The cadastre as a socio-technical system

Stubkjær, Erik

Published in:
GIS Development : Asia Pacific : The monthly Magazine on Geographical Information Science

Publication date:
2006

Document Version
Early version, also known as pre-print

The cadastre as a socio-technical system

by *Erik Stubkjær*, Aalborg University, Denmark

Originally published at
http://www.gisdevelopment.net/magazine/years/2006/june/26_1.htm
as GIS@development: June 2006: The cadastre as a socio-technical system
Reconstructed June 2012. ESt

Introduction

According to the Oxford English Dictionary, the term *cadastre* may refer to either 'a register of property to serve as the base of a proportional taxation', or to 'a public register of the quantity, value, and ownership of the real property of a country'. The latter phrase is best interpreted by taking into consideration a discussion within the United Kingdom after the 1850s, where it was debated whether a cadastre should be established, extending the existing Land Registry. In Continental Europe as well as within the UK, ownership and other interests in land were - more or less completely - recorded at local
courts. However, in Continental Europe, cadastres were introduced from 1700s as a means of levying tax. These cadastres included large scale maps and were managed by the fiscal administration and not by the courts. Accordingly, a cadastre would not contain authoritative information regarding ownership, which was the province of the land registries.

In modern terms we may say that a cadastre is a parcel-based geographical information system (GIS), which according to statute law records units of immobile property, their identifiers and attributes. The reference to statute law implies that the recorded information has some legal status, depending on the character of the rules and the perfection of the nation-wide information system, including the staff in charge. Implicit in this definition are the requests that the GIS should be specific, as to identify pieces of land and their boundaries, and complete, as to cover the whole jurisdiction in a systematic fashion.

A trouble with this GIS-related definition of cadastre, which fits both of the first-mentioned interpretations, is that it does not make sense to most legal advisers. They, now as before, relate recordings on land to the land registries. This lack of coherence may be attributed to the fact that we communicate in the English language of a society, which did not implement the cadastre of the Continental European conception. The continental conception was not coined merely to levy taxes, but emerged through an effort by absolutist kings and their advisers to bring about best use of resources of the realm for 'the common good'. Using new technologies of that time, fractions (calculations) and the plane table, taxes were recast in more rational fashion. More important from a development perspective, an independent governmental fiscal organisation was set up, which eventually bypassed landlords and local corporations, and by that contributed towards the modern state, where in principle citizens are facing state bodies directly, within a context of codified law.

Mention is made that in international development work and in professional terminology, the cadastre is often subsumed under terms like Land management,

Land administration, or Spatial Data Infrastructures. Yet, the International Federation of Surveyors (FIG) has issued publications directly addressing the cadastre (primarily No. 11, 1995). Here, however, an attempt is made to arrive at a more basic determination of the concept.

The notion of *socio-technical system* may refer to the organisation of labour relative to technology, but is used here to consider the essential differences among the elements of such systems. Engineering tasks have developed from the design of a product for delivery along two lines. One line of change regards the increasing complexity of the technical artefacts designed and put into use, e.g. an air plane. The other line of growing complexity relates to the design process, which increasingly not stops at delivery, but includes a life-cycle approach and/or a co-design of the manufacturing organisation. A consequence of the growing complexity is that an understanding of the laws of physics and logic is not sufficient to achieve the intended outcome. Humans come in, and with humans difficult issues like tacit knowledge and norms. Accordingly, socio-technical systems are conceived as made up of three categories of elements. [Figure 1 about here]

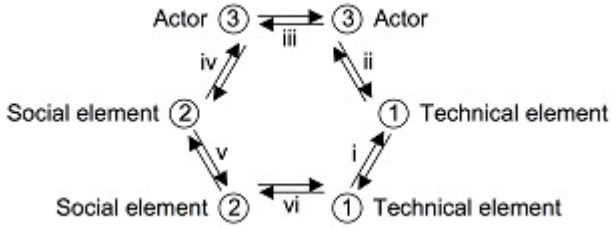

Figure 1: Elements (1-3) and relations (i-iv) in a socio-technical system.
Source: Maarten Ottens: Conceptualizing large complex engineering systems as socio-technical systems - The case of cadastral systems.
Presentation, Aalborg University, May 2005.

The technical elements make one category. Next is a category of *actors*. Actors are physical persons, moreover legal persons like organisations of any kind, and finally groups. Decisive is that actors have intentionality. The third category of *social element* is a kind of residual, as it excludes elements of the technical category, which are subject to the law of nature, as well as elements which have intentionality, as has the actor. Legislation and other rules are good examples of a social element. Social elements tend to restrict the behaviour of actors in analogy with technical elements being dependent on the laws of nature. Of course, actors can ignore and even oppose social norms; also, the modelling does not assume that actors always behave in a rational way.

The combination of the two fields of investigation: cadastre and socio-technical system, was made in the context of a European research action on *Modelling Real Property Transactions* (ESF/COST action G9) with the objective of a better understanding of both concepts. Here some aspects of the research in progress are provided by first listing the main elements identified and then closing the note with a discussion.

The technical elements

The technical elements identified were the following:

- Global positioning and Earth-observation satellites
- Coordinate measuring devices (equipment for surveying and mapping)
- Computers and networks
- Information carriers (hard disks, paper, stones)

While the first three elements depends on the law of nature in their functioning, this cannot be said for the information in the system. The element of information carriers includes the physical manifestations of letters, figures, as well as lines, etc. on a map. The interpretation of these marks, for example to make sense of the text, or to recognize a boundary mark as such, depend on some social code. However, information carriers are considered a technical element, because memorial stones and boundary marks use gravity to stay in position. A similar (relative) permanence of matter can be found regarding text and their appearance in documents, etc. The permanence make us take the recordings as trustworthy testimonies or memorials of past agreements and decisions. However, it is the combination of permanence with social code, which effect the trust. Thus, the issue of information in the system is further addressed in the context of the *Social elements*.

The actors

As actors of the cadastral system, the following were identified:

- Owners and other holders of rights
- Authorities (Government, including the judiciary, the police, and fiscal bodies; municipalities; civil servants, municipal officers)
- Companies (Professionals: Lawyers, surveyors,.. ; Financial institutions: Banks, ..; Software vendors and service providers)
- Educational and research organisations (Universities, ..)
- Groups (Squatters, social movements)

The three first-mentioned elements; owners, authorities, and companies are intuitively obvious. Schools were added, as reflection of present systems and new conceptualisations are, as a historical fact, part of the system under scrutiny. Groups were included for several reasons: >From an engineering point of view, the functioning of a system may be disturbed by group action. Similarly, people who squad an area or a building are sometimes acting or being treated as a group. Furthermore, indigenous people form such groups, and while their rights may not be formally recognized, their importance and influence can be substantial.

A more philosophical reservation have been raised, claiming that only physical persons can have intentionality, as intentionality is directly linked to a mind. According to that position, groups and organisations do not have minds of themselves. However, other philosophers do state that there is such a thing as *collective intentionality*. As a historical fact, groups have acted with shared intentionality, e.g as achieved through deliberations within social movements and associations. Furthermore, organisations are designed to bring about sufficient shared intentionality among its members to achieve stated objectives.

Social elements

Social elements were introduced as a residual category, having in common some rule-like character. Some rules are explicitly stated in writing and promulgated; other rules are vague and implied, nevertheless too important to ignore. As a result, the identification of social elements were cast in formal and informal subcategories, respectively, as shown in Table 1.

Formal	Informal
Legislation (establishing rights and obligations)	Social norms/ values (trust) Customary law
Statutes (of organisations, etc.)	
Standards (of technical nature)	Tacit knowledge
Study programmes	Socialization
Procedures	Rituals
Databases, archives; documents and maps Markers (of legal boundaries, of place names)	Social code (Domain) language

Table 1: The formal and informal social elements of cadastres

The ordering of the elements is tentative. Among formal elements are included Databases, .. and Markers, which correspond to the Information carriers among the *Technical elements*. Similarly, Social code and Language is included among informal elements. It may be considered as problematic to include such an open and large field as language within a socio-technical system. However, rather than ignore the complexity of reality, efforts are made to identify the relevant minimum, for example to consider within the system only the specific terminology and phrases of the system under consideration. Such subset is called the *domain language* or, alternatively, a sub-language. Moreover, it is not satisfactory to record Social norms and Social code in an unrelated way, nor to address *knowledge* only in the context of tacit knowledge. Better options might develop through analyses of the *relations* among the elements stated above, but such task is deferred here.

Discussion

The Continental European conception of a cadastre was communicated in terms of elements of a socio-technical system. This way of describing the cadastre emphasizes that the cadastre is more than a GIS for taxation. The cadastre is embedded in a social practise, part of which is informal and thus difficult to describe and impossible to control. The consequence is that a cadastre, like other socio-technical systems, cannot be constructed alone with closed-world engineering approaches. For many, this is no new information, but part of a research agenda as the one, which was mentioned at the outset of this note. The transplanting of a socio-technical system

from one country or culture to another is a task, which demands a multi-disciplinary effort and the handling of unexpected reactions, as much as engineering skills.

The high level of abstraction applied in the present note is among others motivated by the wish not to market local, e.g. Danish, cadastral solutions. The approach taken here may provide for some ideas on how to effect cadastral development in an informed way. For example, in a specific country, you might want to detail the elements described above according to the local facts.

Acknowledgements
The discussions with Maarten Ottens, Department of Philosophy, Faculty of Technology, Policy and Management, Delft University of Technology, the Netherlands, are highly appreciated. The above text is partly extracted from a 29 page joint paper to be published in the context of the ESF-COST action *Modelling Real Property Transactions*, see costg9.plan.aau.dk.
The research cooperation has been supported by ESF-COST action G9, among others in terms of a Short Time Scientific Mission to Aalborg University (Reference Number: COST-STSM-G9-1408). The research of Maarten Ottens is part of Understanding Complex Systems, a Next Generation Infrastructures research project, see www.nginfra.nl.

Erik Stubkjær
Professor, Dr. Tech. h.c., Lic. agro.
Department of Development and Planning, Aalborg University
Fibigerstraede 11, DK-9220 Aalborg, Denmark
Phone (+45) 9635 8350 Fax (+45) 9815 6541
Web http://www.plan.aau.dk/~est/
Mail est@land.aau.dk