

Awareness Analysis – a Tool for Investigating Inter-organizational Collaboration in Land Administration Systems?

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SUMMARY

Inter-organizational collaboration is the key to the development of future orientated 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 reference to the fact that people in land administration community, often refer to the existence of *awareness* as a success criterion for the development of inter-organizational collaboration this paper looks at the various factors that affect the degree of internal and external awareness in an organization. The paper furthermore builds a methodological framework for analyzing collaboration in land administration systems. The methodology is tested on four cadastral systems (Victoria, Western Australia, The Netherlands and Denmark).

The paper ends up concluding that it is not viable to use the term awareness and the displayed factors as a foundation for precise measurement of the degree of inter-organizational collaboration in land administration systems. However, the built methodology does provide a helpful tool in pointing out general collaborative problems in inter-organizational relationships in land administration systems.

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1. INTRODUCTION

The management of land often occurs in fragmented organizational environments requiring high levels of inter-organizational collaboration. Different organizations from various jurisdictions and ministerial sectors need to work together closely when agreeing on how they will jointly 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 wider society. Using the term of “iLand”, the future paradigm is about the spatially enabling of government, and to make the “where” provided by spatial information a common good available to citizens and businesses to encourage creativity, efficiency and product development (Williamson 2006).

However, this task is generally regarded as very difficult due to problems with inter-organizational collaboration (Onsrud and Rushton 1995). A number of barriers exist on both the individual, organizational and systemic level. Barriers that range from turf concerns, to unclear benefits for the organization, and to narrow categorical funding programs (Linden 2002). When analyzing scientific literature (Craig 1995; Masser 1998; Rajabifard 2003; Van Loenen 2006; Williamson 2003), the existence of “awareness” is often regarded as mean to overcome these hurdles. Awareness is seen upon as a success criterion for the development of inter-organizational collaboration in the land administration community. Generally, people argue that two kinds of awareness are necessary. 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.

The key question is whether these assumptions are correct. Is awareness fundamental for developing inter-organizational collaboration in land administration systems, and can investigations of awareness be used as a tool for analyzing the collaborative environment in the specific content of land administration systems? In order to answer these questions, the author has carried out a series of investigations as part of his current PhD Studies. A recent paper has been published, describing firstly the results of an analysis of the term awareness in a general organizational sense, and secondly the development of two theoretical models for investigating awareness in inter-organizational networks (Clausen et al. 2006). This paper will move further by illustrating a method for analyzing awareness in the specific content land administration systems by outlining a number of key factors that affect awareness, and by testing this method through a number of empirical investigations of awareness in different organisa-

tional frameworks for land administration systems focusing on the case of cadastral systems. This previous research is summarised in chapter 2 below, before heading into illustrating methods for analyzing awareness in land administration systems.

2. MODELS OF INTERNAL AND EXTERNAL AWARENESS

Previous research has documented that awareness not only is a catchword (Clausen, et al. 2006). Awareness does play a fundamental role in the relationship between organizations. A literature review stated that awareness in an inter-organizational sense is about organizations having knowledge of other organization’s purpose and role and on how their organization is interdependent with other organizations in their field. Furthermore, awareness is regarded 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 (Alter and Hage 1993; Hall 1996, 6; Van de Ven and Ferry 1980).

Based on theories of phases of trust (Child and Faulkner 1998) and interdependency (Azad and Wiggins 1995; Gray 1985, 38) in the development of relationships between organizations, it has furthermore been documented that it is possible to develop two theoretical models reflecting the steps of internal and external awareness (Clausen et al. 2006).

The below table 1, outlines the model of internal awareness, focusing on inter-organizational collaboration.

Overall steps	Motivation			Coordination		Outcome
Stages of awareness	Existence awareness	Collaboration awareness	Cooperation awareness	Coordination awareness	Implementation awareness	Evolution awareness

Table 1: The internal awareness model

Table 1 – the internal awareness model – shows that when organizations in an inter-organizational network develop collaborative relationships this ideally happens through three overall steps (see Nedovic-Budic and Pinto 1999, 33) – a motivation step, a coordination step and an outcome step. 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). Then 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 others 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 opportunities 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 should have identified a solution to one or more of their common problems or developed new possibilities. The organizations are now “identifying themselves with each other”. The organizations develop awareness of success and need for further common projects to maintain the already established relations (evolution awareness).

The below table 2, illustrates the theoretical model of external awareness, focusing on organization’s interaction with the external environment.

Overall step	Motivation		Coordination		Outcome
Stage of awareness	Need defining awareness	Collaboration awareness	Coordination awareness	Implementation awareness	Evolution awareness

Table 2: The external awareness model

It is clear that the models on internal and external awareness are almost identical. However, what make a difference between the two models is 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 in the motivation step is therefore focusing on awareness of the need in society of the spatial information, expertise, and services that the organizations possess and/or can deliver (need defining awareness). Organizations do not manage to develop multi-purpose, service-orientated land administration systems if they are not aware of a demand for their spatial information.

The next logical stage in the motivation step is awareness of the role that the organizations play in society and awareness of the interdependency one organization has 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 policies (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.

In conclusion, internal awareness involves the phases 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 phases 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. The different functions of internal and external awareness are illustrated in figure 1 below.

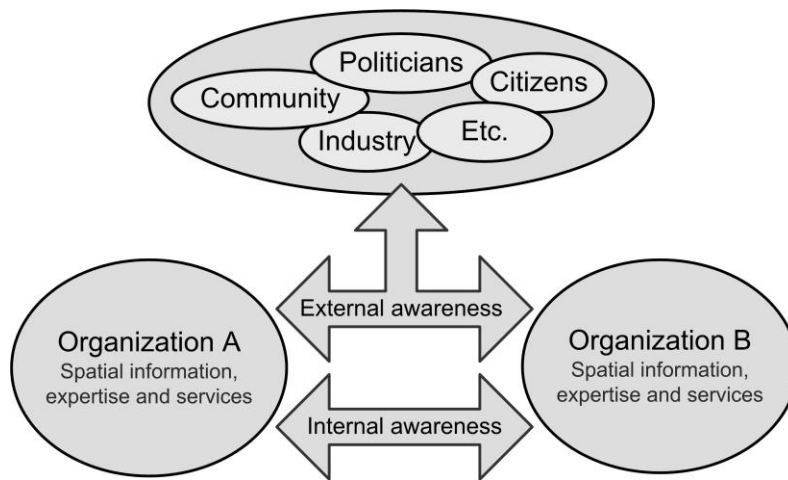


Fig. 1: Internal awareness concerns inter-organizational relations, while external awareness concerns the organization's relation to the external environment

3. METHODOLOGY FOR ANALYZING AWARENESS

What is most interesting concerning the term awareness is whether it can be used as a tool for analyzing the collaborative environment in the specific content of land administration systems. The below sections outline a methodology for evaluating awareness in land administration system, by using the case of cadastral systems being the core component of any land administration system. Cadastral systems include the interaction between the identification of land parcels and the registration of land rights. The identification of land parcels and properties are also used for the valuation and taxation of land and property, and the control of present and possible future use of land.

3.1 Preconditions for the Investigations

Two preconditions for the present investigations of awareness are important to have in mind before going deeper into the methodology. Firstly, it is important to state that the overall purpose not is to build a framework that enables a comparative evaluation of different cadastral systems. The aim is instead to provide an insight within each of the inter-organizational frameworks that forms the given land administration system. The aim is to provide a tool for evaluation of the individual systems. This tool should act as an eye-opener of some of the aspects that constrain inter-organizational collaboration within individual land administration systems. Secondly, it is important to acknowledge that awareness is relative. What seems to be 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 a specific inter-organizational network, but from a methodologically point of view it will be difficult or even wrong to try to compare awareness between networks. Awareness can only be measured in terms of the context in which it exists. 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.

3.2 Factors that Affect Awareness

A series of factors seem to indicate the presence of awareness in order of using awareness as a foundation for investigating inter-organizational collaboration in land administration systems. These factors are structured and presented in table 3 below.

Factor		Explanation
Willingness	Attitude	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		Trust among organizations is a foundation for developing awareness
Network structure	Overall network 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 in the network	Important organizations have better opportunities for developing awareness than less important organizations
Inter-organizational coordination bodies		High mandated, broad represented inter-organizational 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		Visions and strategies that focus on inter-organizational collaboration are essential tools in the development of awareness

Table 3: Aspects proposed to affect internal and external awareness

The relevant factors that effect awareness are developed by collating a range of sources from social science. This is explained in more details below.

Regarding willingness and trust, Alter and Hage (1993) argue that awareness promotes willingness to collaborate and develops trust among organizations. Alter and Hage see willingness and trust as the basic conditions for an everlasting development of inter-organizational networks because it changes the normal perceptions of cost and benefits. 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, social pressure and perceived control (of which technical knowledge seem to be of special interest in cadastral systems). Concerning trust, Sydow (2000) argues that trust can be enhanced through a number of structural elements that effects inter-organizational trust, e.g. frequency and openness of communication, and the homophily the organizations. Therefore trust will by large be analyzed through network structural analysis.

However, since network structure in general is regarded as a scientifically sound entry to analysis of inter-organizational networks (see e.g. Nylehn 1997), network analysis will also be an individual focus area. The analysis uses the framework of Monge and Contractor (2003) for analyzing inter-organizational networks. Monge and Contractor e.g. outline a number of ties to influence the overall network characteristics that all seem to be of importance when analyzing awareness: 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 or more organizations the more aware the organizations get of each other.

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.

While inter-organizational coordination bodies mainly focus on the awareness between organizations, the internal awareness model in table 1 illustrates that it is equally important to build awareness within organizations. Choo (1998) describes how communication in multiple forms structure internal and external awareness. Since the overall focus of the analysis in the PhD focuses on the management level, the approach to investigate communication will use Choo's models on management communication, which e.g. focuses on the methods, levels and regularities of the communication from the management.

Lastly, the method for analyzing awareness in organizations will focus on official written visions of the organizations, since it is a very concrete tool when analyzing both internal and external awareness. Visions can provide a look into organization's focus areas and views on other organizations in the inter-organizational domain. Visions 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.

The factors to affect awareness are put into context in the below figure 2.

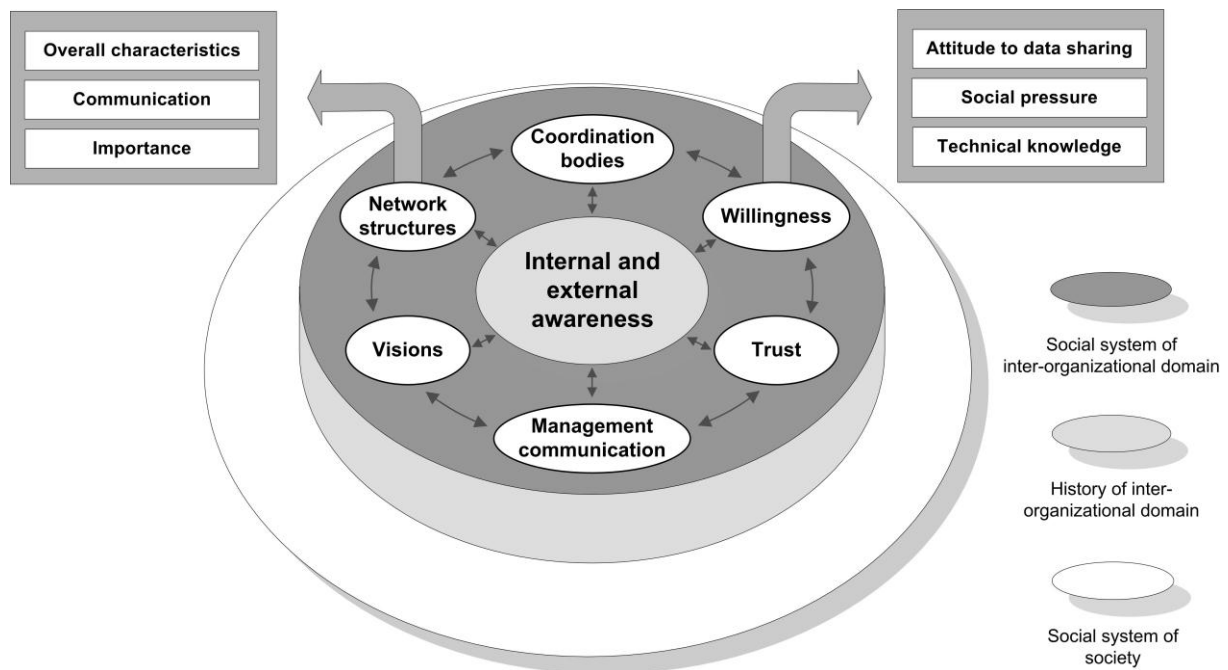


Fig. 2: Overall analytical model for analyzing awareness in land administration systems

In a short description of the model in figure 2, we find in the center the focus of this chapter – the stages of internal and external awareness. Six main factors seem to affect the stages of internal and external awareness in land administration 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, a cadastral system in the case of this paper.

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 has its own isolated life. Of course, every decision made in the domain is affected by the social system of society that it exists within. The inter-organizational domain and its historical foundation exist in a social system of society that is being affected by a number of economic, social and political trends in society. Pricing policies will e.g. affect the willingness to share data.

3.3 Relations between Factors and Awareness Models

The above section sums up on the different factors that seem to affect awareness in cadastral systems, but there has not yet been established any relations between these factors and the two overall models on internal and external awareness. E.g. it has not been illustrated how trust between organizations affect 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 studies.

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 internal and external awareness models in a specific way. E.g. will the factor “attitude to data sharing” affect both the awareness stages of motivation, coordination and outcome in the awareness models, because the attitude to data sharing will constrain all of these stages. Another example is the factor “visions” that mainly will affect the motivation stages in the awareness models, because of the overall guiding role played by company visions.

The below tables (4 and 5) illustrates what happens if one should complete two tables that crosses the possible main impact of each of the overall factors that affect awareness with the stages of awareness in respectively the internal and external awareness model. It should be mentioned that this way of assessment does not relate to any empirical countable method. It is rather based on common sense when using the factors for structuring the interviews with key persons within the specific organization.

Internal awareness		Willingness			Trust	Coordination bodies	Visions	Cognitive structures	Network structures
		Attitude	Social pressure	Technical knowledge					
Motivation	Existence awareness	✓				✓	✓	✓	✓
	Collaboration awareness	✓				✓	✓	✓	✓
	Cooperation awareness	✓		✓		✓	✓	✓	✓
Coordination	Coordination awareness	✓		✓	✓	✓		✓	
	Implementation awareness	✓		✓	✓	✓		✓	
Outcome	Evolution awareness	✓	✓		✓	✓		✓	

Table 4: Crossing of the main impact of the overall factors that affect awareness with the stages of awareness in the internal awareness model

Internal awareness		Willingness			Trust	Coordination bodies	Visions	Cognitive structures	Network structures
		Attitude	Social pressure	Technical knowledge					
Motivation	Need defining awareness	✓	✓	✓		✓	✓	✓	✓
	Collaboration awareness	✓				✓	✓	✓	✓

Table 5: Crossing of the main impact of the overall factors that affect awareness with the stages of awareness in the external awareness model. Since the Coordination and the outcome stages are similar in the two model, they are not displayed here.

One might argue that it is hard to separate each factor's influence on the steps of awareness, and each factor 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 is in fact necessary? The above tables thus provide an overall scheme for using the factors of the awareness models for building an evaluation method that is not exact but rather works as an eye-opener for awareness assessment.

4. CASE STUDIES

4.1 Methodology

The evaluation model presented above has been tested based on case studies of cadastral systems. The case study 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 (Williamson and Fourie 1998).

The case studies have been focusing on cadastral systems having different kind of organizational frameworks in order to test the broad use of the evaluation model. A traditional way of distinguishing cadastral systems is through their system of registration – deed or title systems. However, in this case, the selection will also focus on different organizationally structured systems because of the general focus on the importance of inter-organizational collaboration. In this regard, it seems interesting to investigate both systems that can be characterized as structural dense and structural diverse. Based on this criterion and the opportunity for the author to spend a period of study in Melbourne, Australia, the following cadastral systems have been chosen, see table 6.

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 6: Characteristics of the chosen cadastral systems

The data collection in the case studies happened in two stages. Firstly, a thorough general insight was developed for understanding the given cadastral system. This insight was primarily 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 were carried out through a one-week visit to each organization. Typically, 6-10 persons from each system were interviewed depending on the organizational fragmentation of the given system. The interviewees primarily came 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 were deselected because of the policy orientated focus of this project

4.2 Case Study Results

As presumed, the case studies in Australia and Europe revealed that it is not viable to use the term awareness and the displayed factors as a foundation for *precise* measurement of the degree of inter-organizational collaboration in land administration systems. The case studies thus prove that it is a complicated process to uncover the exact organizational structures and aspects that seem to affect awareness in land administration organizations by using the proposed one-week investigation method. Furthermore, it has proved to be difficult to separate the details of the awareness models. E.g., it has been hard to tell in the internal awareness model where the lines go between awareness of shared values, goals and visions and the need for partnerships to reach these (cooperation awareness). Moreover, the analysis have uncovered that integrated organizations (where the cadastre and land registration are organized within one organization) are hard to analyse using the proposed methodology. E.g. in the internal awareness model, especially the focus on awareness between different organizations in a network has been difficult to evaluate in organizations where cadastral systems are departmentally separated instead of organizationally separated. Lastly, the case studies do not focus much on financial resources and (political) power relations between the organizational entities. The studies have revealed that these factors seem to be of great importance when analyzing awareness between organizations in cadastral systems.

However, the case studies have illustrated that the models of awareness are functioning well on the more general level as indicators of the success or failure of the crucial inter-

organizational collaboration in land administration systems. Especially, the framework build in regard to motivation awareness seem 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 evaluation tool for analyzing cadastral systems.

In The Victorian Cadastral System, the analysis thus 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 organization of the Danish Cadastral System, it seems clear that even though key employees has developed a relatively high degree of the motivation stages of 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 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 customer needs. From an awareness viewpoint, the analysis thus propose that the Western Australian Cadastral System will experience an easy transfer from a traditional introvert 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 aspects also seem to support a wider focus on cadastral data in a collaborative environment that make the organization rank high in all levels of awareness. Regarding internal awareness, especially an integrated and well functioning network structure, a uniting overall strategy, and an efficient and effective communication on the management level in the cadastral system support this. 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 support this.

5. USE OF THE INTERNAL AND EXTERNAL AWARENESS MODELS

Regarding whether the awareness evaluation methodology can be used for other areas in a land administration systems than the cadastral area, e.g. the planning area, the analysis suggest that the methodology are so general that it can be used whenever organizations handling spatial data need to collaborate in order of developing a wider societal focus. However, as argued in Clausen et al. (2006) critics might argue the models are too general and obvious, that the models just are using other words for well-known theories or that the models display a simplistic scenario of the uphill battles of developing collaborative partnerships. It can nonetheless be argued that many of the problems that exist, especially in the public sector today, in developing future orientated arenas for both internal and external distribution and use of spatial data come from a lack of awareness, especially in the early phases of these relationships – the motivation steps. It is furthermore important to recognize the model as an ideal process 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.

An example of how to use the model can be found in the development of spatial services within public institutions. Often public institutions start developing spatial services, e.g. web services, without having built the basic internal awareness of other organizations in the inter-organizational network and without having built awareness of the needs in society and the need for cross-governmental partnerships to fulfill these needs – an awareness that is critical when developing external services in the context of multipurpose systems. The organizations are “silo”-minded at a time when they ought to be outreaching and co-operative. The models suggest that the organizations should focus on building motivation awareness, before rushing into building actual solutions and services.

6. CONCLUSION

This paper sums up on previous research, arguing that awareness is critical both when organizations want to develop effective collaborative relationships and when organizations in the spatial community are developing towards future wider societal service orientated systems. The paper presents two models and definitions on awareness – internal and external awareness, and argues that awareness ideally evolves in steps.

Furthermore, the paper develops and discusses a methodology for investigating awareness focusing on a series of factors to affect awareness in land administration systems: Willingness, trust, network structures, inter-organizational coordination bodies, management communication, and visions. The paper argues, by testing the methodology on four cadastral systems, that it is not viable to use the term awareness and the displayed factors as a foundation for precise measurement of the degree of inter-organizational collaboration in land admin-

istration systems. Instead, the methodology provides a helpful tool in pointing out general collaborative problems in inter-organizational relationships in land administration systems. These problems seem still more present today, where cross-organizational spatial services are being demanded by citizens and businesses to encourage creativity, efficiency and product development.

REFERENCES

- ACIL Tasman. Value of the Western Australian Land Information System. 2004. Melbourne, ACIL Tasman.
- Alter, C. and J. Hage. 1993. *Organizations working together*. London: Sage publications.
- Azad, B. and L. L. Wiggins. 1995. Dynamics of inter-organizational geographic data sharing: A conceptual framework for research. In *Sharing geographic information*, eds. Onsrud, H. J. and G. Rushton, 22-43. (New Brunswick, New Jersey: Centre for Urban Policy Research).
- Bordum, A. and J. H. Hansen. 2005. *Strategisk ledelseskommunikation (Strategic management communication)*. København: Jurist- og Økonomforbundets Forlag.
- Child, J. and D. Faulkner. 1998. *Strategies of cooperation: Managing alliances, networks, and joint ventures*. New York: Oxford University Press Inc.
- Choo, C. W. 1998. *The knowing organization*. Oxford: Oxford University Press.
- Clausen, C., A. Rajabifard, S. Enemark, and I. Williamson. 2006. Awareness as a foundation for developing effective spatial data infrastructures. Paper presented at Shaping the Change, XXIII FIG Congress, Munich, Germany, October 8-13, 2006.
- Craig, W. J. 1995. Why we can't share data: Institutional inertia. In *Sharing geographic information*, eds. Onsrud, H. J. and G. Rushton, 107-118. (New Brunswick, New Jersey: Centre for Urban Policy Research).
- Gray, B. 1985. Conditions facilitating interorganizational collaboration. *Human Relations* 38, no. 10:911-936.
- Hall, R. H. 1996. *Organizations, structures, processes and outcomes.*: Prentice Hall.
- Linden, R. M. 2002. *Working across boundaries*. San Francisco: Jossey-Bass.
- Masser, I. 1998. *Governments and geographic information*. London: Taylor & Francis.
- Monge, P. R. and N. S. Contractor. 2003. *Theories of communication networks*. Oxford: Oxford University Press.
- Nedovic-Budic, Z. and J. K. Pinto. 1999. Interorganizational GIS: Issues and prospects. *The Annals of Regional Science* 33, no. 2:183-195.
- Nylehn, B. 1997. *Organisasjonsteori (Organization theory)*. Oslo: Kolve Forlag.
- Onsrud, H. J. and G. Rushton. 1995. Sharing geographic information: An introduction. In *Sharing geographic information*, eds. Onsrud, H. J. and G. Rushton, xiii-xviii. (New Brunswick, New Jersey: Centre for Urban Policy Research).
- Rajabifard, A. 2003. SDI diffusion - A regional level case with relevance to other levels. In *Developing spatial data infrastructures: From concept to reality*, eds. Williamson, I. P., A. Rajabifard, and M. F. Feeney, 79-94. (London: Taylor and Francis).

- Sydow, J. 2000. Understanding the constitution of organizational trust. In *Trust Within and Between Organizations - Conceptual Issues and Empirical Applications*, eds. Lane, C. and R. Bachmann, 31-63. (Oxford: Oxford University Press).
- Van de Ven, A. H. and D. L. Ferry. 1980. *Measuring and assessing organizations*. New York: John Wiley & Sons.
- Van Loenen, B. 2006. *Developing geographic information infrastructures - The role of information policies*. Delft: Delft University Press.
- Wehn de Montalvo, U. 2000. Access to spatial data - what determines the willingness of organisations to share it? Paper presented at 4th Global Spatial Data Infrastructure Conference, 13 2000, at Cape Town, South Africa.
- Williamson, I. 2006. "Global challenges for land administration and sustainable development." Available from http://www.geom.unimelb.edu.au/research/SDI_research/publications/files/Global%20challenges%20for%20LA%20and%20SD_Williamson_.pdf.
- Williamson, I. P. 2003. SDIs - Setting the scene. In *Developing spatial data infrastructures: From concept to reality*, eds. Williamson, I. P., A. Rajabifard, and M. F. Feeney, 3-16. (London: Taylor and Francis).
- Williamson, I. P. and C. Fourie. 1998. Using the Case Study Methodology for Cadastral Reform. *Geomatica*, no. 3.

BIOGRAPHICAL NOTES

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