functioning network structure and the top-down controlled management of the organization. From an administration viewpoint, the land registration and mapping parts of the Dutch cadastral system are hence not administered as two organizational entities, but by large as two parts of a single working process, in which case many inter-organizational collaborative obstacles is eliminated.

Besides the positive effects from the network and management structures in the Dutch cadastral system, the high potential for developing internal awareness also seem to originate from a uniting overall strategy and an efficient an effective communication on the management level in the cadastral system. In spite of ongoing structural and administrative changes, the Board of management seems to have succeeded in creating an atmosphere of team spirit where the end goal is to improve the user satisfaction.

Regarding the high potential for developing the interesting stage of external motivation awareness in the Dutch cadastral system, the analysis show that several aspects encourage this aspect in Kadaster. The organization has numerous external links on multiple levels and positions, a positive attitude to the benefits that the organization will have from data sharing, and a high focus on the needs of its users because of its position as a self-funding independent public organization. When these aspects are combined with the above-mentioned advantages on the collaborative level in Kadaster, the potential for building the stages of external awareness seem to be very high in the Dutch cadastral system.

In summary, the investigated aspects of the cadastral system in The Netherlands seems to encourage both the phases of internal and external awareness in the system to an almost optimal level.

11 Denmark

In spite of an organizationally divided cadastral system, Denmark has earned the reputation as one of the world's most secure systems regarding land ownership. However, in terms of developing future orientated systems, focusing on societal needs for information from the cadastral system, the picture is more blurred. As the below sections will clarify, weak organizational links and low external motivation levels in the land registry organization thus seem to hamper the developments towards a multi-purpose cadastral system in Denmark.

11.1 Introduction and overview

11.1.1 Denmark – country profile

Denmark

Area   43,098 km^2

Population   5,444,203 (August 2006)

Capital   Copenhagen

Denmark is the southernmost of the Nordic countries. 45 % of the population lives on the eastern island of Zealand, where also the capital Copenhagen is located. Denmark is a constitutional monarchy with a parliamentary system of government. Denmark has a state-level government and local governments in 98 municipalities. The economy of Denmark features very efficient agriculture, up-to-date small-scale and corporate industry (Danmarks Statistik 2006).

11.1.2 Overall cadastral system

The Danish cadastral system is a title registration system built from the German "Grundbuch system". Due to historical reasons, the cadastral system is divided into two organizational components: The *Cadastre* identifies real properties by cadastral numbers and areas, and graphically shows all land parcels. The *Land Book* identifies legal rights (ownership, mortgage and easements) based on the cadastral identification. Private licensed surveyors provides information for the day-to-day updates of the Cadastre by the performance of legal cadastral

surveys – subdivisions etc. The Land Book is updated after request from citizens, lawyers, licensed surveyors, public institutions etc. (Enemark 2002)

11.1.3 Administration and structure

From an overall perspective, two governmental departments administer the cadastral system in Denmark. The National Survey and Cadastre in the Ministry of Environment administers the Cadastre, and the Court Administration in the Ministry of Justice administers the Land Book.

The National Survey and Cadastre

The National Survey and Cadastre is a partly subsidized, smaller government agency. The organization has around 270 employees in eight divisions.

Besides managing the Danish Cadastre, the organization also manages and updates the Danish geodetic network, civil and military topographic maps and the nautical chartering (Kort & Matrikelstyrelsen 2005). Around one third of the yearly expenses (DKK 236.5 million) come from sale of products and services (Kort & Matrikelstyrelsen 2006), the rest is financed by the government.

The organization has a traditional management structure where a board of management is supported by a strategy division and a secretariat. Besides these structures, seven divisions serve the specialized functions of the organization. Each division has a mid-level manager, and often the division is further divided into areas with each its area manager (Kort & Matrikelstyrelsen 2007), see figure 11.1.
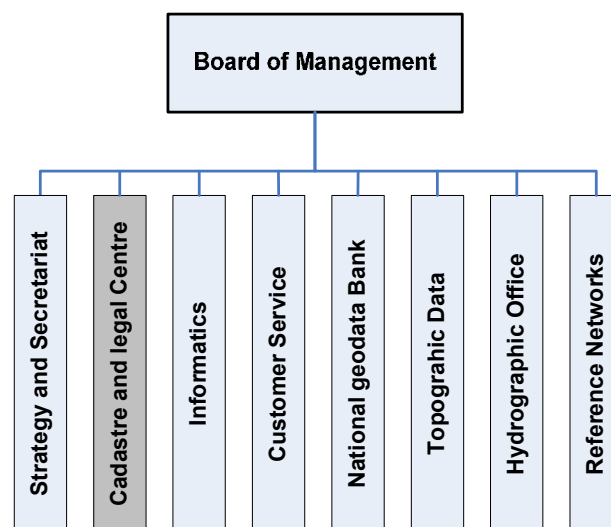
Figure 11.1 Organizational diagram of The National Survey and Cadastre (Kort & Matrikelstyrelsen 2007)

The core cadastral tasks are managed within the Cadastre and Legal Centre which employees about 70 people.

The Court Administration

The Danish Court Administration in the Ministry of Justice is today formally in charge of the title registration in Denmark and the development tasks are carried out here. Besides the property registration in the Land Book, the Court Administration also administers the Person Book, the Car Book and the Housing Co-operative Book. However, since property registration in the Land Book (the recording and protecting of legal rights of ownership, mortgage, easements and leases for land) in Denmark historically is considered as a court task, the actual registration was at the time of the case studies carried out by the local courts (24 as of 1 January 2007). This means that while the Court Administration have had the administrative responsibility of the courts, the function of the land registry has been carried out by a number of rather autonomous judges that to some degree developed their own work routines. Whereas each judge thus has the formal responsibility for updating the Land Book, the actual work is however carried out by the administrative staff at each court. In 2003 404 man-years was spent on title registration, which corresponded to 16.5 % of the total man years at the courts (Justitsministeriet 2005).

11.1.4 Historical development

The cadastral system in operation today, dates back to the 1840's. In order of supporting the collection of taxes and the security and transfer of land and land ownership, the National Survey and Cadastre was established as a central organization in 1844, and simultaneously the Land Registry System was established by the local district courts in 1845. Both systems have through time, especially in the last two decades, undergone major changes both concerning organizational and technical developments.

The Cadastre

Regarding the Cadastre, it has developed from a register primarily used as basis for land taxes to a legal cadastre, supporting both the efficiency of the land transfer processes and the improvement of the overall land management processes. Organizationally, the National Survey and Cadastre in the 1970's employed 350 people in all, where 250 worked with in the cadastral area. Today the whole department employs 260 people and only 70 work in the cadastral area. Technically, the Cadastre became fully computerized in the mid 1990's and today the private licensed surveyors perform most of work in the updating of the cadastral map via the internet – most of the work performed in the National Survey and Cadastre is today hence registration tasks (Daugbjerg and Hansen 2000). These years, the Cadastre is undergoing another technical leap since it became digitized in the mid 1980's. In 2008, the new Cadastral Updating and Quality assurance System is going to be implemented in order of supporting the future

digital administration. The system integrates the cadastral register and map in one production database, rethinks and modernizes the administrative procedures of the cadastral register and map, and will through standardized interfaces support the digital communication with the interested parties in the cadastral processes (Niras 2006).

The Land Book

Regarding the Land Book it has, as said, historically been closely linked to the local courts in Denmark, and dates in this regard back to 1845 where the first permanent register was established using the cadastral identifiers from the National Survey and Cadastre as the primary identification in the land property processes. The present system is from 1927, where a new Title registration law was enacted.

Until recently the courts was administered directly by the Ministry of Justice, but in 1999, the Court Administration was established in order of strengthening the independence of the courts.

While the cadastre has undergone big changes, the land register has been slower to adopt the technological possibilities and readjust towards fulfilling a multipurpose function in society. The National Land Register did not finish the digitalization of the Land Book until the year 2000 (the digitalization did not include maps, deeds etc. but only basic information in abbreviate form – owner, easements, liabilities etc.). Several actors in the Danish land administration system were of the opinion that the Digital Land Book from the very beginning was technologically outdated because of its lack of integration with other land administration systems and its outdated database environment.

11.2 The Danish cadastral system from an awareness perspective

11.2.1 Network structures

Overall network characteristics

The Danish cadastral system is, as said, in general managed by two separate organizations – The National Survey and Cadastre, and The Court Administration. Nowadays both The National Survey and Cadastre, and the Court Administration are located in Copenhagen. However, while The National Survey and Cadastre actual administer the cadastre, The Court Administration is only formal in charge of the registration in the Land Book. The actual registration is carried out in 24 local courts, based on the legal and regulative framework from The Court Administration.

Regardless of the decentralized overall network structure in the Danish cadastral system, none of the respondents thinks that the separation of the Cadastre and the Land Book is an issue in terms of the day-to-day administration of the overall cadastral system. While minor areas of responsibility not are logically situated in the system, several hundred years of regulative development have founded sound administrative procedures. Furthermore, several respondents argue that the technological development, where the physical position of data becomes less important, decreases the need for a closer organizational integration.

However, in the development of the cadastral system towards a multi-purpose system, the tones are less positive. Several respondents from The National Survey and Cadastre argue that the structure where highly autonomous judges administer the Land Book, has constrained the more overall collaborative development in the cadastral system. Even though The Court Administration carries out the development tasks of the land registry the organization's lack of power over the individual judges has made it difficult to guide a common internal and external awareness in the land registration system.

All respondents believe that the centralization of the future land registration system and the fact that the land registration hereby becomes separated from the local judges, will improve the future possibilities for strategic developments of the land registration system.

Network links

From the interviews it seems clear that the network links between the organizations in the Danish cadastral system are very fragile. Regarding development projects between The National Survey and Cadastre, and The Court Administration, the relations may be described as many to few. Relations from several people on the technical, administrative and management levels in The National Survey and Cadastre are handled by only two persons on the administrative and management level in the Court Administration. While the links overall are described as stable, frequent and symmetrical, several respondents find the relations very vulnerable.

As most of the relations back and forth between the two parts of the Danish cadastral system happen directly between The National Survey and Cadastre and The Court Administration, there also exist links to the individual courts. However, these relations are also considered problematic, since the career path in the juridical system typically is characterized by frequent changes of position. The stability of the relations has thus often been an obstacle for cooperation.

Importance in the network

Seen from an outside perspective the immediate importance of the two ministries governing The National Survey and Cadastre (The Ministry of Environment) and The Court Administration (The Ministry of Justice) are quite different. The Ministry of Justice is in general considered more prestigious and powerful than the Ministry of Environment. However, in regard to the administration of geographical information this general knowledge cannot be applied to the

two organizations in the cadastral system. The slow technology adoption of the land registration system, combined with The National Survey and Cadastre's early focus on external collaboration with other departments and organizations handling geographical data, have according to the respondents, meant that the immediate inherited unequal importance of the organizations in the network not is an issue. Whereas it seems that the organizational relations (centrality, external links etc.) are quite equal among The National Survey and Cadastre and the Court Administration, it thus also seems that technical importance (attention on form, quality, research and development of the Danish SDI) of The National Survey and Cadastre are larger than The Court Administration.

11.2.2 Visions and strategies

The National Survey and Cadastre

The main source for visions and strategies for the National Survey and Cadastre are a 22-page pamphlet describing the organization's areas of effort for the next three-year period.

Parameter	Comments
Accessibility and visibility	• Accessible through The National Survey and Cadastre's homepage (Home > Om Styrelsen > Mål og indsatsområder > Indsatsområder 2007-2010)
Sender	• Board of Management
Stakeholders	• The National Survey and Cadastre
Themes	• Infrastructural framework • Geo data • Use • Collaboration
Presentation	• Clear, illustrated, easily read, regularly use of "goal"-boxes, explanation of concepts
Commitment	• Few specific commitments
Use	• Used as starting point for discussions on employee seminars and as an eye opener externally
Additional comments	• The document is a mix of concrete goals and long term strategic visions

Table 11.1 Parameters for visions and strategies in The National Survey and Cadastre

The National Survey and Cadastre areas of effort illustrate a wish for a high degree of both internal and external awareness.

Regarding internal awareness, the areas of effort have a clear focus on collaboration towards other organizations in the public sector. The areas of effort focus on common cross-organizational solutions through binding partnerships and list up a number of both committed and non-committed goals and concrete projects in this regard. However, the areas of effort do not mention any concrete organizations as collaborative partners. Is it however clear that some of the mentioned projects do involve the land register, e.g. in the area of the development of a new common property identifier system.

Regarding external awareness, the areas of effort focus extensively and multi faceted on the role The National Cadastre and Survey can play in fulfilling societal needs focusing especially on digital administration. Under the headline "Geo data – the backbone in the effective digital administration" the areas of effort describes how the aim is to secure that maps and geo data can be used as an unequivocal foundation for the Danish digital administration. Besides a consolidation of the cadastral maps and registers in the overall Danish property system, the main tool for this overall societal focus is to ensure the building of a proper NSDI by supporting standardization, cross-organizational agreements, developing functionalities and establishing geo data portals. Statements confirmed in the interviews, where the common expression is that The National Survey and Cadastres prime goal today not is to be the registrar of cadastral data, but instead to be the main nucleus for developing the Danish NSDI.

The interviews and the author's own inside-knowledge from The National Survey and Cadastre, suggest that the above visions are well known and accepted in the organization. E.g., the visions were in 2007 presented thoroughly and discussed at a two-day seminar for all employees in the organization. However, the interviews do not hide the fact that it has been a hard task to change the goals in the organization from mere production to a more service and network orientated attitude.

The Court Administration

The vision of The Court Administration are the internet based "Goals and Values" presenting the goals, visions and values of The Court Administration (The Danish Court Administration 2007).

Parameter	Comments
Accessibility and visibility	• Accessible through The Court Administration's homepage (Home > Om Danmarks Domstole > Goals and Values
Sender	• Board of Management
Stakeholders	• Offices in The Court Administration

Themes	• Services
	• Organization
	• Employees
	• Result
Presentation	• Short, split up
	• Easily read
Commitment	• No concrete commitment
Use	• The main vision for the whole Court Administration
Additional comments	• Formulated through a process where both management and employees were involved

Table 11.2 Parameters for visions and strategies in the Danish Court Administration

The internal and external awareness in the visions of the Court Administration with regard to property-orientated data are as good as non-existing. The focus lies in general only on the court's role as court instance in the Danish society. The only reference to other organizations hence concerns the information policy of the organization.

11.2.3 Inter-organizational coordination bodies

The main inter-organizational coordination body regarding geographical data in Denmark is the Service Community for Geo Data established in 2002. The overall goal of the Service Community is to support and secure a central role for geographical data in digital administration by developing a SDI and by connecting geographical data from different public sectors to this SDI (Servicefællesskabet for Geodata 2007).

Figure 11.2 shows the organization chart for the Service Community.
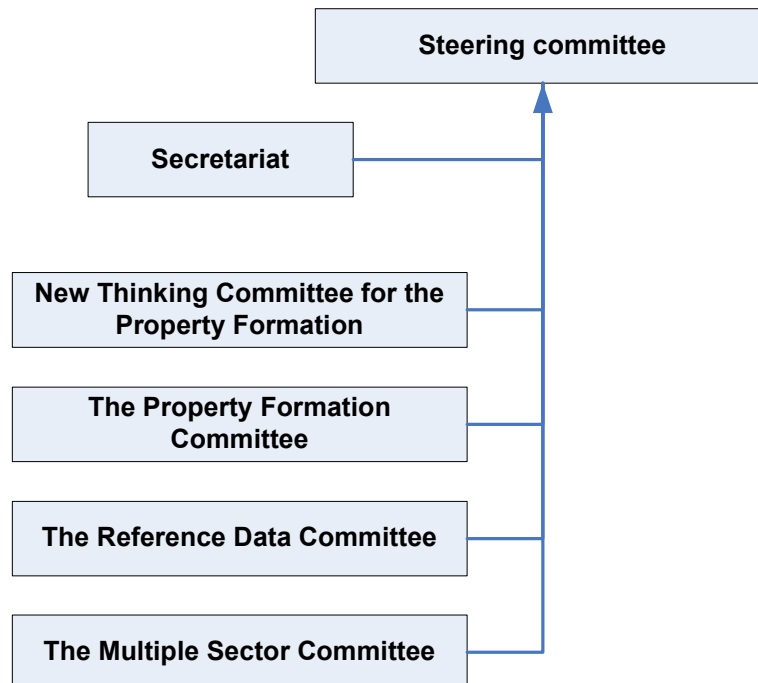
Figure 11.2 Organization chart for the Service Community (Servicefællesskabet for Geodata 2007)

The Service Community is managed by a steering committee consisting of people on management level in a number of ministries and organizations in Denmark:

- The National Survey and Cadastre (chair)

- Local Government Denmark

- Danish Enterprise and Construction Authority

- The Directorate for Food, Fisheries and Agri Business

- The Danish Road Directorate

- The National IT and Telecom Agency

- The Danish Regions

The focus areas of the steering committee are investigated in individual, voluntary, working committees with each its focus, see the organization chart above. The working committees contain representatives from the affected public and private organizations as well as academia, which provide a broad representation of stakeholders. All of the working committees have representatives from both The National Survey and Cadastre and The Court Administration/The Ministry of Justice.

Regarding awareness, the newest action plan (2007) of the Service Community reveals a high focus on both internal and external awareness between the organizations handling geographical data in Denmark and on their future role in society. Concerning internal awareness, one of the top goals is hence to establish a common framework of understanding for the geo data infrastructure and the underlying IT architecture. Concerning external awareness, the action plan will in the forthcoming years focus intensively on solutions in society and will develop a collection of best practices on the use of geo data in society.

The interviews in the Danish case study confirm that the Service Community has been an important part in developing common ground among the public organizations handling geo data in Denmark and in order of creating a personal network among the participants. E.g. the key person (Anja Olsen) in The Court Administration, comments that she did not knew anyone in the geo data community before she joined the Service Community.

However, changes might be under way in the way the Service Community are organized and financed. According to the director of The National Survey and Cadastre, the committees today seem to have reached their limits of political maneuvering as a voluntary organization due to lack of funding. In the future, the work should be more compulsive than today in order of improving the impact of the organization.

11.2.4 Management communication

Management communication in The National Survey and Cadastre and The Court Administration seem in regard to awareness rising to be managed quite differently. While the management in The National Survey and Cadastre largely focus on this, the focus in The Court Administration seems to be almost absent.

The management in The National Survey and Cadastre uses four main tools for especially external awareness building in the organization. Firstly, the employees are every second year on a two-day seminar that discusses the changing role of the organization in society. Secondly, the above-mentioned "Areas of effort"-paper are updated every year and subsequently presented to employees. Thirdly, the weekly newsletter present short articles on the ways the organization's geo data are and can be used in society. And fourthly, 7-8 yearly presentations are arranged on different geo data-use subjects. The interviews suggest that while the management finds it difficult to reach all employees in the organization on the changing role of the organizations

as an SDI-facilitator rather than a production unit, there exist a positive feeling among the employees towards the management's communication skills regarding on the organization's partners and overall role in society.

The management in The Court Administration is less active. The interviewed employees in The Court Administration find that the management does not focus on awareness building communicative measures. It is implied that a future organizational change in the land registry is to blame for the lack of interest of the management into geo data affairs.

11.2.5 Willingness

Attitude

The attitude to data sharing is in general very positive among the respondents in both The National Survey and Cadastre and The Court Administration.

Regarding The National Survey and Cadastre the below citation by the director very well summarizes the overall attitude to data sharing in the organization:

> *"Data sharing is not a question. It is the task for The National Survey and Cadastre to let data come in play. The problem is not as much about sharing data, but more on raising the awareness in the external worlds on the possibilities for using our data and geo data in general. In general, we do not use geographical data our selves. Our purpose is to show the use of these data in society in general and be able to use geo data in an effective digital administration." (Jesper Jarmbæk, Director, translated from Danish)*

However, while the attitude to data sharing thus seem to be very positive on management level in The National Survey and Cadastre, the attitude does not seem to exist on this level in The Court Administration. The above-mentioned organizational change again seems to affect this attitude.

As was the case to the former case study in the Netherlands, data costs also in Denmark seem to be an issue concerning data sharing. When discussing attitude to data sharing several of the respondents mention that data costs influence the actual data sharing negatively – a positive attitude is not enough if the costs of data are too big. E.g., in the past, other public organizations have been reluctant to buy cadastral data sets from The National Survey and Cadastre, which according to the respondents from The National Survey and Cadastre has been a big obstacle to national digital administration.

Social pressure

The social pressure towards the Danish cadastral system is rather limited. Regarding pressure from the GIS community, the organizations' market etc. neither The National Survey and Cadastre nor The Court Administration argue that this is present. However, while The National Survey and Cadastre says this is because the organization are a frontrunner and most of the pressure comes from the organization itself, The Court Administration focuses more on its present development limitations due to the forthcoming organizational changes.

Regarding political focus on the cadastral system, there has been some political focus on the land registry as regard to the possibilities for saving due to a re-organization. Furthermore, The National Survey and Cadastre have been highlighted in the recent years at national level due to factors such as INSPIRE, emergency management and digital administration in general (Den Digitale Taskforce 2007;VK Regeringen II 2005). However, the respondents argue that the actual political pressure on the development of cadastral data and solutions still are limited.

Technical knowledge

The interviews suggest that the technical knowledge regarding structures, processes and policies is very high in The National Survey and Cadastre, while it seems lower in The Court Administration. A very technically minded culture in general permeates The National Survey and Cadastre. Furthermore, most of the people having direct links to The Court Administration are either educated within IT or as land surveyors. In The Court Administration the personnel is instead educated within law. However, the key employee in The Court Administration linking the two organizations together have through numerous projects built some degree of technical knowledge with regard to geo data. Furthermore, the two organizations tend to use the same consultant when developing cross-organizational solutions, which helps improve the technical knowledge in and between the organizations.

11.2.6 Trust

Analyzing trust merely by using the structural conclusion in the above does not provide a positive image on trust between the organizations in the Danish cadastral system. Especially the very fragile communication links theoretically impede trust. However, the few personal links that do exist seem to have been effective for developing a high degree of trust between The National Survey and Cadastre and The Court Administration. Furthermore, the long administrative history that the two organizations share, also seem to affect the general notion of trust in the organizations. However, whereas a general high level of trust thus exists between the organizations as institutions, several respondents mention that the workable trust is build on the good relations on the personal level.

11.3 Overall conclusion of awareness in the Danish cadastral system

11.3.1 Overall summary

Table 11.3 summarize the awareness analyses of the Danish cadastral system.

Parameter	Pros and Cons
Network structure	+ The links between the organizations are frequent, stable and exist both on the management and operational level
	+ The organizational split is not regarded problematic due to a long historical, administrative entanglement
	+ Equal importance in the network
	÷ The decentralization of the land registration with many autonomous judges have made it difficult to guide a common line of development
	÷ The links between the organizations are asymmetrical, de-multifaceted and fragile
	÷ Unstable links to the courts
Visions and strategies	+ The highly mandated, widely known and used visions of The National Survey and Cadastre focus to a high degree on both the organizations role to other public departments as well as to the organizations role in society
	÷ The Court Administration do not have awareness promoting visions and strategies
Inter-organizational coordination bodies	+ Strong administrative mandate
	+ Broad representation of stakeholders
	+ Focus on both internal and external awareness aspects
	+ Good network builder
	÷ Not Compulsive

Management communication	+ The management in cadastre focuses regularly on multiple levels on communicating the importance of both internal and external awareness ÷ The management in the Court Administration do not focus on awareness because of the future organizational spin off of the land registry
Willingness	+ Positive attitude to resource and external benefits by data sharing + High degree of technical understanding on all levels in The National Survey and Cadastre + Medium degree of technical understanding on the land registry parts in The Court Administration + Use of the same technical consultant ÷ Low pressure from community and market ÷ Low to medium political interest and focus on the cadastral area
Trust	+ High degree of personal trust based on frequent communication + Symmetric, non-power related relations

Table 11.3 Summary of the awareness analyses of the Danish cadastral system

11.3.2 The investigations in an awareness context

Transferring the above empirical investigations to the theoretically built awareness methodology, the outcome is that the cadastral system in Denmark seems to have problems in both the phases of internal and external awareness mainly because of a low score in organization handling the Land Registry part of the system, see table 11.4 and 11.5.

Internal Awareness				
Overall step	**Stages of awareness**	**Description**	**The national Survey and Cadastre**	**The Court Admin.**
Motivation	Existence awareness	Awareness of other organizations in the cadastral system	⊠⊠⊠	⊠⊠⊠
	Collaboration awareness *Problem-setting*	Awareness of shared role of organizations in cadastral system	⊠⊠⊠	⊠⊠☐
	Cooseration awareness *Direction-setting*	Awareness of capabilities and resources in the cadastral system	⊠⊠⊠	⊠⊠☐
		Awareness of shared values, goals and visions among the organizations in the cadastral system	⊠⊠⊠	⊠⊠☐
		Awareness of need for partnerships in the cadastral system to reach shared goals and visions	⊠⊠⊠	⊠⊠☐
Coordination	Coordination awareness *Structuring*	Awareness of shared problems and/or new possibilities	⊠⊠⊠	⊠⊠☐
	Implementation awareness *Problem solving*	Awareness on how to solve problems and develop new possibilities	⊠⊠⊠	⊠⊠☐
Outcome	Evolution awareness *Maintaining relations*	Awareness of success and need for further common projects to maintain the established relations	⊠⊠⊠	⊠⊠⊠

Table 11.4 Internal awareness in the Danish cadastral system

External Awareness				
Overall step	**Stages of awareness**	**Description**	**The National Survey and Cadastre**	**The Court Admin.**
Motivation	Need defining awareness	Awareness of society's need and interest of the spatial information, expertise and services that the organizations in the cadastral system posses and/or can deliver	☒☒☒	☒☐☐
	Collaboration awareness Problem-setting	Awareness of the role of the cadastral system in society	☒☒☒	☒☐☐
		Awareness of organizational interdependency in order to reach shared goals and visions	☒☒☒	☒☒☐
Coordination	Coordination awareness *Structuring*	Awareness of shared problems and/or new possibilities	☒☒☒	☒☒☐
	Implementation awareness *Problem solving*	Awareness on how to solve problems and develop new possibilities	☒☒☒	☒☒☐
Outcome	Evolution awareness *Maintaining relations*	Awareness of success and need for further common projects to maintain the established relations	☒☒☒	☒☒☒

Table 11.5 External awareness in the Danish cadastral system

The above completion of the two models of awareness from the empirical studies of the Danish cadastral system suggest as mentioned an imbalance in the Danish cadastral system. Through the models it is argued that while The National Survey and Cadastre seems to have developed a close to perfect degree of both internal and external awareness, The Court Administration is struggling with both phases.

The analyses suggest that the reasons for the low score of The Court Administration compared to The National Survey and Cadastre should be found in several of the analyzed factors. Of course the existing re-organization of the land registry part of The Court Administration influences

the management's general focus on the land registry's role; however this seems only to be one problem among others. Several other factors also seem to affect the awareness levels of The Court Administration negatively.

Firstly, looking at the motivation steps of both the models on internal and external cadastral awareness, is seems clear that even though the key employees in the land registry part of the court administration appear to have developed a relatively high degree of both internal and external awareness e.g. through the participation in the inter-organizational coordination body, the organization's levels as a whole are widely underdeveloped: 1) Other organizations or the role of land registry data in society are not mentioned at all in the visions or strategies, 2) only a few fragile links exist to The National Survey and Cadastre, 3) the decentralization of the land registration to a large number of rather autonomous judges have made it hard to develop common multi-purpose orientated systems and seems to have limited the general level of development in the organization, and 4) it does not seem as if the management in the court administration actively focuses on awareness in its communication strategies.

As opposed to The Court Administration, the analyzed factors of The National Survey and Cadastre affect the motivation steps of the awareness models much more positively. The organization's view on it self as an NSDI-nucleus means that the visions and strategies to a great extent praise and focus on awareness, furthermore the closer structure of the organization, more external links, and the multi-faceted awareness management communication positively affect the motivation steps in both the internal and external awareness models.

Regarding the steps of coordination and outcome, the analyses suggest higher awareness levels in The Court Administration than in steps of motivation. Employed by The National Survey and Cadastre, the author himself has been project leader in a cross-organizational cadastral project involving key employees in The Court Administration. In this case it became clear that the levels on trust, influencing especially the stage of coordination, were highly prominent in the relation between The National Survey and Cadastre, and The Court Administration. However, it also got clear that the technical understanding in The Court Administration to some degree were, if not hindering, then hampering the awareness phases of structuring and problem solving between the organizations. Even though it not directly affected the levels of awareness, the specific case also pointed out that the willingness to share data was much affected by political constraints due to economic revenues.

In summary, the case studies of the Danish cadastral systems suggest that the National Survey and Cadastre have developed extended levels of both internal and external awareness, while The Court administration are less developed especially in the levels of motivation mainly due to a lack of awareness from a overall organizational viewpoint.

The conclusions from the above four case studies will be pointed out in the below conclusion chapter.

12 Conclusion

12.1 Conclusions and future research

Following the arguments that awareness in the land management community often is regarded as important to inter-organizational collaboration both concerning the inter-organizational relationships and concerning the organization's interaction with the external environment, the overall research question asks: Can awareness be the area for investigating inter-organizational collaboration in land administration systems?

To answer this question, five objectives for the research are outlined:

1. To *document* whether and how inter-organizational collaboration plays a role in the development towards land administration systems founded on a multi-purpose perspective.

2. To *investigate* and *define* the role and nature of awareness with regard to inter-organizational collaboration.

3. To *develop* an evaluation model for investigating awareness as an evaluation factor for inter-organizational collaboration in land administration systems using cadastral systems as case.

4. To *test* an evaluation model as an evaluation factor for inter-organizational collaboration in land administration systems against four case studies on cadastral systems.

5. To *discuss* the findings of the thesis in order of assessing the broad use of awareness as an area for investigating inter-organizational collaboration in land administration systems.

12.1.1 Objective 1: The role of inter-organizational collaboration in land administration systems

In order of setting the scene for this thesis and for investigating whether the argued collaborative promoting role of awareness is important to land administration systems at all, the research investigates objective 1 on the role of inter-organizational collaboration in land administration systems.

In overall, collaboration seems to be very important to land administration systems. The argument are in general supported by an investigation of the land management paradigm, which illustrates that the cross-organizational needs for sharing land information in land administration systems require a high degree of inter-organizational collaboration. However, a number of other factors also support the argument. A review of literature displays that three

overall trends these days are driving the requirements and possibilities of collaboration in land administration systems even further. Firstly, the developments in ICT have improved the possibilities for sharing spatial information. Secondly, environmental issues, focus on emergency management, complex RRRs etc. make governments require accurate and comprehensive information from several sources. Thirdly, there has been a change in the overall public administration agenda towards e-governance, which very much focuses on cross-administrative collaboration. Lastly, the underlying foundation for the land management paradigm – SDI – is influenced heavily by collaborative mechanisms.

In conclusion, collaboration seems be very important and play an increasing role in the development of multi-purpose land administration systems when focusing on the general nature of the system, the development of ICT, the increasing need of spatial information, and the focus on e-governance.

12.1.2 Objective 2: The role and nature of awareness with regard to inter-organizational collaboration

Whereas objective 1 documents that inter-organizational collaboration indeed is crucial in land administration systems, objective 2 looks into the role and nature of awareness with regard to inter-organizational collaboration. In the community it is hence argued that awareness plays an important role in overcoming the collaborative hurdles that may exist when handling land information in an inter-organizational environment.

Regarding a general understanding on the concept of awareness, research puts forward that awareness on the general level is closely related to knowledge and recognition between two participants. However, awareness is often not symmetrical and several different modes of awareness exist ranging from non-existing awareness to fully reciprocal mutual awareness. In the specific field of organizational collaboration, several authors suggest that awareness is very important to the relationship between organizations. Awareness in an inter-organizational sense is about organizations having knowledge of other organizations purpose and role and on how their organization is interdependent with other organizations in their field. Furthermore, awareness seems to be fundamental to the development of organizational relationships because it affects trust between organizations, the willingness to work together, and the organization's understanding of mutual interdependency.

When analyzing literature and the general use of the concepts in the community at conferences etc. it becomes clear that two kinds of awareness seem to be necessary regarding awareness as a facilitator for inter-organizational collaboration in land administration systems. Firstly, the involved organizations need to be aware of the existence and relevance of each other's functions and responsibilities in order to develop effective, collaborative relationships. Secondly, the organizations in common need to be aware of the potential social, economical and sustainable opportunities that the organizations together possess in terms of interacting with the organization's external environment. The two kinds of awareness may be addressed as internal and external awareness, see figure 12.1.
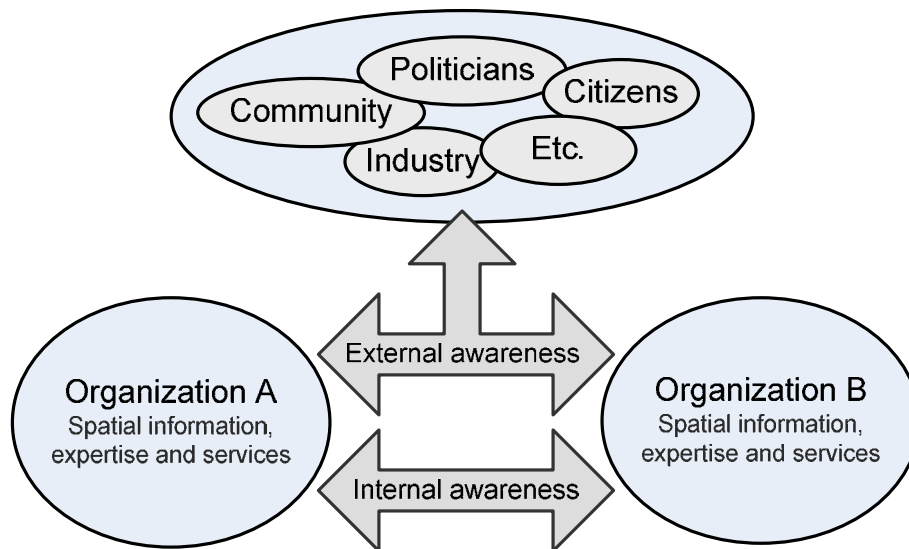
Figure 12.1 Internal awareness concerns inter-organizational relations, while external awareness concerns the organization's relation to the external environment

Concerning a more thorough understanding of awareness, theories based on phases of trust and interdependency in the development of relationships between organizations documents that it is possible to develop two theoretical models reflecting steps of internal and external awareness. The models argue that the development of both internal and external awareness ideally happens through three overall steps – a motivation step, a coordination step and an outcome step. In order to define awareness with regard to the inter-organizational relationships in land administration system, internal awareness involves the phases of recognition that allows organizations to make sound decisions in solving problems or developing solutions regarding handling of land information, expertise and services between the organizations. External awareness involves the phases of recognition that makes organizations recognize why and how they alone and together can make their land information, expertise and services available to society in order to support a social, economic and sustainable development.

Regarding the validity of the awareness models, critics might argue that the models are too general. However, it is important to recognize the models are meant to work as ideal processes that can help pointing out problems in inter-organizational relationships, and not as an illustration of real life organizational interactions with all the struggles of control, power and independency this may include. Furthermore, it may be argued that the understanding of inter-organizational relationships as a continuous process, which can be observed in the awareness models, is not a very good representation of reality. The models hence assert a start and an end for the process of awareness, and assume that a lower stage of awareness always is followed by a higher stage. However, as Meredith (1995) argues, organizations will often refuse or obstruct further development in the relationship with other organizations in case of loss of interdependency. An argument supported by Gray (1985) who emphasizes that while we see the processes from collaboration to coordination as a series of sequential phases, it is worthwhile having in mind that "as in any natural sequence, internal and external forces can interrupt, enhance, or impede the cycle".

However, once again the discussion comes down to the nature of models. As Silva (2005) points out:

> *"Modeling a certain reality consists in creating a simplified view of that reality, thereby making it easier to comprehend. A model is an ideal, incomplete and imperfect representation of reality, and no model is suitable for all purposes. Modeling is a form of abstraction – which is the extraction of just the essential aspects of reality – and therefore the result depends on the choices we make."*

The choice in this thesis was to make a rather simple representation of the reality of awareness in the two awareness models. Further research, may focus on the development of more detailed models of awareness, which can encompass the more dynamic nature of inter-organizational relationships.

The research presented in this thesis conclude that awareness is critical to inter-organizational collaboration, since awareness in combination with other factors (such as trust, willingness and interdependency) acts as a foundation for organization's engagement towards each other. It is concluded that two kinds of awareness are of interest with regard to inter-organizational relationships in land administration systems – internal and external awareness. Furthermore, the research illustrates that it is possible to build two models that describe different stages of internal and external awareness.

12.1.3 Objective 3: Methodology for investigating awareness

Besides investigating whether the arguments in the community on awareness in general is correct, the overall focus in the thesis is on the use of awareness as an evaluation tool. The focus on awareness as an evaluation tool in objective 3 follows the conclusions on awareness as both a precondition for developing collaboration among organizations, and for supporting the possibilities of creating the knowledge base required to take the use of information in the organizations beyond the boundaries of the organizational networks. On this background awareness seems to be suitable for investigating the *potential* of developing collaboration in inter-organizational networks and for making the organizations set eyes on the broader use of their data.

However, since it is not possible to measure the stages of awareness directly, the research outlines a number of factors that seem to indicate awareness in the case of cadastral systems. The relevant factors that apparently effect awareness are developed by collating a range of sources from social science. Besides the already mentioned factors of willingness and trust, the research also outlines *network structures, inter-organizational coordination bodies, management communication,* and *visions*, as factors of relevance when evaluating an organization's degree of internal and external awareness, see figure 12.2.
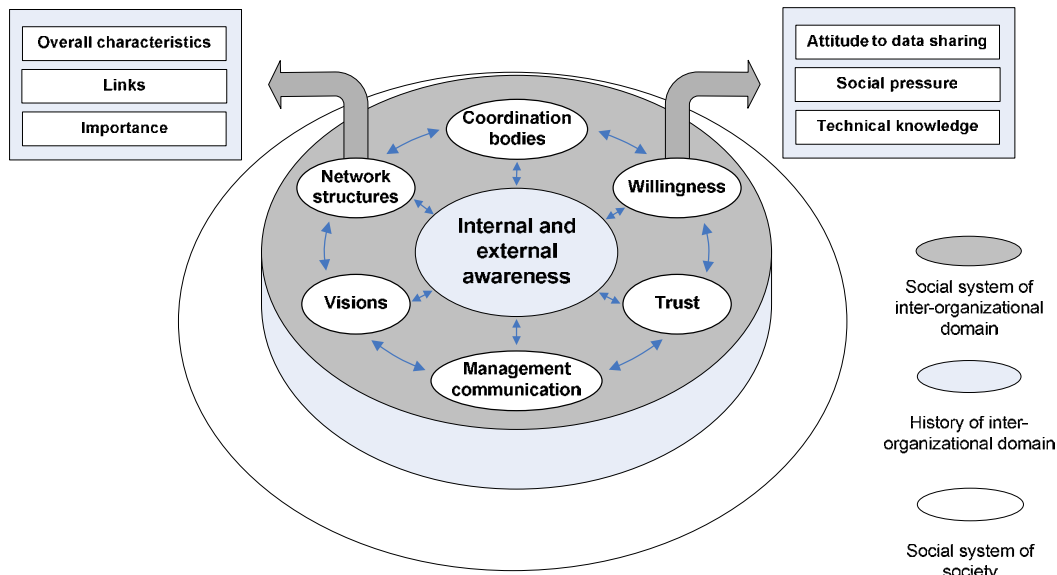
Figure 12.2 Awareness evaluation model

Furthermore, two tables are completed in order to establish relations between the two models on internal and external awareness, and the evaluation factors mentioned above. The tables relate the possible main impact of each of the evaluation factors against the stages of awareness in respectively the internal and external awareness model. Since the tables are completed on a non-empirical background, future research may focus on the more detailed relations between the evaluation factors and the awareness models in an evaluation context.

In conclusion, the research illustrates that from a theoretical viewpoint it is possible to develop an evaluation model using awareness as an overall evaluation factor for inter-organizational collaboration in land administration systems using cadastral systems as case.

12.1.4 Objective 4: Testing the evaluation model

In order of testing whether the developed evaluation model on awareness is useful as a basis for investigating inter-organizational collaboration in land administration systems, the model is empirically applied on four case studies within cadastral systems in Europe and Australia. The case study method is selected because of its ability to investigate contemporary phenomenon in real-life settings, and because the method in general is recommended for investigations within cadastral systems. The reasons for choosing a multiple case study design is that this design is more scientific robust and the conclusions are more powerful than a single case study.

The case studies illustrates that the evaluation models and methodology used to investigate awareness are functioning well on the more general level as indicators of the success or failure of the crucial inter-organizational collaboration in cadastral systems. Especially, the framework with regard to motivation awareness seems to be important in explaining some of the problems

cadastral systems are facing today. The below examples will indicate some of the findings that have been revealed when using the awareness models as an evaluation tool for analyzing cadastral systems.

In The Victorian Cadastral System, the analysis suggest that the system in spite of a one-ministerial structure due to issues such as distrust and an asymmetrical network structures not share a common motivation awareness of the future directions of the system. Particularly one department does not seem to have build awareness of the need for inter-organizational collaboration. The analysis put forward that this lack of motivation awareness makes it hard for the organizations to conduct a specific project on updating the Digital Cadastral Data Base.

In the Danish Cadastral System, the analysis also indicates problems concerning motivation awareness. With regard to the land registry agency, it seems clear that even though key employees have developed a relatively high degree of the motivation stages in both the internal and external awareness models through e.g. the participation in an inter-organizational coordination body, the organization's levels of motivation awareness as a whole are widely underdeveloped. The cadastral mapping agency on the other hand seems to have developed much higher levels of both internal and external awareness mainly because it sees itself as an NSDI-nucleus. A feeling that seems to permeate throughout the whole organization. However, the differences in awareness suggest that the Danish cadastral system encounter future problems when developing inter-organizational collaboration.

In The Western Australian Cadastral System, a fully integrated system seems to provide almost optimal conditions for developing all levels of both internal and external awareness. The development of internal awareness seems to be driven by an organizational business chain model, an extensive focus on product development across traditional organizational boundaries, and a positive focus on data sharing from the management. Regarding external awareness especially the inter-organizational coordination body WALIS seems to have had a big impact in conjunction with an encouraging management view on the organization's societal role, multiple communication channels, and a general focus on costumer needs. From an awareness viewpoint, the analysis thus propose that the Western Australian Cadastral System will experience an easy transfer from a traditional inward focus on cadastral data to a focus on cadastral data as a backbone in a spatially enabled society.

In The Dutch Cadastral System, a number of awareness factors also seem to support a wide focus on the societal use of cadastral data, which make the organization rank high in all levels of awareness. Regarding internal awareness, especially an integrated and well functioning network structure, a uniting overall vision, and an efficient and effective communication on the management level in the cadastral system supports the broad use of data in society. Regarding external awareness, especially the organization's numerous external links on multiple levels and positions, a positive attitude to the benefits that the organization will have from data sharing, and a high focus on the needs of its users because of its position as a self-funding independent public organization supports the organization's focus on a multi-purpose role in society.

However, since the case studies illustrates that the strengths of the awareness evaluation models and methodology is on the general level, future research may provide the tools for more detailed analyses. Especially two areas should be considered in this regard.

1. *More time for the case studies.* It would be fruitful to interview more people in the organizations, and have time for more continuous development of the interview questions, e.g. in the follow up on interesting areas in order of providing a deeper understanding of the individual evaluation factors.

2. *Special focus to integrated systems.* The case studies reveal that organizationally integrated cadastral systems are difficult to analyse using the proposed methodology. E.g. does the network analysis in the case study of Western Australia not provide much value to the overall understanding of awareness in this system. The integrated "business-process structure" of the cadastral system in Western Australia does not call for inter-organizational collaboration in the same way as for instance the organizationally fragmented Danish cadastral system. Consequently, closely integrated systems probably call for other evaluation frameworks than the one proposed in this thesis.

However, in conclusion the case studies illustrate that it is possible to use awareness in an evaluation context. Whereas, the tests expose that it is not recommended to use the term awareness and the displayed factors as a foundation for precise measurement of the degree of inter-organizational collaboration in cadastral systems, the methodology seems to provide a helpful tool in pointing out general collaborative problems in inter-organizational relationships in land administration systems.

12.1.5 Objective 5: The broad use of the findings

The last point that remains to be forwarded deals with the broader use of awareness as an area for investigating inter-organizational collaboration not only in the case of cadastral systems, but in land administration systems as a whole.

Looking, at other inter-organizational collaborative domains within land administration systems, e.g. the relationship between the land use and the land development parts of the system, we find that the developed models on internal and external awareness, and the derived evaluation framework, largely also can be applied here. In all domains, organizations have to get to know each other and each other's role in society before they haste into building actual solutions.

However, as the research of internal and external awareness demonstrates, it is often necessary to alter the awareness models in order to adapt best of possible to the specific domain. This is especially important within the coordination step of the models.

In conclusion, the developed evaluation model seems to be of use in other inter-organizational collaborative domains within land administration systems, than cadastral systems alone because of the general similarities among organizations within land administration systems, and because of the general nature of the illustrated framework.

12.1.6 Overall conclusion

Putting the result in the above sections together, we find that the research of the thesis's five objectives provided the following conclusions:

1. Inter-organizational collaboration seems be very important and play an increasing role in the development of multi-purpose land administration systems when focusing on the general nature of the system, the development of ICT, the increasing need of spatial information, and the focus on e-governance.

2. Research into the role and nature of awareness with regard to inter-organizational collaboration conclude that awareness is critical to inter-organizational collaboration. Moreover, research illustrates that two kinds of awareness are important for building inter-organizational relations – internal and external awareness. Furthermore, research display that it is possible to build two models that describe different stages of internal and external awareness.

3. Research illustrates that from a theoretical viewpoint it is possible to develop an awareness evaluation model on inter-organizational collaboration in land administration systems founded on six indicators of awareness: Coordinating bodies, willingness, trust, management communication, visions and network structures.

4. Tests of the awareness evaluation model on four cadastral systems illustrate that it is possible to use awareness in an evaluation context when pointing out general collaborative problems among organizations in land administration systems.

5. Whereas, the awareness evaluation model was tested on cadastral systems model, the model seems to be of use in other inter-organizational collaborative domains within land administration systems because of the general similarities among organizations within land administration systems, and because of the general nature of the illustrated framework.

In an overall conclusion, we find that awareness can be the area for investigating inter-organizational collaboration in land administration systems. However, the developed evaluation framework seems to be suitable mainly for pointing out general collaborative problems that will then form the basis for a search for more detailed collaborative problems.

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Appendices

Appendix 1:   List of interviewed persons during case studies

Appendix 2:   Summary of interviews on CD-ROM (for examiners only)

Appendix 3:   List of the author's publications in conjunction with this research

Appendix 4:   Bibliography

Appendix 1: List of interviewed persons during case studies

Victoria, Australia

Mr. Bruce Thompson – Director, SII

Mrs. Elizabeth Thomas – Manager, Policy and Business, SII

Mr. David Boyle – Deputy Surveyor-General, LandVic

Mr. Ian Ireson – Deputy Director of the Land Registry, LandVic

Mr. John Parker – Former Surveyor-General, LandVic

Mrs. Leonie Newnham – Manager Asset Strategy, LandVic

Mr. Mathew Warnest – Senior Analyst at the National Electronic Conveyancing Office

Mr. Peter Ramm – Manager Geodetic Infrastructure, LandVic

Western Australia, Australia

Mr. Grahame Searle – Chief Executive, DLI

Mr. Giles Nunis – Executive Director Information Access, DLI

Mr. Robert McArthur – Manager Cadastral Plans, DLI

Mrs. Marnie Laybourne, Director, WALIS

Mr. Max van Weert – Manager Registration Services Branch, DLI

Mrs. Robin Piesse – Manager Market Development, DLI

Mr. Tony Sutherland – SLIP Program Director, DLI

The Netherlands

Mr. Godfried Barnasconi – Board of Management, Kadaster

Mr. Albert Hensema – Works Council Member, Kadaster

Mr. Hans Hogeveen – Works Council Member, Kadaster

Mr. Dick Eertink – Senior Adviser, Policy ad Strategy, Kadaster

Mr. Evert Meiling – Secretary of the Supervisory Board, Kadaster

Mr. J. Luykx – Notary and Chair of User Board

Mr. Marcel Reuvers – Director of Geonovum

Mr. Marien Bultman – Account manager, Kadaster

Mr. Paul van der Molen – Director, Kadaster International

Mr. Peter Laarakker – Director Strategy & Policy, Kadaster

Denmark

Mrs. Anja Olsen – Chief Consultant, The Court Administration

Mr. Henrik Hviid – Consultant, The Court Administration

Mr. Jesper Jarmbæk – Director, The National Survey and Cadastre

Mr. Knud Villemoes Hansen – Chief Consultant, The National Survey and Cadastre

Mrs. Pia Dahl Højgaard – Manager, Cadastre and Legal Centre, The National Survey and Cadastre

Mr. Søren Reeberg Nielsen – Vice Director, The National Survey and Cadastre

Mr. Thorben B. Hansen – Chief, Market Area, The National Survey and Cadastre

Appendix 2: Summary of interviews on CD-ROM (for examiners only)

Appendix 3: List of the author's publications in conjunction with this research

Clausen, C.   (now Thellufsen), A. Rajabifard, S. Enemark, and I. Williamson. 2006. Awareness as a foundation for developing effective spatial data infrastructures. Proceedings of the XXIII FIG Congress, Munich, Germany, October 8-13, 2006

Thellufsen, C.   and S. Enemark. 2008. Awareness Analysis – a Tool for Investigating Inter-Organizational Collaboration in Land Administration Systems? Proceedings of the Integrating the Generations, FIG Working Week 2008, Stockholm, Sweden 14-19 June 2008

Thellufsen, C., A. Rajabifard, S. Enemark, and I. P. Williamson. 2008. Awareness as a foundation for developing effective spatial data infrastructures. *Land Use Policy (in press).*

Appendix 4: Bibliography

Christian Bech Thellufsen (former Clausen) was born in 1976 in Lemvig, Denmark and completed his primary and secondary schools, and high school in the same area. He graduated with a M.Sc. in Surveying, Planning and Development from Aalborg University in 2003, after which he worked 1½ year in a private surveying company, before starting his PhD-studies in 2005. During his PhD he has been supervised by Professor Stig Enemark from Aalborg University, and Special Consultant Knud Villemoes Hansen from The Danish National Survey and Cadastre. In 2006, he visited Melbourne University for 6 months, which provided very valuable input for his research. In 2007 he worked 3 month in The Danish National Survey and Cadastre as a project leader on a project regarding the geographical location of servitudes. Christian is married to Maiken, with whom he has a daughter.