



USING THE CASE STUDY METHODOLOGY FOR CADASTRAL REFORM

By Ian Williamson
Professor of Surveying and Land Information
Department of Geomatics
University of Melbourne, Australia
and
Clarissa Fourie
Senior Lecturer
Department of Surveying and Mapping
University of Natal, South Africa

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ABSTRACT

Cadastral reform is on the world's agenda. Countries world wide are reforming their systems. It is generally accepted that there is no standard cadastre for any country since the social, cultural, economic, legal and institutional needs of all countries are different. Experience also indicates that cadastral reform is very difficult and that inappropriate reforms can do more harm than good. Therefore the best way to undertake cadastral reform is to adopt a rigorous case study methodology to evaluate and understand the existing system and the economic, cultural and social influences which affect it.

The paper reviews the case study methodology in general, looks at how the methodology can be improved for cadastral application by drawing on other disciplines, especially anthropology, and investigates the role of case studies in the cadastral reform process.

INTRODUCTION

The changes in Eastern and Central Europe, and in southern Africa have focussed the world's attention on cadastral reform. However cadastral reform is a world-wide phenomena in most nations as a result of world trends to embrace free market economics and micro-economic reforms.

Organisations such as the World Bank, the European Union and the United Nations are all promoting cadastral reform as one means of improving or supporting economic development, social stability, and urban and environmental management. As a result there has been an increasing number of cadastral consultants travelling the globe over the past decade advising on cadastral reform strategies. However experience indicates that cadastral reform is very difficult and that inappropriate reforms can do more harm than good.

In undertaking these reforms it is generally recognised that the needs of all countries are different and that no cadastral system will be identical to another. Due to the inseparable relationship between man and land, cadastral systems are intimately tied to the social structure and culture in any country, state or jurisdiction. Therefore any cadastral reforms must understand and accommodate these social structures and cultures. Therefore a key step in designing appropriate cadastral reforms is understanding local conditions and the current cadastral system from a legal, technical, institutional, social, economic and political perspective. It is these aspects of the nature of cadastral systems and the cadastral reform process which have much in common with anthropology studies and hence justifies the application of anthropological processes in this area. In the case of anthropology, specific societies or groups within societies are the units being studied. In the cadastral case it is the specific cadastre or particular aspects or operations of the cadastre within a jurisdiction, which are the units being studied. It is argued that these two aspects being studied have much in common from a social, cultural, legal and institutional perspective.

Further the micro-level focus of anthropologists has meant that their research methods and analytical frameworks have been honed to accommodate detail. It is the contention in this paper that because cadastral systems are based on the land parcel and so closely tied to society through a very close man-land relationship, that is micro-level details, that research approaches can be relatively easily adopted from anthropology to cadastral research. This hypothesis has been proven to some extent by the undocumented field work of Williamson (1986) and Fourie (1994). This paper also attempts to document the research link between the two disciplines, so that cadastral research does not have to re-invent the wheel but can import anthropological techniques to push forward and sharpen the frontiers of cadastral research.

In undertaking cadastral reform today many researchers or consultants design a strategy to obtain relevant information based on experience or a pre-conceived idea of what is required. Unfortunately this step is often undertaken in an ad hoc manner even though there has been some documentation on what sort of information should be obtained (Dale and McLaughlin, 1986:241, Williamson, 1986 and 1990).

The paper is based on the premise that it is essential to gain a detailed understanding of the existing conditions through the case study approach and then to make comparisons with other systems to gain a fuller understanding of the system and its strengths and weaknesses, and options for improvement, prior to recommending solutions. Typically surveyors, lawyers, cadastral experts or land administrators do not have formal training in such methodologies, with the result that cadastral reforms are sometimes based on an incorrect understanding of the local conditions and less than rigorous comparisons. The reality is that cadastral reforms are being undertaken on a regular basis using non rigorous approaches, sometimes with unfortunate consequences. This is common as observed by a UN adviser (Durand-Lasserve, 1996:21), albeit his paper refers more generally to related models for urban systems: "There is a growing awareness of the limitations of the models used over the last few decades, yet no other models have been proposed. The consistency with which the same methods are used, with the same unsatisfactory results, raises a central question: the influence of urban models transmitted by institutions and international experts in all countries of the regions. It rarely seems to be a case of leadership or domination, but would appear rather that these models force themselves upon authorities and national experts. They are thus led to reproduce previous experiments with some small improvements and to use well-trying predominant models."

The objective of this paper is to draw on the experience of other disciplines which have similarities in the type of background data and techniques required for cadastral reform. Anthropology is such a discipline. It has developed very sophisticated and rigorous research methodologies and techniques to enable a better understanding of different societies and social structures. It is recognised however that this is only one of several methodologies which have the potential to improve the cadastral reform process; for example systems deriving from information systems theory also offer potential.

The paper reviews the case study methodology in general and investigates the role of case studies in the cadastral reform process specifically. It draws on two cadastral studies to help explain concepts and processes. The first study was undertaken by Williamson and colleagues as background to the design of the Thailand Land Titling Project in the early 1980s; the second is a recent study coordinated by Williamson to compare the Digital Cadastral Data Bases (DCDBs) in the Australian states and territories.

DEFINING CASE STUDIES

The studies undertaken to date by consultants such as land surveyors, lawyers and others working in the area of cadastral reform have often been termed 'case studies'. This term has come to mean an examination of the cadastral system of a particular jurisdiction, both at a broadly descriptive level and at a more focused level, where specific problems have been identified. Often, but not always, the consultant enters the field with a picture in their head (a cognitive model) of their own cadastral system or some component of a cadastral system (such as a Torrens system of title registration), and they attempt from the outset to draw direct comparisons between their picture of how the entire cadastre operates and what they see in the field. They then proceed to recommend changes to the system being investigated by drawing from their own picture or experience.

This paper is suggesting that a more useful approach, in order to sharpen the rigour of the analysis or research, would be to adopt an anthropological classification of case studies. Hammersley and Atkinson (1983) state that the field of investigation consists of 'the setting' and the 'case study'. In cadastral terms, the setting would be the entire cadastral system and the case study would be a particular problem area being examined in more detail.

Hammersley and Atkinson argue that "...it is potentially misleading to talk of 'studying the setting'.. (as) it is not possible to give an exhaustive account of (it)." Their view is that, "(a) setting is a named context in which phenomena occur that might be studied from any number of angles; a case is those phenomena seen from one particular theoretical angle. Some features of the setting will be given no attention at all.. (and) a setting may contain several cases.." (1983:43-44).

What this implies in cadastral terms, is that it is generally impossible for a consultant to study an entire cadastral system of any jurisdiction in the sufficient detail necessary to be able to compare whole systems, let alone fix the system. Rather an overview of the 'setting' is required followed by a 'case study' or a number of 'case studies' focusing on specific aspects within the cadastral system.

With respect to the choice of case study area, Hammersley and Atkinson argue that "...the process of identifying and defining the case under study proceeds side by side with the refinement of the research problem and the development of the theory." (1983:43-4). That is, as research proceeds on the 'setting,' or general cadastral system, so problem areas, or areas for further exploration, are identified, which then become 'case study' areas. In cadastral reform the research for the choice of case study area is generally influenced by policy makers in the economic, social and political fields. Great care must be taken in the choice of case study areas to ensure the study is useful.

For example, in the same jurisdiction one cadastral consultant, from one interest group, could be asked to do a study of the efficiency of the cadastral system with respect to land markets. Another consultant, from another interest group, in the same jurisdiction could be asked to study the impact of the cadastral system on traditional tenures. They would all start by analysing the 'setting' of the whole cadastral system and then focus a case study on a particular area, which would give them the most information in their area of interest.

The choice of a case study area is not only informed by the identification of problems during the research, but also by reference to cadastral theories as described in texts by Dowson and Shepherd (1956), Dale (1976), Dale and McLaughlin (1988) and Simpson (1976), in publications such as *The Statement on the Cadastre* produced by the International Federation of Surveyors (1995) and in reports from United Nations meetings such as *The Bogor Declaration* (1996).

It must be noted that solutions to problems in cadastral systems are not the central purpose of the case study research method. In this respect the paper adopts the approach of Onsrud et al (1992). They argue that "... a case study is an examination of the phenomenon in which the primary purpose of the observer has been to carry out research rather than to implement a system or improve an operational environment." (1992:33). This paper will argue that a case study is a research tool which should be used to understand a cadastral system, and that of itself it cannot supply solutions for problems in the system.

The paper will argue that firstly a rigorous case study should be undertaken of an aspect of a cadastral system, within the context of the whole cadastral system. This study should be done with as little reference as possible to the consultants prior knowledge of other systems except at the theoretical level. Once this is largely complete it will be possible to both understand that system's problems better and secondly allow comparison with other cadastral systems. Thirdly, based on this foundation, better solutions can be developed to improve cadastral systems.

THE ROLE OF CASE STUDIES IN THE CADASTRAL REFORM PROCESS

This paper will argue that before solutions can be developed to fix a cadastral system, a consultant should acquire an extensive knowledge, even in general terms, of the existing cadastral system and where it fits within the wider society. This knowledge will help the consultant make better decisions and will also enable the consultant to make comparisons with other systems and import ideas from these systems. The paper is arguing that if the consultant begins immediately by importing ideas from other systems with which they are familiar, without first understanding the system being studied, the cadastral solutions suggested are often inappropriate and unlikely to work. This paper sets out some guidelines on how to do improved or more rigorous structured cadastral research that will underpin a better cadastral reform process.

Based on the authors' experiences in the field and tried methods of research over the years undertaken by anthropologists, this paper is arguing that there should be three basic and distinct steps in undertaking successful cadastral reform. All three steps have to be taken consecutively. It is generally not possible to jump to step three, solutions, and miss out the other two.

Step 1: Doing a case study within a jurisdiction. This step focuses on how to get a general picture of a system and then acquire more intensive data on a particular part of the jurisdiction by using case studies premised and tested on a hypothesis. This research should be done with minimal reference to the cadastral systems with which the consultant is already familiar.

Step 2: Drawing comparisons between jurisdictions and case studies. After completing the development of the picture of the cadastral system and focusing in on some of the major areas via case studies only then is it possible to draw comparisons between the jurisdiction under study and other systems. This can only be done if the elements of all the cadastral systems being compared have been described in extensive detail in a rigorous impartial manner, so that areas of difference and commonality can be identified, as well as intra-jurisdictional linkages.

Step 3: Creating solutions. The consultant can only be confident that the solutions which appear to work in other jurisdictions can be successfully adapted to the jurisdiction being studied if the previous two steps have been undertaken. The steps are shown diagrammatically below in Figure 1.

(Not included in online publication)

DOING A CASE STUDY WITHIN A SOCIETY OR JURISDICTION'

As indicated above, a picture of a society, or a jurisdiction, is acquired by investigating the 'setting' and then focusing in on a 'case study' or 'case studies'. To build this picture the anthropologist uses 'raw' data which generally consists of their observations of human behaviour (including speech) (Pelto, 1970:2-3). This 'raw' data is acquired through a range of research techniques such as structured interviews (where a range of specific questions are put to an individual); key informant interviewing (where a range of questions are put to a key person); and participant observation (where information is acquired merely by being there and participating in the life of the people). (Pelto, 1970:2-3).

The detail required to populate an anthropological study means that anthropologists have been noted for their focus on the micro-level, of single communities, households and individuals (Hammersley and Atkinson, 1983). In the more recent past, anthropological approaches have taken into account the effect of the wider society on this micro-level (Poggie et al, 1992:9). The detailed description of a particular community or society which is produced by an anthropologist, based on the 'raw' data collected, is called an ethnography. Ethnography is essentially a description, or a form of story-telling, rather than the development of theory or the testing of theory (Hammersley and Atkinson, 1983:1-2). Ethnography is very different from ethnology, which is the branch of anthropology which deals with races and peoples, their origins, characteristics etc. (Collins, 1986:289).

Some argue that only through ethnography can the meanings that give form and content to processes be understood (Hammersley and Atkinson, 1983:1-2). Based on Williamson's experiences in cadastral system analysis, obtaining the rich ethnographic detail of a particular cadastral system is an essential step to understanding how the system operates and in making suggestions on how it could operate better (see Thailand example below). This approach could assist in developing and testing new cadastral principles and accords with anthropological studies, where ethnography is used to develop and test anthropological theories.

Central to the research techniques of an anthropologist is the formulation of the hypothesis. A hypothesis is defined as a tentative theory or supposition provisionally adopted to explain certain facts and to guide the investigation of others.. the empirical evidence obtained is used as evidence for and against the hypothesis.. to be tested. (Pelto 1970:34,44)

This hypothesis is developed while doing the preliminary research on the 'setting', which in cadastral terms would consist of the particular society's cadastre and the socio-economic and policy aspects which affect the cadastre. An analysis of the 'setting' is then followed by the choice of hypothesis and case study area for more detailed interviewing. For example, in the Thailand research, knowledge of the World Bank's policies, an understanding of Thai society and government administrative processes, and a broad overview of the cadastre was first obtained before the hypothesis was confirmed and the case study areas chosen (see below).

Based on the choice of hypothesis, the anthropologist locates the persons and setting which will provide the most information related to the research question. Using a range of techniques to acquire the data the researcher will ensure that the type of people to whom they speak will be a representative sample, so that a holistic picture or total picture is acquired. In cadastral research there are also a range of stake-holders who are sources of information and need to be interviewed to ensure that a holistic and representative picture is being analysed. Drawing on the Thailand example, stakeholders identified included; surveyors, financial institutions, lawyers, tertiary institutions, banks, judiciary, politicians, land owners, land developers, government officials, village headmen and international funding agencies.

Using this approach in the Thailand context, a diagram is presented below showing how to plan this type of research when analysing a cadastral system. A hypothesis was adopted that states "The Thai cadastral system is inefficient - circa 1980". The case study or studies were then used to either prove or disprove the hypothesis by obtaining data from a range of sources and stakeholders. The first column sets out the level of cadastral categories from the micro to macro. The second column identifies the distribution of stakeholders within these levels who could provide data, while the third column identifies the different data sources. It is important to ensure that the data sources cover all the categories and stakeholders to ensure rigorous well structured research and coverage, i.e. that the field is sufficiently covered.

Figure 2 Not included in online publication.

Once the case study interviews have been done and written up as field notes, the researcher needs to stand back and assess whether they have sufficient information to have proved or disproved the hypothesis. If the results are inconclusive additional research methods, such as informal interviewing, should be added; or a new hypothesis formulated which might have more bearing on the field. In the Thai case, after detailed analysis, it became evident that many of the processes were efficient and that conceptually the cadastral system was generally very well designed.

Finally, the several different pieces of data acquired must be logically interrelated. They must also fit in with other aspects of the local culture. This process of conceptualisation should also relate the specific local data to some body of general theory, (Pelto, 1970:257). That is, the interview data from the case study on a cadastral system should be logically interrelated. The data and conclusions drawn should also fit with other aspects of the cadastral system which were identified when the 'setting' was studied. Finally, in interrelating the data obtained, general cadastral theory should be used to inform the process. By general cadastral theory we mean, for example, parcel numbers within a particular plan of survey or cadastral map are an accepted form of classification in land registration systems; not all cadastral systems rely on accurate cadastral maps; and land registration systems contain both parcel boundary information and legal information regarding rights, restrictions and responsibilities.

When doing this analysis, the researcher has to link micro level information with macro level information. The linkages identified demonstrate that "...causality is not unidirectional but rather multidirectional, involving dynamic, interactive mechanisms..". (Stonich, 1992:156). Applied to cadastral research this would mean that an element of a cadastral system exists because of a number of causes and not because of a single cause. For example, the reason why the cadastres of the states of Victoria and Queensland in

Australia are different is largely because the federal constitution of the country, which dictates that land administration and land laws is a state responsibility. However it is also because of the density of settlement in Victoria by comparison to Queensland, that they were settled at different times, that the topography and size of the states varies, and that they have different political structures and land laws developed at different periods of Australia's history (also see Australian case study below).

If a researcher follows the more rigorous research methods outlined above they can be reasonably certain that they have acquired a picture of that particular society's cadastre. They can also be confident that this picture will be fairly representative of the actual situation; and that it will be both detailed and data rich, factors which this paper argues, are an important component in any inter-jurisdictional analysis. Such a picture is a necessary condition for successful comparative research and the development of appropriate solutions.

Case study for the Thailand Land Titling Project

The work in Thailand by Williamson and others is used to illustrate an actual example of undertaking cadastral research. Although this work was done sometime ago, many of the research methods outlined above were done intuitively and often were a matter of common sense, albeit they do not exactly follow the proposed methodology. This paper is an attempt to use such intuitive experience, linked to more formal research approaches, to build a better understanding of the cadastral reform process and the methodology.

The Thailand Land Titling Project was originally proposed by the World Bank as a mechanism to assist the growth of Gross National Product (GNP) in Thailand. As described in Angus-Leppan and Williamson (1986) and Williamson (1990) the project required a complete re-evaluation of the Thai cadastral and land administration system. This was done by undertaking a general analysis of the cadastral system and by carrying out of a number of targeted case studies.

Following are some of the steps which were undertaken in obtaining the necessary data in order to describe the 'setting' and to design a strategy to focus on problem areas which required cadastral reform.

1. meetings with politicians and senior government officials to confirm the major political challenges facing the government regarding land and land management. It was important to obtain the current national development plan for the country, and fully understand where the stated objectives for the project sat on the government's political agenda
2. translation of the Thai Land Code and Civil and Commercial Code, and associated laws and regulations into English for review and evaluation. This focused on both the laws concerned with land transfer, as well as cadastral mapping and surveying.
3. a review of historical books, articles and references on the development of the land ownership and land administration system in Thailand over the last two hundred years. This included an initial understanding of the Thai acceptance for administrative authority, of the ability of the Thai bureaucracy to accommodate change and new technology, the role of the private sector and of the professions, of the Thai reverence for the Royal family, of the traditional village structure and of the strength and weaknesses of the Thai rural economy.
4. an extensive and detailed investigation into the numbers and status of land parcels in the country, the different land tenures and the amount of government lands including forest lands. This was done by province and district.

The hypotheses adopted included those introduced by the World Bank as well as some developed during the background research. Those introduced by the Bank were developed from economic principles, such as:

- titling supports economic development;
- titling supports poverty eradication in rural areas;
- titling improves regional income disparities;

While those developed during the contextual research included:

- titling supports urban land management and urban land markets;
- the essential nature of undertaking land titling at the local level and of involving local villagers;
- improved records management is as important as the creation of the records themselves;
- without the delivery of land titles to landholders, the project will fail

The hypotheses were developed within the framework of some generally accepted cadastral principles brought by the consultants preparing the project, such as:

- the importance of working from the whole to the part for the efficient operation of cadastral surveying and mapping systems;

- an understanding of the benefits and application of general boundaries principles;
- the importance and close linkage between title registration, and cadastral surveying and mapping;
- simple parcel identifiers are preferable to complicated identifiers;
- systematic adjudication is preferable to sporadic adjudication.

Based on the broad contextual research, a number of investigations or 'case studies' were undertaken in Bangkok and in the north, north east, south and central parts of Thailand. These investigations focussed on:-

- a detailed review of the three key cadastral processes of land adjudication, subdivision and land transfer. This also included an estimation of staff, equipment and financial requirements involved in these processes;
- a review of the institutional relationships between the head office of the Department of Lands in Bangkok and the provincial and district offices. This included obtaining a clear understanding of the administrative structure of all the divisions, sections and units within the Department, as well as an understanding of the relationship of the Department to the Ministry, to provincial governors, to local government and to other ministries;
- a review of the training and education system for officials involved in the project. This detailed information was gained through structured interviews, participant observations, key informant interviews and reviewing documentation. ewing documentation.

The data collected during the various visits or 'case studies' was confirmed or expanded by the following techniques:

- the researcher developed a close working relationship with counterparts who spoke Thai and English fluently. It was most important to get these persons 'on side' and to believe in what the researcher was doing.
- visited villages and small towns in the regions to view the actual cadastral processes occurring and to interview land owners. It was beneficial to get an understanding of what land owners believed constituted a parcel boundary and how they perceived land ownership.
- talked to the judiciary to gain a better understanding of the severity of boundary or land disputes across the country.
- talked to banks and lending authorities to understand the need for improved security of tenure and ownership as a basis of obtaining credit.
- unofficially talking to people not associated with the government, usually informally; for example land developers and people who had recently either bought or sold land. This was often difficult to do but was essential in gaining a better understanding of how the system 'really worked'.
- continually keeping the 'big picture' and overall objectives in focus. For example this project was conceived in the rural section of the World Bank with the result that the initial proposal was not concerned with urban areas. However it became clear that any cadastral reform would impact equally on urban areas as rural areas. As a result of an approach during the project preparation phase the World Bank agreed to include all urban areas in the project.

While a reasonable effort was made in this project to analyse the setting, to create some hypotheses and to undertake some targeted case studies, all within accepted cadastral principles, the project preparation was less structured and more intuitive in the way it went about comparing the Thai situation to other cadastral jurisdictions which may have offered solutions. This meant that the development of solutions was undertaken in an unstructured manner, drawing heavily on the expertise of the Thai officials, as well as the experience of the consultants. Fortunately history has shown that most solutions proposed were appropriate.

In summary the Thai investigation shows a successful approach to developing the setting, adopting and establishing hypotheses, undertaking case studies and doing intra-jurisdictional comparisons. Its weakness is in establishing inter-jurisdictional linkages, testing hypotheses across jurisdictions and developing solutions.

DRAWING COMPARISONS BETWEEN JURISDICTIONS AND CASE STUDIES

Pelto argues that it is feasible to make cross-cultural comparisons of "...elements of (human) behaviour.." (1970:30). Extrapolating from this, this paper argues that it is possible to make inter-jurisdictional analyses of elements of cadastral systems.

To be able to draw these comparisons in cadastral research it is important to understand more about how to make these comparisons. This entails looking at the role of ethnographic data; how definitions and classifications are developed; what are 'elements' or 'units'; and their relationship both within each jurisdiction and between jurisdictions; and finally the testing of hypotheses across a number of jurisdictions.

In order to illustrate this comparative component of the methodology, the paper draws from a recent workshop with the coordinators of the Digital Cadastral Data Bases (DCDBs) of each of the Australian states and territories (PSMA, 1996). The aim of the workshop was to understand the different systems in each jurisdiction and to make it possible to create and maintain national DCDB products. To reach this objective the participants had to go through an extended exercise of understanding each jurisdiction and of comparing jurisdictions. A number of lessons were learnt, again intuitively, which can be applied to, and sharpened by, anthropological research methods. This exercise is described below.

Experience from an Australian Digital Cadastral Data Base Workshop

All mainland states and territories of Australia have completed first generation Digital Cadastral Data Bases (DCDBs). These jurisdictions are now facing issues concerned with updating and upgrading these DCDBs to serve different client interests. There are also demands from clients for national DCDB products. It is this latter demand which brought the different jurisdictions together to develop national DCDB products. The workshop highlighted the differences between systems and again emphasised that there are eight different Torrens systems of title registration, eight different cadastral survey and mapping systems and eight different DCDBs in Australia. However it must be recognised that land matters are a state or territory responsibility in Australia and that the states and territories were all separate British colonies less than 100 years ago. Therefore it is to be expected that the land systems should be different.

As a result of the above requirements, the technical managers of DCDBs from all states and territories of Australia met in August, 1996 to discuss issues concerned with their DCDBs. The meeting was organised by the Australian Public Sector Mapping Agencies (PSMA) in cooperation with the Australian Inter-governmental Committee on Surveying and Mapping (ICSM).

The workshop was based on two hypotheses. First, by understanding in detail aspects of each DCDB, delegates would be able to formulate a strategy for achieving a more efficient approach to establishing and updating national DCDB products. Secondly, the sharing of developments and experiences between jurisdictions in updating and upgrading DCDBs will provide a better understanding of trends in updating and upgrading DCDBs and will allow each jurisdiction to improve its own system more efficiently.

The key to 'proving' these two hypotheses, was the need for all delegates to understand in detail, the processes, problems and issues concerned with the creation, updating and upgrading of all other DCDBs in Australia. This was to be achieved by drawing comparisons between descriptions of each jurisdiction's DCDB. A weakness of this exercise was the inability to satisfactorily establish more detailed hypotheses about creating national DCDB products and to clearly establish principles on which to evaluate the hypotheses.

As a first step in the process, documents about Australian and world-wide trends in cadastral reform, with particular emphasis on DCDBs, were distributed to delegates. This provided the appropriate 'setting' for the investigation.

All jurisdictions were asked to prepare background data on their DCDB according to a set pro-forma as a first step in understanding individual systems. This step would also provide the data for the 'setting' for each individual system. The type and categories of data were based on previous research into Australian DCDBs by Williamson. Considerable effort was given to preparing a pro-forma which would ensure easy comparison of the different DCDBs. It was accepted that each jurisdiction had a DCDB, that there was an identifiable data flow to update the DCDB and that there was a set of policies directing and administering the operation of the DCDB (these could be considered 'principles'). Finally it was believed that if the participants could document these processes or elements for each jurisdiction, it would enable cross comparison thereby improving understanding of all systems so that national DCDB products could be created. Initially each jurisdiction was requested to provide the following data:

- a flow chart and description of the subdivision process, with particular emphasis on the flow of cadastral survey and mapping data through the system, from its creation by a surveyor, to the final updating of the DCDB, after the plan of survey has been approved by the responsible authority;
- the current policies governing the operation and management of the DCDB;
- the current status of the DCDB;
- a description of the DCDB highlighting certain elements;
- a description of the process of updating and upgrading the DCDB;
- the major problems and issues facing the maintenance of the DCDB future developments for the DCDB;
- future developments of the DCDB;

Unexpectedly the detailed data that was provided from each jurisdiction was different in content and detail, to the extent that it was very difficult to compare the systems sufficiently, albeit the data was useful. The difficulty arose in that many jurisdictions had a different interpretation of what was asked. It was obvious that similar terms and concepts meant different things in different jurisdictions. In addition, while systems may have appeared similar at first glance, the diversity of detail which became apparent made comparisons difficult. The workshop also highlighted that each jurisdiction is responding to different client, technical, administrative, local and financial pressures, in deciding the objective, form and character of its DCDB.

Since the initial data was compiled and submitted to the organisers prior to the workshop it was possible for them to review it before the delegates came together. As a result the organisers decided to develop a more detailed questionnaire based on the experience from the previous submissions which hopefully would improve the descriptions of the jurisdictions' DCDBs thereby enabling better comparisons. As a result a new more detailed pro-forma was developed for each jurisdiction which requested information and data on the following:

- the key steps in the information flows concerned with survey plans indicating responsible agencies and showing a simple flow chart;
- the management of the DCDB with emphasis on the responsible agency for each step in the process;
- the role of the private sector in updating and upgrading the DCDB;
- the DCDB data model relating to information held on property parcels, non-property parcels and general data. Other questions were asked about metadata, completeness, spatial accuracy, update formats to clients and currency of data;
- perceived update problems and constraints;
- future developments of the DCDB including digital updating, coordinate cadastres, communication strategies for dissemination of the data, new institutional arrangements, integration of DCDB with other systems etc.;

Jurisdictions completed the questionnaire and submitted it early on the first day of the workshop, however there were again problems of interpretation which still made comparison between jurisdictions difficult although some useful comparative data resulted. The difficulties included not having common definitions and similar interpretations of concepts, as well as the need to again describe systems at a more detailed level. As a result jurisdictions were split into two broadly representational working groups in the workshop and asked to determine the similarities and differences between the different systems. They were not given any conceptual framework but they had already prepared two sets of data on their DCDBs and had a good idea of what the organisers were seeking.

The two groups presented their findings in a plenary session and surprisingly again differences were found between the two groups. The groups had established more categories and detail in order to be able to make comparisons. Working Group A had 29 categories and Working Group B had 27 categories. This made it easier to identify commonalities and differences between systems. At this stage there was a much greater understanding by all delegates of the different systems, as well as their own systems. As a result a major plenary session was convened where the data from the two groups was brought together into one table after much discussion. Again the categories were expanded to accommodate the detail across all DCDBs resulting in 41 final categories, some brought through from the groups and some newly defined. This interactive process in developing reliable comparative data highlights the lack of generally accepted DCDB definitions of terms to develop national DCDB products and the lack of clear DCDB principles. However at the conclusion of the iterations, the workshop had achieved one of its objectives of having all jurisdictions gain a sufficient understanding of the other DCDBs to be able to discuss constructively the creation of national DCDB products by integrating the separate systems. Importantly at this stage all representatives of jurisdictions were able to place their DCDB in a wider conceptual framework which enabled the refinement of country wide definitions and linking of these definitions into logical categories, as well as the development of new countrywide categories. The outcome of the workshop was that general agreement was reached on the creation of a simple National Cadastral Data Model which would contain some agreed core elements that would facilitate the creation and maintenance of national DCDB products.

With regard to the methodology proposed in this paper, each jurisdiction was described in detail, a general hypothesis or framework was determined, case studies on particular aspects were investigated in detail (which enabled definitions and classifications to be made) and finally both intra-jurisdictional and inter-jurisdictional comparisons were carried out.

A number of research principles can be identified by relating this Australian study to anthropological theory.

Pelto argues that "(one) of the most frequent criticisms of (comparative) studies is concerned with the basic weakness of the primary ethnographic data.. (A) logical improvement of research design could be achieved by intensive controlled collection of ..general data.. as well as intensive data in the area of interest.." (1970:302) from a sample of societies or jurisdictions.

That is, the first step in improving cadastral research is to build knowledge about a jurisdiction or a range of jurisdictions, in terms of the steps outlined above. The Australian study showed how important it is to have extensive and detailed knowledge of a jurisdiction in order to be able to rigorously compare jurisdictions. It also showed how difficult this is since it took four attempts before sufficient detail was available to enable useful comparisons.

Detailed data should then be used to build concepts and definitions about the society's jurisdiction or 'setting' and the case study area in particular. These definitions are rules for the grouping of information into categories, which allow a person to state a number of generalisations that apply simultaneously to several different actual situations (Pelto,1970:30). It is these categories or groupings that make it possible to draw comparisons and say what units are similar, and in what way; and what other units are different.

To make comparisons anthropologists have to arrive at conclusions about definitions which fit all the societies being analysed. The concepts and definitions developed must be inter-culturally translatable and must have the same meaning in different cultural contexts (Pelto,1970:276-8). To produce such definitions the researcher sifting the information must be able to state clearly what evidence they are using from each system in order to prove that such a system fits into the definition. In developing these definitions reference and comparisons must frequently be made to the published literature on the subject. That is, definitions must be provable by evidence and

fit logically into a theoretical framework (Pelto,1970:283).

The Australian study showed that receiving countrywide agreement on definitions became the fundamental step necessary to be able to design a workable system which would produce national DCDB products. It was only once general categories were developed by participants, based on agreed definitions, that it was possible to generalise sufficiently about all eight jurisdictions to enable useful comparison. In the end useful comparison was just as much about identifying commonalities as it was about identifying differences.

The classification of units or categories is based on rules of procedure, concepts and definitions. Such a unit or category in cadastral research would be for example, a cadastral data base, or a topographic map, or a geodetic network, or the accuracy of one particular set of data. "Our only justification for lumping units under a particular label is that we are prepared to state in what respects ..these units are similar, at the same time accepting the proposition that in other respects these units are distinct.. (F)or comparative purposes we must.. be prepared to deal with the ways in which the similar units do in fact differ from each other." (Pelto,1970:28). For example, all the Australian jurisdictions have a DCDB, but the accuracy requirement for each varies across all eight of them. As illustrated in the Australian study, the identification of more and more detailed elements or units within a jurisdiction made the comparison between the jurisdictions both possible and more fruitful. Hammersley and Atkinson argue that ".. the selection of cases should be designed to generate as many categories and properties of categories as possible and to relate categories to one another." (1983:44). In terms of Noblit and Hare's approach, this allows the researcher to compare and contrast characteristic elements and their linked components (1988:28). This detailed approach both builds knowledge about the system and allows comparisons with other systems.

By identifying a large range of elements within each system it is possible, when comparing one system (or cadastral system) to another system, to both compare intra-culturally as well as inter-culturally (Pelto,1970:304). That is, it is possible to identify how the elements in one system relate to each other in one jurisdiction, by comparison to how they relate to each other in another jurisdiction. For example, the processes of updating the DCDBs in each state or territory have many of the same steps and components, and involve similar organisations, but as a whole each process is different, resulting in very different DCDBs in each jurisdiction. For example the data models are different as are the accuracy criteria, update and upgrade techniques, hardware and software, data elements and data structures. This study highlights that an intra-jurisdictional, together with a inter-jurisdictional approach makes it possible to understand better how each system operates and the extent to which their elements are comparable and where they are different.

The best approach therefore, as happened in the Australian study, is to acquire the same amount of intensive ethnographic information for each jurisdiction and apply the same hypotheses (initially these were unclear in the DCDB study). It is then possible to establish both intra-jurisdictional and inter-jurisdictional relationships. "In a sense, the model provides a series of repeated tests of each hypothesis." (Pelto,1970:304). This ensures that rigorous, well structured, representational research is being done.

Noblit and Hare take this one step further and argue that it is the "..constant comparing of many groups (which) draws the sociologists attention to their similarities and differences. Considering these leads him to generate abstract categories and their properties." (1988:63). As Pelto sees it, inter-cultural (inter-jurisdictional) analyses are the only reliable basis on which to establish a general principle (1970:9), which in the Australian case shows that intensive and comparative cadastral research identified core elements within DCDBs. This made it possible to build a common conceptual framework which will facilitate the creation of national DCDB products, in the long term if not the short term. Perhaps the comparative method put forward in this paper can be used to further expand the generally accepted principles in cadastral theory.

In summary the Australian experience is a very good example of a comparison between different jurisdictions, of developing definitions and classifications, of identifying intra- and inter-jurisdictional linkages and of how to develop solutions based on the case studies, prior knowledge and the comparisons. However it shows weaknesses in the original approach with respect to the creation of the setting for each jurisdiction, in basing the study on unclear cadastral principles and in not being able to establish clear hypotheses on which to base comparisons.

CREATING SOLUTIONS

The development of cadastral solutions is the final step in the case study methodology after the data collection, hypothesis generation, refinement and creation of definitions and intra-jurisdictional and inter-jurisdictional comparisons. It is based on the knowledge developed by the research methods outlined above, but does not form part of the hypotheses that were used to generate the information. That is, the research approach suggested is a necessary but not a sufficient condition to the development of appropriate solutions. It is necessary because it is the foundation which allows better solutions to be developed.

Poggie et al argue that "unfortunately, as many examples attest, the mechanisms and energies for application are impotent if we fail to understand, in precise, measurable, valid, and replicable terms.." what we are trying to change. It is only by seeking to understand things that we can come to a position where we can influence them (1992:13-14). They advocate that "..replicable and systematic procedures of data collection and analysis are a requirement for the building of useful.. theory (which) is an aid both to understanding

..phenomena and in changing existing social conditions." (1992:4).

This paper adopts this approach and argues that the production of sound ethnographies of cadastral systems and the rigorous comparative analysis of systems, along the lines outlined above, and as carried out in the Australian DCDB workshop, will substantially improve cadastral reform processes. It will improve a researcher's ability to do cadastral reform because:

- they will be able to rely on their own and others research methods;
- there will be a greater understanding of the jurisdictions;
- they will be able to do better comparative analysis;
- it will help expand and strengthen cadastral concepts and build general cadastral principles;
- they will be able to import solutions from other jurisdictions with more confidence either completely, or in an adapted form;
- they will be able to develop indigenous cadastral reform solutions;
- it will assist them in actually influencing the development of events;

CONCLUSIONS

This paper argues that many cadastral reform projects are being undertaken in an ad hoc manner and are based on an inadequate understanding of local conditions in the jurisdiction being studied. Too often consultants import concepts and solutions from their own jurisdictions without due regard to the needs of the country in question. This can result in a high probability that the project will not be a success. The paper does recognise that many projects will be designed on intuition, experience and common sense and may be successful, but it is the conclusion of the authors that this is a high risk approach.

The paper argues that it is essential that any cadastral reform project should be based on a structured three stage case study methodology, where the first stage is concerned with undertaking a study of the broad setting followed by actual case studies and associated activities, with the second stage concerned with ethnography and comparisons, while the final stage is concerned with developing appropriate solutions. In developing this methodology the paper has drawn heavily on the rigorous case study theory used by anthropologists.

In developing the methodology, the paper has used two cadastral studies, one concerned with Thailand and one Australia, to explain the principles and concepts of the proposed methodology. An analysis of these studies, which were based on intuition and experience, has identified the weaknesses in the methodologies used.

This research has also identified to the authors the weaknesses in accepted cadastral theories and principles. It is hoped that the adoption of a more rigorous case study methodology in cadastral reform will assist in expanding and improving cadastral theory.

The authors consider that this paper is only a first attempt at drawing on the extensive research and scientific rigour in other disciplines to help improve the cadastral reform process. It is hoped that others will build on this initiative to further refine the methodologies and processes.

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