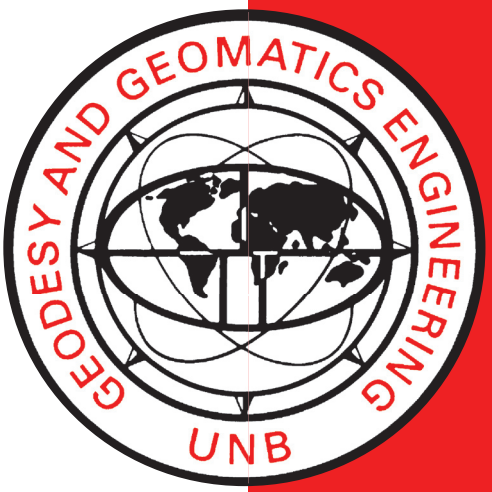
LAND REGISTRATION: MANAGING INFORMATION FOR LAND ADMINISTRATION

S. NICHOLS

August 1993



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PREFACE

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LAND REGISTRATION: MANAGING INFORMATION FOR LAND ADMINISTRATION

Susan E. Nichols

Department of Geodesy and Geomatics Engineering
University of New Brunswick
P.O. Box 4400
Fredericton, N.B.
Canada
E3B 5A3

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PREFACE

This technical report is a reproduction of a dissertation, entitled *Land Registration in an Information Management Environment*, submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department of Surveying Engineering, September 1992. The research was supervised by Dr. John McLaughlin, and funding was provided partially by the Canada Mortgage and Housing Corporation, the Natural Sciences and Engineering Research Council of Canada, and by Energy, Mines and Resources Canada.

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ABSTRACT

A narrow conveyancing perspective in land registration has led to the development of numerous unconnected, specialized registries in most jurisdictions, each maintaining a specific set of land tenure information. A focus on complex legal procedures has also inhibited innovation and system reform. The objective of this research has been to demonstrate how land registration can be more effectively designed to meet broader land management requirements. The conclusion is that this can be accomplished by putting greater emphasis on the information management function of land registration.

This thesis provides a synthesis of land registration from an information management perspective. It examines the requirements for tenure information in land management and land administration and develops models for these processes to demonstrate the potential role of land registration. Problems in existing land registration arrangements and recent trends in system development are reviewed.

A set of conceptual models has been designed to describe land registration functions, processes, information, and systems from an information management perspective. One of the advantages of the models is that they are independent of specific legal, technical, or administrative arrangements. Using these models, the thesis provides a methodology for evaluating land registration systems and requirements, and a framework for identifying appropriate reform options and developing reform strategies.

The research was based on a detailed analysis of requirements in three Canadian jurisdictions, on an evaluation of the Swedish Land Data Bank System, and on site visits in other countries. Although the case studies led to the development of the theoretical models, the research also made practical contributions. The studies became a focus for improved government co-ordination in Newfoundland and the Northwest Territories. In Prince Edward Island the research also contributed to new government policy and departmental reorganization to improve the management of land tenure information.

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ACKNOWLEDGMENTS

Since this research was conducted over a rather long period and in so many places in Canada and around the world, this summary will fall short of acknowledging all of those who contributed information, time, advice, and financial and moral support. To those who are not mentioned directly here, I extend my appreciation for their assistance.

The major sources of funding for the research were the Canada Mortgage and Housing Corporation through their scholarship programme, the Natural Sciences and Engineering Research Council, and Energy, Mines and Resources Canada. Additional logistic support for the case studies was provided by the Royal Institution of Chartered Surveyors through their AUTOCARTO London Trust Award, the Central Board for Real Estate Data (CFD) in Sweden, and the governments of Newfoundland and Prince Edward Island (through the Maritime Resource Management Service). Without this type of support, I could not have gained the breadth of experience on which this study is based.

During the case studies and site visits, literally hundreds of people took time to share their experiences and provide information. I am grateful to all of them. Special mention must be made to key people including Gordon Campbell of the Legal Surveys Division, EMR (formerly Regional Surveyor in the NWT), Jim Ramsay (Director of the Real Property Records Division in PEI), Neil MacNaughton (Director of Surveys for Newfoundland), and many people in the New Brunswick Geographic Information Corporation, including Roger Gaudet (Director of Surveys), Rod MacKenzie (Vice-President Legal), Emilia Sousa (Vice-President Development) and Mary Kimball (Deputy Registrar and Registrar of Land Titles).

But I would like to particularly thank my many friends in Gävle, Sweden who contributed so much to this research, especially Sune Andersson (Director General of the CFD), also Nils-Göran Nilsson, Bengt Kjellson, Bo Línden, and Lennart Frej from the CFD, and Per-Anders Karlgren of the National Land Survey.

At the Department of Surveying Engineering there are again many people who must accept a general thank you for their assistance over the years, including the secretarial staff, the professors, and the Land Studies Group. I have worked with my supervisor Dr. John McLaughlin for more than a decade and he has not only provided extensive financial support, but has also given me the opportunity to gain experience, challenged me to do more than my best, and shared his knowledge and vision. I would also like to thank Dr. David Wells for his assistance, advice, and support, including providing me with a place to write in isolation deep in the woods of New Brunswick this year. Thanks also to the other members of the examining committee for their comments and advice.

I have had many other friends in the profession through the years who have supported my efforts, including Professors Angus Hamilton (UNB), Peter Dale (Polytechnic of East London), and Ian Williamson (University of Melbourne). But particularly during this last year some special people made an extra effort to provide a lifeline to what is referred to as the real world. These include Dr. Chukwudozie Ezigbalike (University of Melbourne), Marianne and Nils-Göran Nilsson (Swedish International Development Agency in Zimbabwe), and here at home Kayleen Bell (Unisys Canada), Jean and Ivan Ford (Champlain Institute), and Professor Gerhard Gloss (UNB). Without their friendship this might never have been completed.

And a very special thank you to my parents who have given me continuous encouragement and assistance through the years. This is the result of their efforts as much as my own.

1. INTRODUCTION

The integrated and interdependent nature of the new [environmental] challenges and issues contrasts sharply with the nature of the institutions that exist today. These institutions tend to be independent, fragmented, and working to relatively narrow mandates with closed decision-making processes. Those responsible for managing natural resources and protecting the environment are institutionally separated from those responsible for managing the economy. The real world of interlocked economic and ecological systems will not change; the policies and institutions concerned must.

UN World Commission on Environment and Development, 1987 [1]

The land will remember our generation and the choices we make. Each generation makes its demands on the land, but ours are no longer modest. Each leaves its legacy on the landscape; ours may be more enduring. Clear cut, contaminated, and washed by seas of oil, the land records our needs and our neglect.

The consequences of our land use decisions no longer respect spatial or temporal boundaries. We have an unprecedented capability to damage the global environment on which life depends. Basic land-related problems such as hunger and homelessness are now international concerns. Land policy issues – from productivity and urban growth to social justice and environmental protection – are as complex as they are critical.

Traditional land management has often failed to find effective solutions. In response the World Commission on Environment and Development has called for an integrated approach – one that recognizes the interdependent nature of economic development, protection of the environment, and institutional reform. To meet the challenges of the next century, this institutional change must be based on a greater understanding of the roles that tenure and land registration play in land management.

This imperative has provided the rationale for the research reported here. The underlying purpose has been to demonstrate how land registration can make a more significant contribution to land management than it has in the past. The major conclusion of the research is that this goal can be accomplished by putting new emphasis on the information management function of land registration.

By viewing land registration from an information perspective, a number of land management objectives can be achieved. It opens new opportunities to develop the necessary linkages between economic development of the land and conventional land management processes. Land registration systems can respond to a greater number of diverse users and help create a basis for informed decision-making, particularly at the local level. A focus on information management also enables system managers to develop more appropriate strategies for reforming the land registration process.

Past research has been more concerned with the narrow role of land registration in conveyancing and property taxation. Standard works concentrate on the legal and administrative arrangements within particular jurisdictions or types of systems.[2] Other research has addressed specific problems in land registration, for example, from a cadastral or an economic perspective.[3] While cadastral research has recognized the information role of land registration, it has usually been presented in the context of converting customary land tenure to registered title[4] or developing more comprehensive land information systems.[5]

More recently land registration has attracted attention on two fronts. Driven in large part by the application of computers and other technologies, improvements in specific systems have been documented in detail.[6] The need for land registration to play a broader role in land development and environmental management has also begun to be addressed, although the potential impact on land registration systems has yet to be explored in depth.[7] Amid the papers on the general issues and the individual system reforms, there is still a need for a more rigorous examination of land registration.[8]

The contribution of this research is to provide a synthesis of land registration within the three dimensional framework illustrated in Figure 1.1. The potential role of land registration in land management, and more specifically in land administration, has been examined to determine land registration functions, objectives, and requirements. From this analysis, new models for land registration have been designed which emphasize the information management function. Of more direct, practical value is the initial development of a model strategy for managing land registration system reforms to meet the land management requirements. These three aspects – land, information, and system management – form the matrix for the research problems and objectives outlined in this chapter.

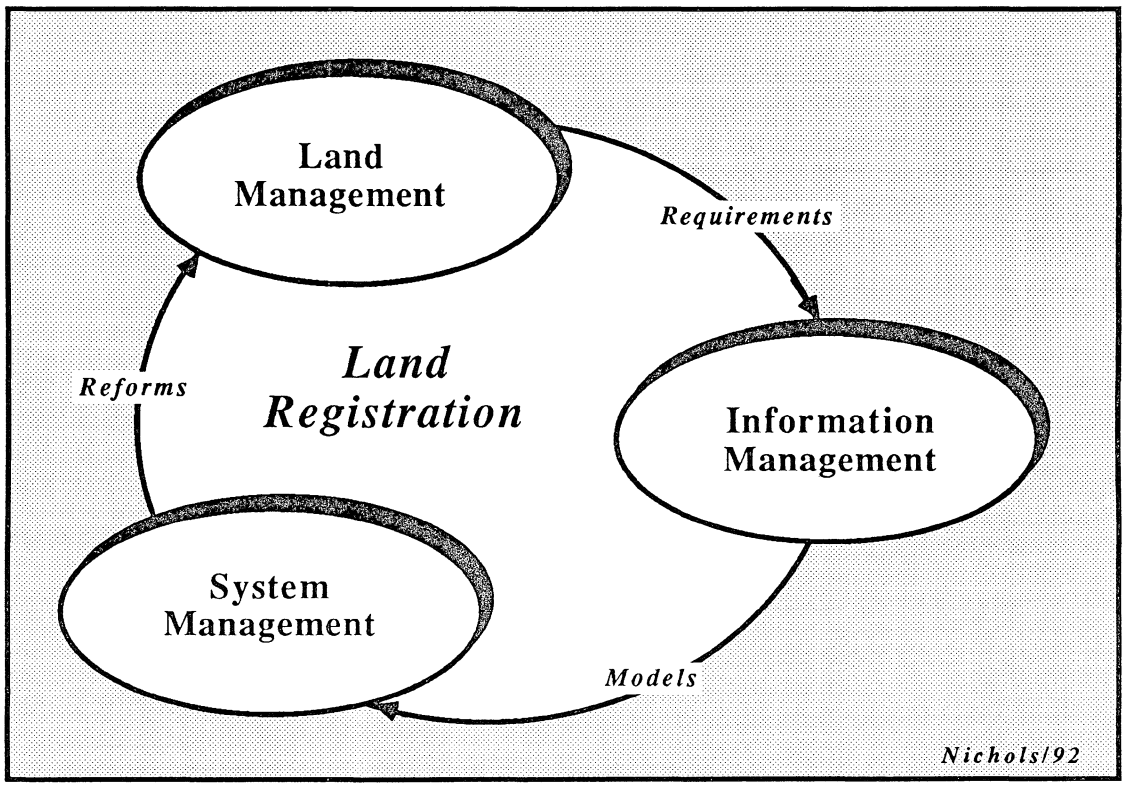

FIGURE 1.1: Land registration in an information management environment

1.1 Land Registration Defined

For this research, **land registration is the official, systematic process of managing information about land tenure.** The purpose of this section is to briefly introduce the terminology and concepts implied by this definition in order to develop a shared understanding of the thesis objectives and scope.

1.1.1 System concepts

A **system** is an organized set of components and relationships among those components.[9] It exists to meet objectives either internal to the system or defined by the external system environment. In a land registration system, for instance, to facilitate conveyancing is an external objective while to store information efficiently is an internal objective.

A **process** is a series of actions or operations undertaken to meet one or more objectives. There are both processes within systems and systems within processes. As used in this thesis, land registration refers to a process which includes the development and maintenance of land registration systems. Similarly, land registration is one process within larger systems, such as land administration or land tenure systems.

A **function** is an action or role for which something specifically exists or is brought into being. It describes what the system or process does or is supposed to do.[10] An **objective** is an end or position to be achieved, and is thus more specific than a function. While information management may be the primary function of land registration, objectives (e.g., to provide information for property assessment) are uniquely defined for a particular system at a particular point in time. As will be shown in Chapter 5, many land registration systems have common objectives.

1.1.2 Information management concepts

Information is **data** that has been processed and conveys a meaning or significance to the user with respect to a specific activity. It is *"a useful organization and selection of facts [or data]...."*[11] What is information to one person, however, may be data to another. For example, a set of boundary measurements in a field book may be considered data to a land manager concerned with the relative location of a parcel of land to a stream. A surveyor may consider this same set of measurements the information required to retrace the boundary. Since data and information are user dependent, the term information is used more often in this work.

As society becomes more dependent on information, as the volume of information expands, and as the ways to collect, process, and transmit information become more diversified, there is a need to recognize and manage information as a resource.[12] **Management** is the effective use of available means to achieve certain ends. It involves setting goals and objectives and then designing and implementing strategies to ensure these are met. Common objectives in **land information management (LIM)** include improving the quality of information related to land, reducing storage costs, or improving public access.

One strategy for achieving such objectives is the design or reform of information systems. A land registration system is an example of a **land information system (LIS)**, which McLaughlin[13] has defined as:

> *a combination of human and technical resources, together with a set of organizing procedures, which results in the collection, storage, retrieval, dissemination, and use of [land] data in a systematic fashion.*

Although this definition and its representation in Figure 1.2 refer to technical resources, an LIS does not necessarily imply the use of computers nor does a computer alone comprise an LIS. The introduction of computers and other information technologies has, however, been a catalyst for reforming land registration systems.

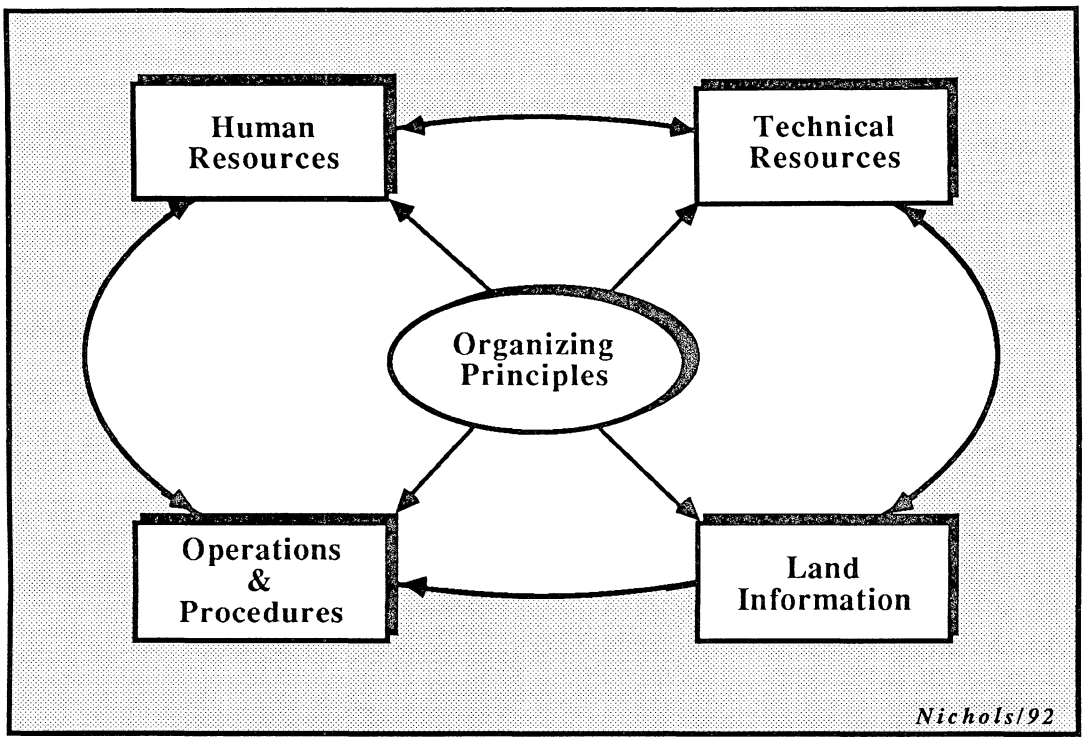

FIGURE 1.2: Land information system

1.1.3 Land tenure concepts

From a legal perspective, **land** may be defined as any portion of the earth over which rights of ownership, stewardship, or use may be exercised,[14] including:

- the earth's surface;
- water covered lands and water resources;
- features and resources, natural and artificial, attached to the earth;
- minerals and other resources beneath the earth's surface;
- well-defined portions of the air space.

Tenure is derived from the Latin *tenere* (to hold) and is *" the act, right, manner, or term of holding something."* [15] In common law tradition, the term land tenure is usually restricted to the well-defined system of estates in land derived from the feudal system of England.[16] **Land tenure**, in the broader sense used here, is an intricate pattern of legal, cultural, economic, and political relationships people have with the

land.[17] Among other things, it is concerned with: how land is valued, used, and regulated; how land is spatially divided among groups and individuals; and how benefits from the land and its development are distributed within society. McLaughlin[18] has defined land tenure more precisely as *"an institution encompassing the rights, responsibilities, and restraints that govern the allocation, use, and enjoyment of land."*

1.1.4 Land registration concepts

Land registration is usually defined in terms of creating a record of property rights. As used in practice, the term land registration system is often further restricted to the register of private, surface land interests. The definition given here, i.e., where **land registration** is the official, systematic process of managing land tenure information, has been chosen to encompass a wider range of interests and information. As illustrated in Figure 1.3, this information can be classified as:

- *information about people* -- i.e., individuals and groups of individuals who have recognized interests in land;

- *information on the nature of these interests* -- i.e., the rights, responsibilities, and restrictions in land, including their duration and their effect;

- *information about the land* -- i.e., the units of land, or land parcels, to which these interests apply, including location, value, resources, and use where appropriate.

The information may be represented in a textual or graphical format and the medium may vary. Even an oral record of the history and status of community tenure might be considered a rudimentary form of land registration if the information is publicly recognized and consistently maintained.

Land registration must be **official** in the sense that the information may be used as evidence of interests in land, for example in resolving disputes or when land is used as collateral. To be **systematic**, there must be policies, standards, and procedures in place to collect, validate, maintain, and provide access to the information.

For this research, land registration systems are classified as being either **primary or secondary systems.** In the former, the main function is to manage information on land tenure, usually for legal purposes. Secondary systems include those in which creating and maintaining a record of land tenure is secondary to the purpose of the system. In some jurisdictions and for some types of interests, secondary land registration, carried out for such activities as property taxation and land use planning, may provide the best available evidence on certain aspects of the land tenure status.

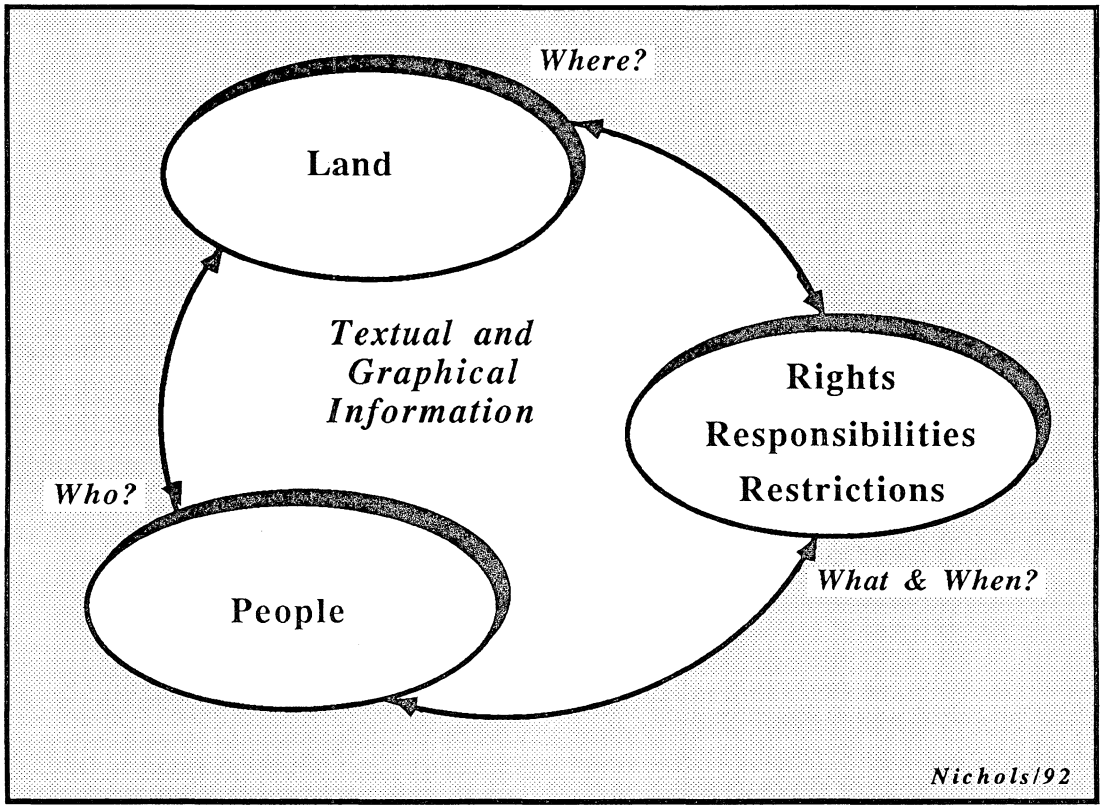

FIGURE 1.3: Land tenure information

A term closely associated with land registration is **cadastre**, defined as *"a record of interests in land encompassing both the nature and extent of those interests."* [19] In this research, a distinction has been made between land registration and cadastre for several reasons. Whereas land registration is a process, a cadastre (e.g., juridical, fiscal, or multipurpose) is actually a product of this process. Creation of a cadastre is an example of an effective strategy for achieving many objectives of a land registration system.

Perhaps more importantly, the term cadastre, as it is used in practice although not necessarily in theory, emphasizes the graphical component of the record, the **cadastral map or plan** that provides either the spatial index for a land register or the description of the land parcels.[20] Some land registration systems have limited graphical information and many of the opportunities for improving land registration exist in better management of the textual information.

1.2 The Land Registration Problems

Land reform and information technology have inspired renewed interest in land registration and have provided the rationale for many projects to introduce improved systems. But project managers have sometimes ignored or misunderstood fundamental problems, technology has not always been used to full advantage, and opportunities to make more effective improvements have frequently been lost.

Many of the difficulties result from three problems which are addressed in this thesis. The first is that the function and objectives of land registration have been too narrowly defined to meet the emerging needs in society for land tenure information. Secondly, unquestioned belief in the merits or demerits of certain land registration models has led to sterile, theoretical debates over systems that were designed, often over

a century ago, to meet the needs of specific countries. Attention has thus been diverted from more fruitful exploration of alternatives that may be more appropriate in a world of changing information requirements. Related to this, but a separate issue, is the problem of how appropriate land registration reforms can be designed and implemented -- what are the requirements and constraints, what are the priorities, and what are the options?

1.2.1 The land management problem - redefining the role

Land regulation has a direct impact on property rights and, conversely, land management decisions are effected through the land tenure system. But this simple connection has often eluded policy makers and planners. As Popper points out in a discussion of why land use plans often fail:

> *The development industry, whose business it is to deal in the commodity of land, is naturally aware of the significance of land ownership. But many persons whose job it is to regulate land apparently don't know or care about this most basic political and economic fact of the resource they guard. Unlike developers, they are profoundly unaware of the inherent polarity of ownership and regulation -- the one aims at private benefit, the other at public benefit. The one means* ***use,*** *the other* ***restraint of use.***[21]

Denman goes further in arguing that only those who hold property rights to individual land units have the positive power to actually execute resource policies and plans.[22] There are ultimately two courses of action for those who wish to regulate land use: restrict the positive power of the land holder or coerce the land holder into compliance through incentives and penalties. In either case, information about land tenure is required by both sides in order to ensure that land management decisions are equitable and effective.

Two strategies to improve the decision-making process are local citizen involvement and an interdisciplinary approach to the issues. To achieve local participation, those who have interests in land -- whether to use, control, or to benefit from the land -- need to know what rights they currently hold and how policies and plans

will affect those rights. To balance environmental, economic, and institutional factors, decision-makers also need access to information about land tenure.

Information alone is not enough, however. Complex resource management decisions require information that is current, reliable, and capable of being integrated with other information about the land and about communities. In a recent World Bank review of environmental management and economic development, the importance of such integrated information to interdisciplinary planning is highlighted:

> *Combined with traditional methods of collecting physical data and the integration of such information with socio-economic data on population,* ***land tenure systems,*** *and so forth, these developments [in information technology] suggest that systematic linking of macroeconomic and resource planning can indeed become a reality. [emphasis added]* [23]

In a land management context, the demands for land tenure information and on the systems that manage this information include:

- service to an increasing number of diverse information users, encompassing governments at all levels, industry, private citizens, and special interest groups;

- provision of efficient access to a wide range of information in different formats and through a variety of mediums;

- procedures and standards that can facilitate integration of land tenure information with information from other sources;

- flexibility to enable new types of tenure interests to be incorporated as land policies change the land tenure framework.

The problem is that land registration systems, the sources of land tenure information, are unable to meet these demands easily. The traditional function of land registration has been narrowly defined as either a means to secure rights of ownership in land or as an administrative aid in such activities as tax collection or state land allocation. Among the consequences of this narrow perspective are the following:

- development of systems to meet the specific needs of traditional user groups, primarily the legal profession and others involved in conveyancing;

- development of a plurality of unconnected, special-purpose systems (primary and secondary) in every jurisdiction, each collecting specific portions of land tenure information for its own mandate and each with its own standards and procedures;[24]

- a focus on land law and complex legal procedures, with only a secondary regard for information services and management of the information;

- an emphasis on legal and administrative tradition that has inhibited innovation such as the introduction of information technologies, development of new procedures, inclusion of new types of information and interests, and consideration of alternative data sources.

These problems, which may be summarized as specialization, inflexibility, and legal complexity, limit the role of land registration in land management. As Dale[25] stated in a recent address on cadastral reform in Australia:

> *It is time to question the philosophy and practice of land registration and to examine the changes that are in progress.*

More specifically, there is a need to redefine the function and objectives of land registration within the broader land management context, in order to design systems that can meet both current and future requirements for land tenure information.

1.2.2 The information management problem - developing new models

A **model** is a representation of some aspect of the real world that is designed to describe features and relationships of interest. It may be used for explanation and illustration, for simulation and design, or for prediction.[26] Because it is only a representation, a model is necessarily biased by what is included, what is left out, and

how emphasis is assigned. In other words, it reflects the perspective and objectives of the creator.

Most of the literature in land registration has been focused on either explaining or comparing various land registration systems. The models derived from these analyses are well recognized and are commonly classified in English speaking jurisdictions as private conveyancing, registration of deeds (and other documents), and registration of title.[27] However, simply because these models have become entrenched in the literature does not mean that they adequately describe reality nor that they are the most useful models, for example, in designing system reforms.

Some of the characteristics and deficiencies of prevailing models (and their classification) are explored more fully include the following:

- The models emphasize exclusive private rights to surface lands and do not adequately represent the registration of other land tenure interests;

- They are based on systems that were developed to meet the historical needs, traditions, and property structures of specific jurisdictions and therefore do not necessarily reflect new requirements, conditions, or system reforms such as automation and privatization;

- The characteristics, including the advantages and disadvantages, attributed to the models do not reflect the wide spectrum of variations among actual systems;[28]

- They are based on legal and surveying distinctions that are often inconsequential compared to information management arrangements that may actually determine how well a land registration system meets its objectives;[29]

- They are often usually inadequate for evaluating systems and strict adherence to particular aspects, such as guaranteed title, has constrained the identification of more appropriate options for reform.

Much of the debate over land registration system reforms has been centred around these simplified, theoretical models. It has therefore been more academic than

practical. What the models represent are two perspectives on land registration: the legal perspective where models are distinguished by procedures, the legal effect of registration, and the degree of state involvement; and the surveying perspective that emphasizes how land parcels are delimited.

If the perspective is changed to a focus on information management, as is proposed in this thesis, then the classical debates (e.g., deeds vs. titles; general vs. fixed boundaries) become less relevant. To promote more constructive evaluation of land registration systems, to design more appropriate improvements, and to take advantage of the broad range of available options, new models reflecting the significance of information management are required.

1.2.3 The system management problem - designing appropriate reforms

Many factors have contributed to interest in land registration reform, including the need to provide better security of tenure and the need to find more efficient methods of handling the increasing number of land transactions. As illustrated in Figure 1.4, land registration reforms can be classified as:

- *first registration* --- sometimes referred to as land titling, in which a system for formally adjudicating and recording land tenure interests is first introduced;

- *system conversion* -- where one type of land registration system replaces another (e.g., conversion from registration of deeds to title registration);

- *system improvement* -- which involves any institutional, administrative, or technical improvement to a system, the most common example being computerization.

It should be noted in this classification that both first registration and system conversion are really subsets of system improvement, particularly when viewed from an information

management perspective. They are separated here because they often involve special issues.

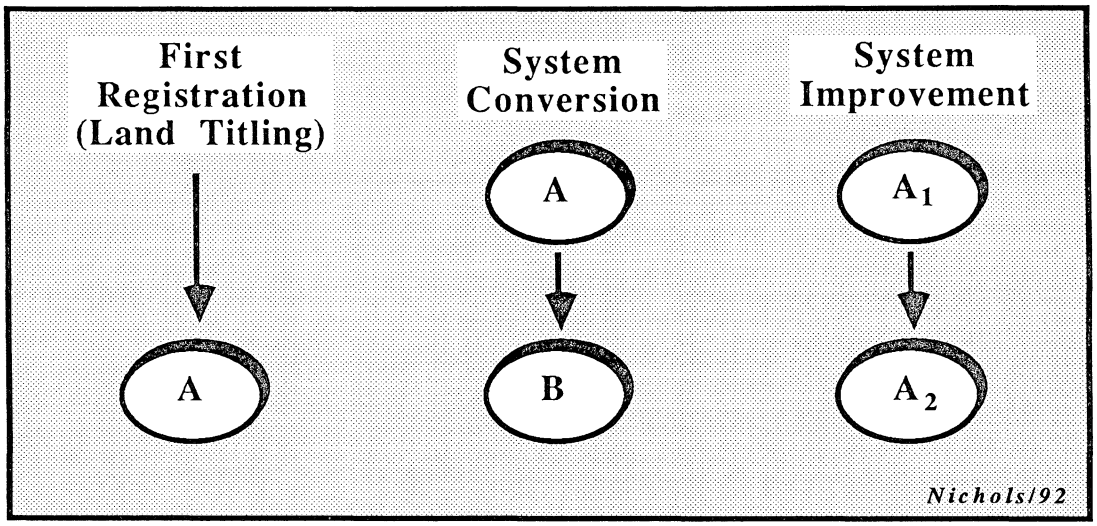

FIGURE 1.4: Types of system reforms

Since most system reforms are still in the design or implementation stages, there have been very few rigorous evaluations to identify, for example, what the actual benefits and costs were, what worked, what did not work, and why? But it is increasingly becoming recognized that there have been problems implementing reforms and actually achieving all of the potential benefits. These problems include the following:

- A poor understanding of the constraints and requirements in a particular jurisdiction, of the limitations of model systems, or of the project objectives has led to inappropriate and therefore less than optimal improvements;[30]

- Some reforms, such as computerization or conversion to a land titles system, have been viewed as a panacea for problems that must be addressed by other measures and more beneficial options have often been ignored;[31]

- There is a tendency to concentrate on technical and procedural improvements at the expense of introducing institutional and administrative change;

- Insufficient attention has been given to the management of land registration systems, which is especially critical to the successful implementation of reforms.

If these and other problems are to be avoided in the future, then there is a need to address such issues as the evaluation of existing systems and requirements, the development of appropriate strategies for reform, and the management of institutional and technical change. All of these topics have been addressed to some degree in the literature, but there is no comprehensive synthesis directly related to land registration. Although to provide such a synthesis is beyond the scope of this research, one goal has been to begin its development.

1.3 Research Objectives and Methodology

This thesis is the result of case studies of land registration systems and land information systems conducted over approximately eight years. The original research objectives have been redefined to respond to problems and possibilities encountered in the case studies. To address the problems outlined in Section 1.2, the thesis objectives are:

1. to systematically examine land management and land administration to determine the role of and requirements for land registration;

2. to design a set of information management models for land registration systems based upon the functions, objectives, and requirements identified;

3. to develop strategies for designing and implementing system reforms, which consider:

    - methodologies for evaluating existing arrangements and determining requirements
    - model strategies for identifying appropriate options for reform
    - special issues affecting the implementation of reforms.

To meet these objectives, the systems development methodology shown in Figure 1.5 was used. Existing land registration and land management arrangements were analyzed to identify functions, objectives, and processes in each case study, from which the general requirements for land registration were derived. The design of model systems and strategies was then based on the findings. To actually perform the analysis, a methodology for evaluating systems was also developed.

The results from each case study were tested in subsequent studies to refine the methodology, the analysis, and the design. This iterative approach mitigated the major limitation of the research – the fact that the models could not be rigorously tested by implementation. Instead they were tested against observations made in other jurisdictions (e.g., how appropriate are the models in this new situation, what is missing and what can be added?). Examples of the application of the models are given within the thesis.

Supplemented by short site visits to 18 other land registration systems in six countries, the case studies form the core of the research. Three studies were undertaken in Canadian jurisdictions: Northwest Territories (NWT);[32] Newfoundland;[33] and Prince Edward Island (PEI).[34] An evaluation of the land registration system in Sweden[35] formed the fourth study. It confirmed the importance of the information management models and provided much of the information for implementing registry reforms. Although no formal study was made in New Brunswick, it has been considered a fifth case since research conducted in this province over the last decade provided significant background information.

The major contributions of each study are summarized in Table 1.1. In Chapter 3, the results of the study in the NWT are emphasized. Appendix I presents the Newfoundland case study in detail as an example of the application of the methodologies and models. Appendix II discusses the PEI case study and the resulting organizational reform and Appendix III describes the Swedish system from a management perspective. Other descriptions of the research and findings may be found in the references.

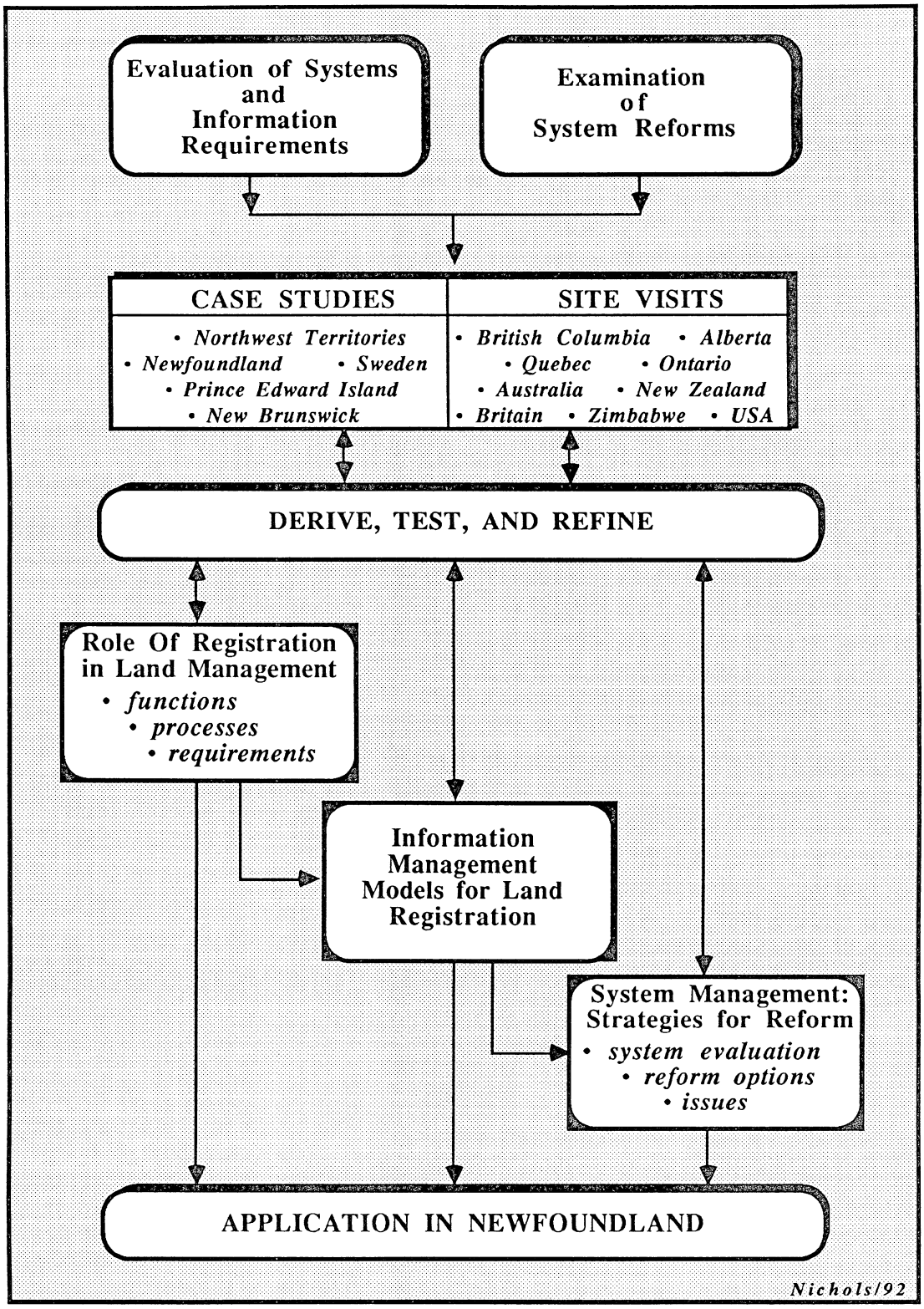

FIGURE 1.5: Research methodology

TABLE 1.1: Contributions of the case studies

CASE STUDY *(years)*	POPULATION & AREA	FEATURES OF PRIMARY REGISTRATION SYSTEMS	MAJOR CONTRIBUTIONS TO THIS RESEARCH
NORTHWEST TERRITORIES *(1983-85)*	52,300 [1986] 3,379,684 sq km	• centralized Torrens land title system • 8 other important registries for leased land, resource and native interests under federal and territorial jurisdiction	• initial development of evaluation strategy • role of land tenure information in resource management and land administration
NEWFOUND-LAND *(1984-86)*	568,400 [1986] 404,517 sq km	• centralized, improved deed system with computerized name & location index • many unregistered and occupational interests & no maps of current tenure	• test/refinement of evaluation strategy, functions, objectives, and requirements • initial development of models and reform strategies
PRINCE EDWARD ISLAND *(1986-87)*	126,700 [1986] 5,660 sq km	• rudimentary deed registry system with 2 district offices • part of prov. gov't land records office with assessment & mapping since 1988	• test/refinement of evaluation strategy, functions, requirements, models and reform strategies • institutional reform: issues and options
SWEDEN *(1989-90)*	8,350,000 [1987] 449,964 sq km	• European land titles system in 95 districts with separate registries for parcel data • automation & integration of info from both systems by separate gov't. agency	• confirmation of info management model and refinement of reform options • managing reform: strategies and issues
NEW BRUNSWICK *background material only*	709,500 [1986] 73, 436 sq km	• rudimentary deed systems in 15 counties; pilot conversion to land titles in one county • part of provincial Geog. Info. Corporation with assessment & mapping since 1989	• issues in converting from deed to title system; institutional issues • development of cadastral survey and mapping reform options and issues

1.4 Research Contributions and Thesis Organization

The contributions of this research are both practical and theoretical. From the practical aspect, the case studies in the Northwest Territories, Newfoundland, and Prince Edward Island were part of actual system evaluation and reform processes. The recommendations of the NWT report were adopted by an intergovernmental LIS workshop in 1987. The analysis of processes and requirements was used as background for subsequent system development within the Regional Surveyor's Office.[36] In Newfoundland the study led to the formation of the interdepartmental Land Tenure Advisory Committee and although no specific actions resulted directly from the study, it provided a focus for discussion and co-operation.

The PEI study was conducted with the Maritime Resource Management Service and the recommendations were adopted as government policy in 1988. The recommended restructuring of government departments to create a Real Property Records Division (land registration, property mapping, and property assessment) was effected in 1989 and land registration reforms are currently under development. The integration of land administration functions recommended in the final report was also adopted as the structure for the New Brunswick Geographic Information Corporation in April 1989.

From an academic perspective, the contributions of the research include the following and are discussed in more detail in Chapter 7:

- development of general models for land administration functions and processes (Chapter 2);

- an examination of the role of and requirements for land registration in land management and land administration (Chapter 2 and 3);

- design of a set of information management models for land registration that are independent of legal, administrative, and technical arrangements and therefore can be used to analyze many forms of land registration in any jurisdiction (Chapter 5);

- development in the case studies of a methodology for evaluating systems and information management requirements (Chapter 6);

- initial design of a framework for identifying and implementing the broad range of options for land registration reform (Chapter 6).

However, the major contribution of this research is to provide a synthesis of land registration from an information management perspective. The synthesis includes the need for land registration (Chapters 2 and 3); why and how land registration systems can respond to the emerging land management requirements (Chapters 4 and 5); and how appropriate strategies for improving land registration systems can be developed (Chapter 6). Conclusions, recommendations, and a more detailed discussion of the research contributions are presented in Chapter 7. Although examples are drawn from the case studies throughout the thesis, additional examples including the results from the final Newfoundland study are presented in the Appendices.

1.5 Endnotes

1 World Commission on Environment and Development [1987], *Our Common Future*. G.H. Brundtland, ch., New York: Oxford University Press, at p. 310.

2 For example, in Sir E. Dawson and V.L.O. Sheppard [1952], *Land Registration*. Colonial Research Publications No. 13, London: Her Majesty's Stationery Office, the origins and principles of land registration are traced but the text mainly concerns the legal/administrative structures in selected countries. A more recent legal text is V. Di Castri [1987], *Registration of Title to Land*, 2 vols, Toronto: Carswell.

3 For example, the economics of deed registration systems in the United States is examined by D.D. Moyer [1977], *An Analysis of the Land Title Record System*, Ph.D. Dissertation in Economics of Information, University of Wisconsin, Madison, WI; World Bank research on the economics of providing security of title through land registration in Thailand is summarized by G. Feder, et al. [1988], *Land Policies and Farm Productivity in Thailand*, Baltimore: The John Hopkins University Press.

4 Examples include S. R. Simpson [1976], *Land Law and Registration*, Cambridge: Cambridge University Press; L.C. Holstein [1987]. "Considerations for land registration improvement for less developed countries," 3rd World Bank Seminar on LIS, Washington, March, 1987.

5 For example, J.D. McLaughlin [1975], *The Nature, Function, and Design Concepts of Multi-purpose Cadastres*, Ph.D. Dissertation in Civil and Environmental Engineering, University of Wisconsin, Madison, WI.; P.F. Dale and J.D. McLaughlin [1988], *Land Information Management: An Introduction with Special Reference to Cadastral Problems in Third World Countries*, Oxford: Clarendon Press; D. Jeyandandan and I.P. Williamson [1990], "A cadastral model for developing countries," In *Papers and Proceedings from the National Conference on Cadastral Reform '90*, Dept. of Surveying and Land Information, University of Melbourne, Australia, pp. 81-93.

6 Among the many reports and summaries of developments are those published by the Australian Urban and Regional Information Systems Association (AURISA), including I.P. Williamson, ch. [1985], *Report of the Working Group on Statewide Parcel-Based Land Information Systems in Australasia*, AURISA, Sydney, New South Wales; a description of one of the most highly automated systems is found in S. Andersson [1987], "The Swedish Land Data Bank System," *International Journal of Geographic Information*, 1(3), pp. 253-263; Deed registry systems have been given less attention, but see for instance, B. Dansby [1987], "Automation of title search and examination," In *Papers from the Annual Conference of the Urban and Regional Information Systems Association*, v. I, Fort Lauderdale, FL, August, pp. 87-100.

7 A very recently published work that paralleled the development of this thesis is G.H. Larsson [1991], *Land Registration and Cadastral Systems: Tools for Land Information and Management*, New York: John Wiley and Sons. Larsson addresses the major topics presented here from a more practical perspective with emphasis on European systems and on improving land registration and cadastral systems in developing countries.

8 Perhaps the most provocative call for reform has been made by P.F. Dale [1990], "International trends in cadastral reform - or registration of title, is it time for a change?" In *Papers and Proceedings from the National Conference on Cadastral Reform '90*, Dept. of Surveying and Land Information, University of Melbourne, Australia, pp. 1-9; also see J.L.G. Henssen [1990], "Cadastre: indispensable for development," *ITC Journal*, 1990-91, pp. 32-39; S. Nichols and J. McLaughlin [1990], "The information role of land registration in land administration," vol 7, *Proceedings of the XIX Congress of the FIG*, Helsinki, June, pp. 105-114; L. Holstein, [1990], "The cadastre as a tool of resource management in developing countries," In *Pre-Prints of Surveying 2000*, RICS and

CASLE, pp. 25-52; J. .D. McLaughlin and S.E. Nichols [1989], "Resource management: the land administration and cadastral systems component," *Surveying and Mapping*, 49(2), pp. 77-85; J.D. McLaughlin and I.P. Williamson [1985], "Trends in land registration," *Canadian Surveyor*, 39(2), pp. 95-108; G. Larsson [1975], "Social and administrative functions of a cadastre: environmental studies, planning, and administration," *Canadian Surveyor*, 29(1), pp. 75-81.

9 This definition and others in this section have been derived from standard dictionaries to meet the purposes of this thesis.

10 J.A. Perrolle [1987]. *Computers and Social Change: Information, Property, and Power*. California, Wadsworth Publishing Company, at p. 17.

11 *supra*, note 10, at p. 4.

12 See, for example, J. Diebold [1985], *Managing Information: The Challenge and the Opportunity*, New York: American Management Associations.

13 J.D. McLaughlin [1985], "Land information management," Unpublished lecture notes, Dept. of Surveying Engineering, University of New Brunswick, Fredericton, N.B.; also see J. D. McLaughlin and S.E. Nichols [1987], "Parcel-based land information systems," *Surveying and Mapping*, 47(1), pp. 11-29.

14 R. Barlowe [1978], *Land Resource Economics*, 3rd ed., Englewood-Cliffs, NJ: Prentice-Hall, at pp. 9-12.

15 *Webster's New Collegiate Dictionary* [1975], Toronto: Thomas Allen & Son Limited.

16 Such interpretations are summarized, for example, by D.M. Walker [1980], *The Oxford Companion to Law*, Oxford: Clarendon Press, at pp. 712-713; this emphasis on common law estates is also followed by S. R. Simpson [1976]. *Land Law and Registration*, Cambridge: Cambridge University Press, at pp. 26-39. Note, however, that Simpson refers to systems of customary land tenure systems in later chapters; also see *Black's Law Dictionary* [1979], 5th ed., St. Paul, Minn.: West Publishing Co., p. 1317.

17 A broader concept of land tenure is explored in a seminal paper by P. Bohannan [1963], " 'Land', 'tenure' and 'land-tenure', " *African Agrarian Systems*, D. Biebuyck, ed., Oxford: Oxford University Press; reprinted as LTC Reprint No. 105, Land Tenure Center, University of Wisconsin, Madison, WI.

18 J.D. McLaughlin [1980], Unpublished lecture notes in cadastral studies, Department of Surveying Engineering, UNB, Fredericton, N.B.

19 J.D. McLaughlin [1975], *supra*, note 5, at p. 1.

20 This trend was illustrated at a recent conference on cadastral reform, where the majority of papers actually concerned the survey and mapping component of the cadastre -- D. Jeyanandan and G.J. Hunter, eds. [1990]. *Papers and Proceedings from the National Conference on Cadastral Reform '90*, *supra*, note 5; a similar practice is evident in two widely cited cadastral reports, which also emphasize the surveying and mapping issues -- U.S. National Research Council (NRC), Panel on a Multipurpose Cadastre [1980], *Need for a Multipurpose Cadastre*, and [1983], *Procedures and Standards for a Multipurpose Cadastre*, Washington: National Academy Press.

21 F.L. Popper [1978]. "What's the hidden factor in land use regulation?" *Urban Land*, 34(11), pp. 4-6, at p. 4.

22 D.R. Denman [1978], *The Place of Property: A New Recognition of the Function and Form of Property Rights in Land,* Berkhamsted, Herts, UK: Geographical Publication Limited, at pp. 38-39.

23 J.J. Warford [1989], "Environmental management and economic policy in developing countries," in *Environmental Management and Economic Development,* G. Schramm and J.J. Warford, eds., Baltimore, MD: John Hopkins University Press, at p. 13.

24 To cite only one example here, in the Northwest Territories, there are at least 8 major, unconnected, primary registries under either federal or territorial jurisdiction. The land titles office had only about 16,000 current and historical titles in 1985 and, in terms of economic value, is a minor registry compared to those concerned with resource rights. The recent process of transferring the administration and ownership of large areas, including resource rights, to aboriginal groups will probably increase this complexity.

25 Dale, *supra*, note 8, at p. 2.

26 P.J. Denning [1990], "Modelling reality," *American Scientist,* 78, November-December, pp. 495-498, at p. 496.

27 See, for example, S.R. Simpson [1976], *supra*, note 4, at p. 124; Dale and McLaughlin [1988], *supra*, note 5; McLaughlin [1975], *supra*, note 5, introduces different models and classifications which are examined in more detail in Chapter 4.

28 This is especially true of the classification of deed registry systems which may range from rudimentary and voluntary filing of documents to sophisticated examination and indexing procedures.

29 For example, one often cited objective is to facilitate conveyancing and a related problem is the time delay before the transaction takes effect. In large centralized land title systems (e.g., Australia) the time for examination and final registration has often been in the order of several months. Yet the models do not distinguish these systems from other Torrens title systems (e.g., Alberta and British Columbia) that, through better administrative arrangements such as decentralization, can process a transaction in several days.

30 For example, a World Bank project in Yemen involved the implementation of an integrated (co-ordinated) cadastral survey system which was inappropriate because, among other reasons, there was insufficient trained staff in the country to maintain the system, R. Anderson [1991], "Land registration in developing countries: the Yemen experience." Unpublished Graduate Seminar Paper, Dept. of Surveying Engineering, UNB, Fredericton, N.B.

31 Until recently in Atlantic Canada, for instance, the focus on conversion to a land titles system limited development of other deed registry improvements and opportunities to provide better information services were lost.

32 S. Nichols [1985]. *Towards the Development of a Land Information Network in the NWT: An Assessment of Information Requirements,* and [1983], *Land Information Requirements in the Northwest Territories: A Preliminary Assessment.* Contract reports for the Legal Surveys Division, Surveys and Mapping Branch, Energy, Mines and Resources Canada, Ottawa, 167 pp. and 52 pp. respectively.

33 S. Nichols [1987], *Requirements for Land Tenure Information in Newfoundland,* Contract report for the Lands Branch, Newfoundland Dept. of Forest Resources and Lands, St. John's, Newfoundland, 74 pp. and [1984], *A Preliminary Assessment of Land Information Requirements in Newfoundland,* Unpublished technical report, Department of Surveying Engineering, University of New Brunswick, Fredericton, N.B., 52 pp.

34 S. Nichols [1988], "A new strategy for land information management in PEI," Graduate seminar paper, Dept. of Surveying Engineering, University of New Brunswick, Fredericton, N.B.; and in association with Maritime Resource Management Service, Inc. [1987], *A Corporate Approach Towards Land information Management in the Province of Prince Edward Island: Final Report,* [1987], *A Recommended Strategy for Land Information Management for the Province of Prince Edward Island,* [1986], *The Land Information Management Environment in Prince Edward Island (background report),* Contract reports for the Government of Prince Edward Island, Charlottetown, P.E.I.

35 S. Nichols [1989], "Management of an LIS: What can be learned from Sweden?" Paper presented at a Special International Workshop on Land Registration, Dept. of Surveying Engineering, University of Maine, Orono, ME.

36 The study findings were reported in Energy, Mines and Resources Canada, Legal Surveys Division [1985], *NWT External User Needs Study,* Canada Lands Information Environmental Study External Report, EMR, Ottawa.

2. THE LAND MANAGEMENT REQUIREMENTS

> *To make a decision... on how the land, water, and minerals of a nation will be used is of no consequence in the ultimate event unless he who makes the decision has the power of execution also. The positive power to execute is synonymous with the power to use, dispose of, and alienate – the property power.*
>
> *Denman, 1979*[1]

Information is the foundation for making, implementing, and enforcing land management decisions. Those involved in the management process – from public policy makers to private developers – require information about the potential environmental and economic impacts of land-related activities. They also require information about land tenure because the implementation of plans and policies ultimately rests in rights to use, control and benefit from the land and its resources.

Without appropriate information about the nature of land tenure, the land management process is clouded with uncertainty. Land investment will be carried out with caution if at all, responsible use of the land can be discouraged, and community harmony may be endangered. As custodians of land tenure information, land registration systems have an essential role to play in land management.

The objective of this chapter is to examine the role of land tenure in land management to determine general requirements for land registration and to set the stage for a more detailed analysis of land administration in Chapter 3. Figure 2.1, which is based on the thesis components presented in Figure 1.1, illustrates the framework for this analysis. As background for the discussion on land management, the concepts of land tenure and property are first explored.

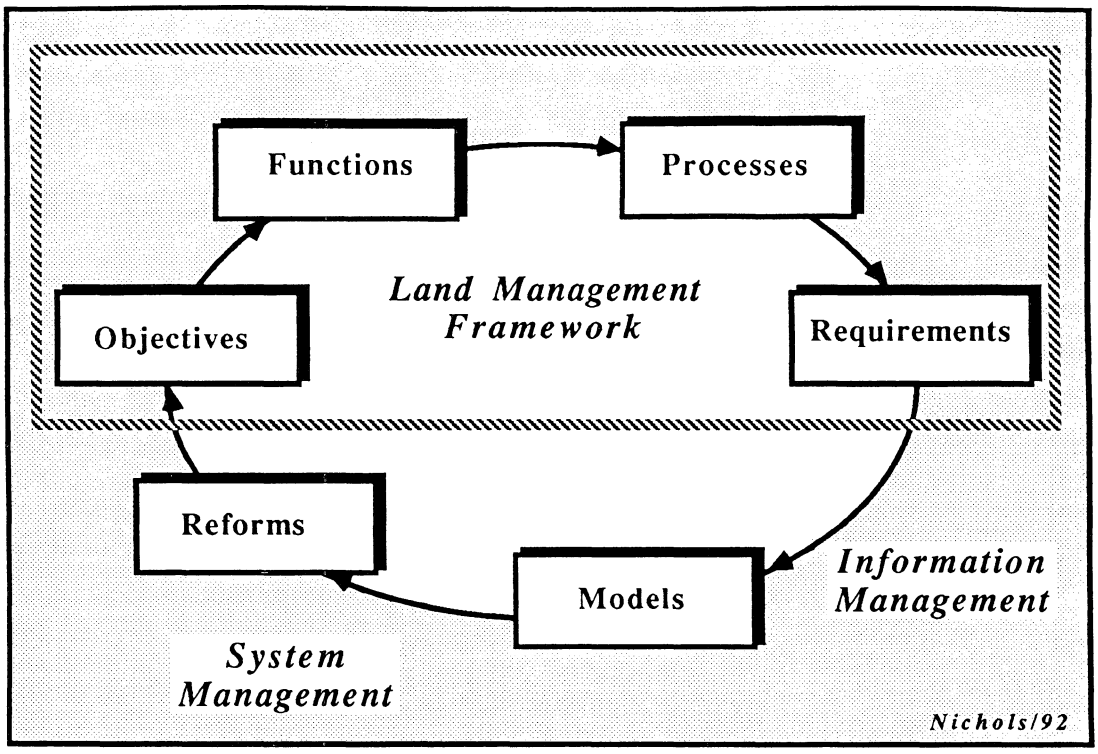

FIGURE 2.1: The land management framework

2.1 Land Tenure

The literature on land registration generally focuses on property or the set of rights people have with respect to the land. Unfortunately the term property is often equated with private property, thus limiting the understanding of other interests such as community rights, rights recognized by custom, restrictions, and obligations people have with respect to the land. In this work the term land tenure is used to include private property arrangements but also other interests with significance to land management.

2.1.1 Real property

According to MacPherson, property is a set of enforceable rights, held by individuals, to the use or benefit of some object.[2] As an institution, property comprises established, legally recognized relationships among people that govern their behavior with respect to the resources they control as a community. Individuals may include quasi or artificial persons that act as individuals, such as married couples, corporations, co-operatives, aboriginal groups, or governments.

The role of a property system is to define who will be included in or excluded from the enjoyment of resources and what conditions will apply. Property rules establish a framework for allocating scarce resources and for enforcing nonviolent solutions when these claims are in competition or are perceived as inequitable. As summarized by Ackerman, "*...the law of property considers the way rights to use things may be parcelled out amongst a host of competing resource users.*" He adds that "*..the ways in which user rights may be legally packaged and distributed are wondrously diverse.*" [3]

Land has unique characteristics that make it a fundamental object of property in every society. Since it is an essential element in most human activities, land has value (economic and cultural) and is subject to claims for exclusive control by individuals and groups. Land is also immovable and in theory indestructible, enabling a successful claimant to actually recover the lost property object rather than only receive compensation for damages. To reflect this real action of recovery, the common law classifies land as real property.[4]

The land itself is not property; property is the set of rights in land, enforceable either through custom or law. In common law the rights and interests held by an individual are called an estate; title refers to the legal relationship between the holder and the estate.[5] Classifications of these estates, such as freehold and leasehold, are derived from the feudal system of land holding in England. Property interests and estates in land

are also classified as being either legal (protected by law) or equitable (traditionally protected only by the courts of equity). This distinction is still important in many common law jurisdictions when determining the effect of interests in land and sometimes how they are recorded.[6] But the question of whether an estate is equitable or legal is specific to the land law (including law reforms) of the jurisdiction.[7]

2.1.2 Property systems

Property systems describe how the relationships among people with respect to the land are defined and enforced. Specific property systems reflect cultural traditions and the dominant values in a society and thus often favour specific groups based on such criteria as race, gender, and social class. Property is therefore a political as well as a legal institution.

In describing property systems, three general classes of relationships can be distinguished:[8]

- *private property* – where an individual has the right to exclude all other individuals from the use or benefit of land;

- *common property* – where, by membership in a group, individuals have the right not to be excluded (e.g., communes, public highways, certain condominium areas);

- *state property* — which is private property held by the state as an artificial person or corporation, although lesser interests may be allocated to others (e.g., Crown and municipal lands).

No society has a pure system of private property in land and even in systems where all land is held by the state, some private and common rights (however limited) will exist. Or as Runge explains:[9]

> *... it is possible to identify a rather wide continuum of...property institutions operating in the real world. These institutions are composed*

> *of a mixture of rights to exclude and be included. At one end are the cases in which each individual has a full right to exclude others from everything he or she owns – pure private property. At the other end are cases of purely common property, in which each has a full right to be included in particular resources. In reality, we seldom see property rights defined over resources which do not have some blend of these exclusionary and inclusionary characteristics.*

Among the roles or functions of property systems are the following:[10]

- allocation of access to land resources, and thus access to power, status, and wealth, within society;

- allocation of scarce resources among competing uses, including present and future uses;

- provision of incentives to individuals to invest in improving land, by granting control and ensuring security;

- reduction of bureaucratic decision-making and adjudication and the associated costs, through delegation of all or part of the rights to individuals and smaller groups of individuals.

Property is a dynamic institution, and today systems in many parts of the world are undergoing significant change. Where full exclusive individual rights have predominated, environmental issues are beginning to demonstrate the need to protect community rights as well. At the same time, exclusive rights are now being defined for resources that were once considered common property (e.g., ocean resources, ground water, and even in a limited way, the air). In many nations, equity issues are forcing changes in how rights are distributed. Economic and environmental problems related to common property systems in Eastern Europe are causing major reforms, a situation indirectly predicted by Hardin in his article entitled "The Tragedy of the Commons."[11] Part of the impact of these and other changes is the need to revise how and what rights are recorded and protected.

2.1.3 Land tenure: broadening the property horizons

Land tenure has been defined as the rights, responsibilities, and restraints people have with respect to the use and benefit of the land. It is a key concept in broadening the perspective on land registration and on society's relationship to the land in general. It encompasses property, but the formal real property system is only part of the land tenure arrangements in society. Among the reasons for focusing on the term land tenure in this research are:

A Greater Focus on Land and People: Property emphasizes rights or relationships; the object of property – i.e., the land – is often forgotten. This is reflected in land registration because in many jurisdictions the description of the land is given very low priority and there is only limited information about land and people. One objective of this research is to broaden the concept of what is registered and more generally, of what land registration is all about, so that it can better respond to needs other than legal questions about property rights.

A Wider Range of Systems: As mentioned earlier, property is very often associated with private property and in common law with the particular set of estates derived from the English feudal system. These systems are changing and this needs to be reflected in land registration. Furthermore, there are many other types of tenure arrangements that need to be emphasized in land registration.[12] The term land tenure gives greater recognition to the plurality of cultural values and customary as well as legal relations with respect to land.

A Broader Definition of Interests: Property focuses on rights. Restrictions on those rights (e.g., land use regulations, leases, or easements) and responsibilities associated with the rights (e.g., financial, legal, environmental, or social) can be

considered as rights held by others (e.g., mortgagor, the community, leasee, or the government).[13] The reason for specifying restrictions and responsibilities in this research is to give these important sets of interests more emphasis and in particular to include interests which may not be now recognized as the subject of registration.[14] The literature on land registration also gives little attention to systems for registering resource rights, building rights, zoning restrictions, or personal liens that affect real property.

Recognition of the Changing Land Relationships: Land tenure systems are dynamic. The general trend in western societies from feudal relationships, to a use-value concept of land where exclusive, individual rights are based on productive use of the land, to an exchange value concept where land is considered a commodity, and more recently to a shift toward land stewardship, has been described by McLaughlin[15] and others.[16] Land tenure is not limited (as property often is in practice) to the set of relationships derived from the use-value or commodity concepts. It allows new relationships to the land, such as the responsibilities arising from land stewardship, to be expressed. If land registration systems are to respond to future needs, then land stewardship requirements are important in defining the functions of land registration.

2.1.4 Land tenure systems

A land tenure system consists of the organized and established institutional arrangements in society that govern how land and resources are allocated, used, and enjoyed. These arrangements range from the underlying philosophies that guide the distribution of rights and responsibilities to the formalized procedures and bureaucracies that secure and enforce them. Land tenure systems may be classified in terms of:

- the degree of legal codification;
- the relative emphasis on rights, restraints, and responsibilities;
- the relative emphasis on individual, collective, or state rights.

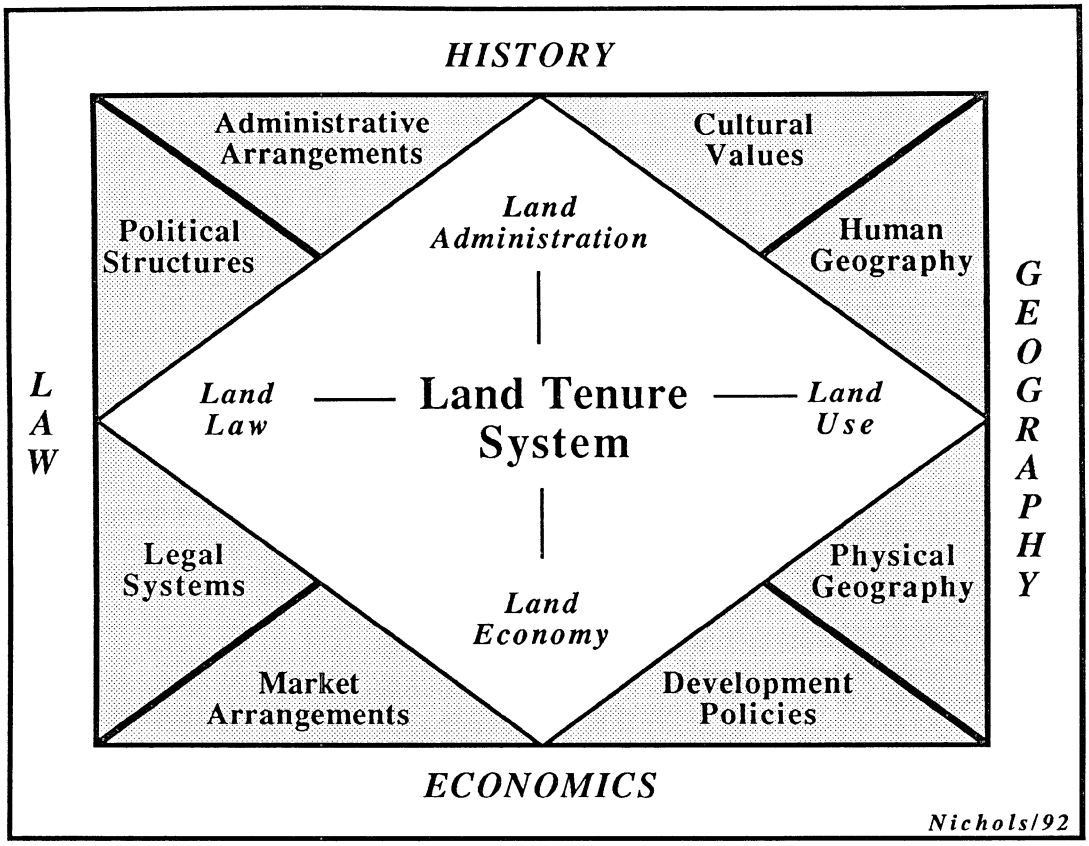

FIGURE 2.2: Important factors in describing land tenure systems

Figure 2.2 illustrates many of the inter-related influences that should be considered in describing land tenure systems. In this section, four of these are briefly described as an introduction to land management and administration.

Land Law: The law defines the property relationships that are the core of the land tenure system. Land tenure may be customary (undocumented customs and interests accepted as binding upon members of the society), codified (documented as in civil codes, judicial decision, legislation, and regulations), or some mixture of both. Customary or informal tenure can offer major challenges in developing cadastral

systems. In Newfoundland, for example, where the traditional means of acquiring land in the many isolated settlements was through occupation, the incomplete records of land tenure have hindered cadastral mapping, property assessment, and land registration improvements.[17]

Land Economy: Land economy is concerned with the *"economic relationships people have with the land."*[18] Ely defined land economics as a *"science which concerns the utilization of the earth's surface or space, as conditioned by property and other institutions."*[19] The primary influences on land tenure are the land markets, i.e., the conditions affecting land transactions including credit arrangements, and the economic development policies (formal and informal) that affect land. Thus, for example, a policy to encourage agriculture may involve the provision of property-related incentives such as transfer development rights, deferred taxation, or broader land reforms to improve the quality and security of tenure interests.[20]

Land Use: While land use is often considered a subset of land economy, it is isolated here to emphasize not only how land use affects and is affected by property relationships, but also the importance of such factors as settlement patterns, ethnic factors, urbanization trends and issues, and in general the ways in which people have adapted to and used the physical resources available. Often the historical land use patterns are as important in understanding a land tenure system as the current land utilization.

Land Administration: Land administration is concerned with the management of the land tenure system, including arrangements for monitoring and enforcing many of the laws and regulations affecting tenure. In any country, land administration is a product of the political and social development of the nation. While the public sector (at all levels of

government) usually forms the major part of land administration, the role of the private sector may also be important, particularly in controlling how interests are created, transferred, secured, and controlled. The more specific role of land administration is discussed further in its relationship to land management.

2.2 Land Management

Land management is defined here as the process of making and implementing decisions about how land and its resources are distributed, used, and protected in society. While individual land holders are part of the land management process, the emphasis in this section is on the public land management role. The objective is to outline the functions and processes in land management to demonstrate the importance of land tenure and land tenure information.

For the purposes of this research, a broad interpretation of land management has been taken, one which includes both resource management and land use management as shown in Figure 2.3. It is recognized that in practice, the management of any land use or resource cannot be considered in isolation, but the diagram illustrates the relative complexity of various activities.

2.2.1 Objectives and functions

O'Riordan has defined resource or land management as:

> *the process of decision making whereby resources are allocated over space and time according to the aspirations and desires of man within the framework of his technological inventiveness, his political and social institutions, and his legal and administrative arrangements.*[21]

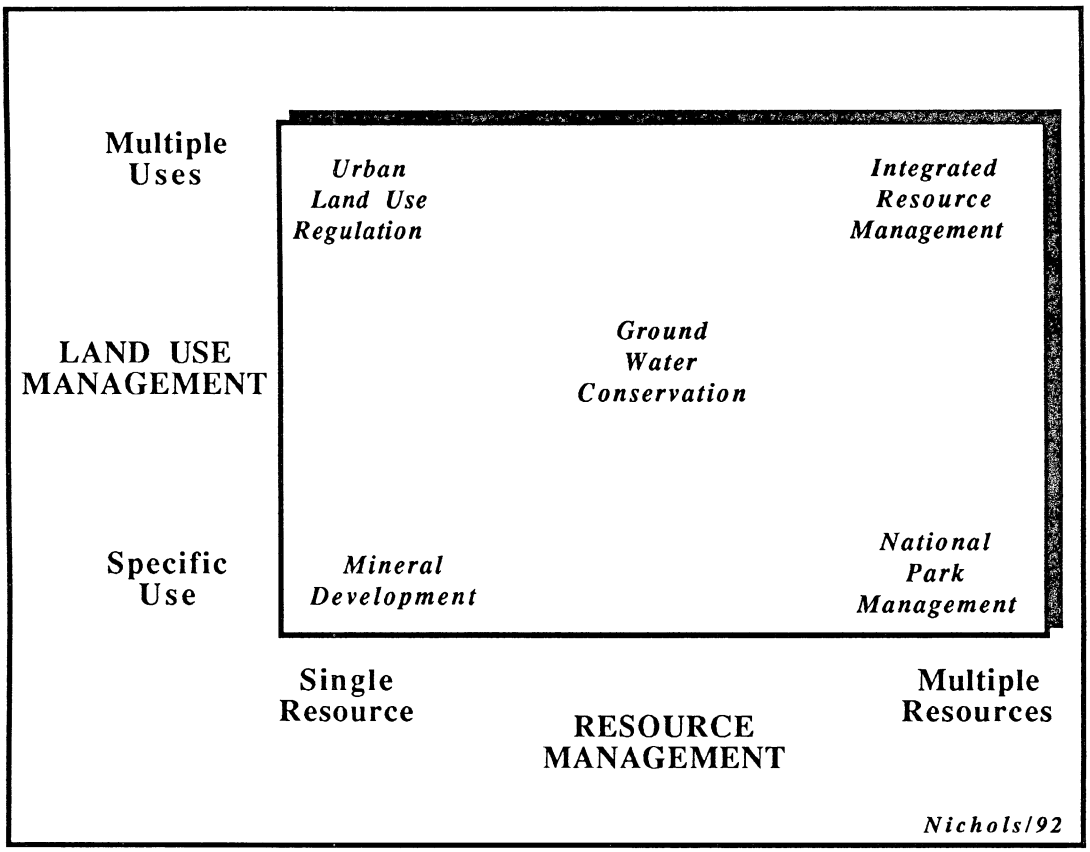

FIGURE 2.3: Examples of land use and resource management

This process can be viewed from many perspectives, but the two primary views are economic and environmental. In Figure 2.4, which illustrates the functions of land management, a third perspective is added. The institutional dimension has always existed, but until recently its explicit role in land management has been given less attention. [22]

From the environmental perspective, land management is concerned with the great diversity of chemical, physical, and biological factors, their complex and interdependent relationships, and the effect of human activities on the delicate balance that exists in nature. Ensuring that these activities do not create a permanent imbalance or detrimental effect has been the major objective from this perspective. Therefore one of the primary land management functions can be defined as protection. But what is

considered detrimental or what degree of protection is required are value judgments and have often been at issue when environmental views are in conflict with economic and social development.[23]

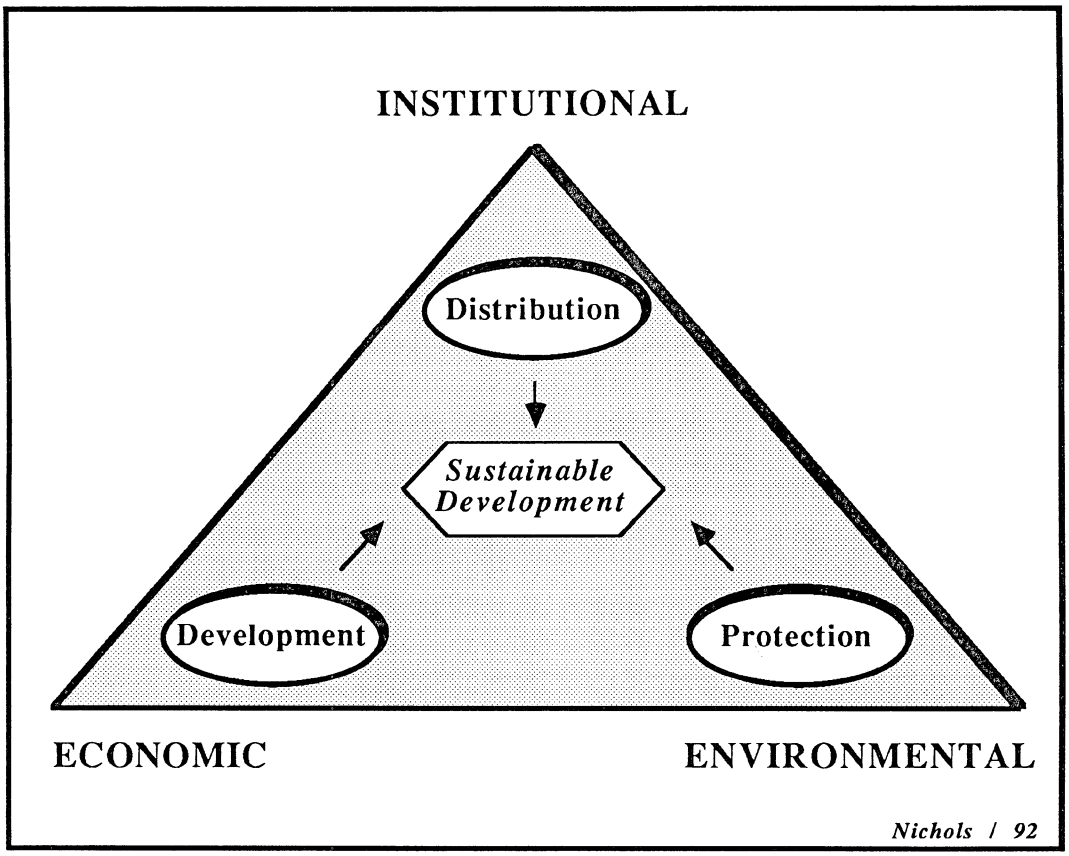

FIGURE 2.4: Land management functions and the objective of sustainable development

From the economic perspective the main objective is the creation of wealth through the use and development of the land and its resources. Land is viewed as a commodity with an economic value. Resource development is driven and controlled by the markets and projects are assessed on the basis of their relative benefits and costs. In such environmental accounting, land management priorities are generally assigned solely on the basis of the perceived economic consequences. One of the problematic

consequences of the economic perspective are negative externalities, e.g., costs to the environment or society which are not accounted for in the developer's production costs.

One objective of land management from an institutional perspective is to use the property system to internalize these externalities, e.g., through greater protection of community rights and through creation of incentives and disincentives to discourage or eliminate certain land uses. For example, rather than simply enforcing strict anti-pollution laws, the U.S. Environmental Protection Agency initiated an incentive program in which marketable credits (or rights to pollute) are issued to industries for meeting emission standards. These credits can be used to ease emission standards in other company plants or can be bought and sold to others. The principle is that through the market the overall emission standards will be met; even if some plants exceed the standards others will fall below them.[24]

The institutional perspective recognizes the social priorities and arrangements that control the distribution and use of the land. Education, law, family, religion, and politics are all part of the institutional setting within which land resource decisions are made and implemented. But it is through the land tenure arrangements that the distributive function of land management is achieved.

Land management objectives depend on the priorities within a particular society, its needs and constraints, and the opportunities afforded by the resources available. But one objective – sustainable development – has been the focus of considerable attention in recent years. The World Commission on Environment and Development has defined this term very simply as development which *"meets the needs of the present without compromising the ability of future generations to meet their own needs."* [25] In essence this is conservation restated, where conservation may be defined as *"the wise use of resources over time."* [26] To achieve sustainable development, there must be a balance between economic and environmental goals and greater recognition must be given to social goals and the role of institutions in land management.[27]

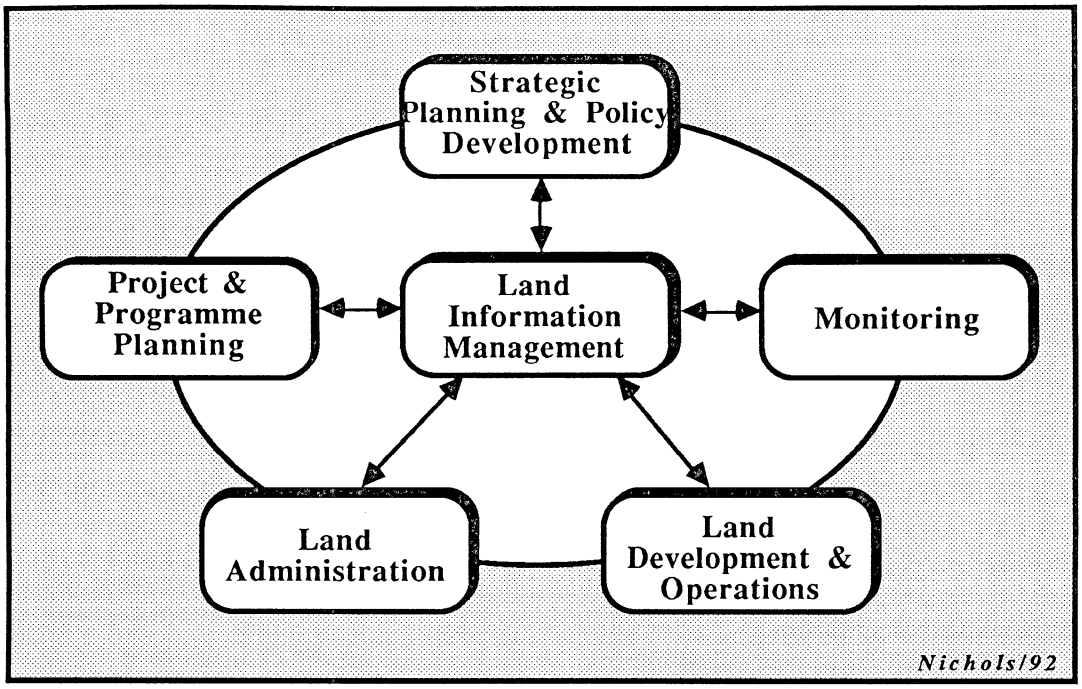

FIGURE 2.5: Primary land management processes

2.2.2 Processes

Figure 2.5 illustrates the main processes or activities of land management which are carried out to achieve the functions and objectives described above.[28] They are:

Strategic Planning and Policy Development: A policy is broad guideline that outlines goals and acceptable procedures. It can set out a course of action that enables the goals and objectives to be met. It is usually the result of a strategic planning process in which general needs, constraints, opportunities, and options are evaluated to determine appropriate goals and measures.

Project and Programme Planning: This is referred to as administrative and operational planning by Lang and Armour[29] and consists of developing more specific

objectives and devising the detailed means for achieving these objectives. It also involves organizing the available resources for carrying out the plans and deriving criteria by which projects and programmes can be evaluated.

Land Administration: As the management of the land tenure system, this is the means by which the distributive function is achieved and is the basis for development activities (e.g., the right to use the land) and many activities related to environmental protection (e.g., creation and enforcement of land use restrictions).

Land Development and Operations: These are the activities outlined in policies and plans as the means for achieving the particular goals and objectives. They range for instance from the development of physical infrastructure (e.g., highways, reservoirs) to co-ordinating and mobilizing various public and private organizations to effect an environmental strategy (e.g., putting a coastal zone management plan in place).

Monitoring: Lang and Armour identify two forms of monitoring: pre-action and post-action.[30] The former includes the identification of problems and opportunities that require policy and planning action. The latter is the control mechanism for the management process and compares the situation (e.g., as measured for example by water quality, soil loss, regional employment, or property values) against the criteria established in the planning phases and the original policy goals.

Information Management: The effectiveness of all of these processes depends in large part on the management of information. Information – on the environment, on land and resource use, and on land tenure – assists in:

- reducing uncertainty in making decisions, although it should be noted that *"uncertainty can be a function of too much information, not just too little"*;[31]

- identifying and evaluating appropriate courses of action;
- monitoring the results of the actions taken.

However, the goal is not simply to collect as much information as possible,[32] but to manage appropriate information well. This involves for instance evaluating information requirements, organizing the information to meet these requirements, and controlling how information is accessed, presented, and used.

2.3 Land Administration

Land administration has been defined for this research as the management of the land tenure system. The purpose of this section is to outline the functions and processes involved, and in particular to show the relationship of land registration to land administration and land management.

2.3.1 Objectives and functions

The objectives of land administration will be set within the context of the broader land management objectives. If for example, the land management objective is to facilitate economic development through the inventory, extraction, and sale of natural resources, then the objectives for land administration might include the development of efficient systems to allocate rights to these resources, to provide security for private investments, and to prevent and resolve disputes. If the specific land management objective is to minimize the conversion of agricultural lands to urban land use, then the land administration objective may be to monitor land transactions to enforce compliance with land use and development regulations.

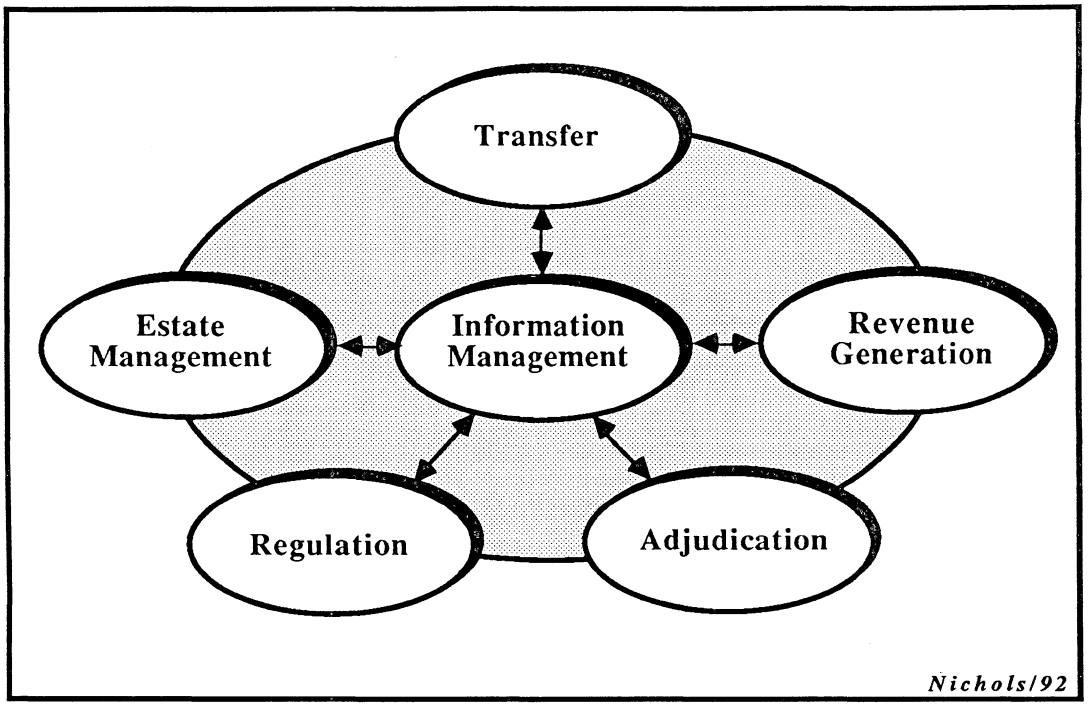

FIGURE 2.6: Land administration functions

Figure 2.6 illustrates the functions of land administration, each of which are described below:

Land Transfer: This involves the initial delegation of interests in land from the state to individuals, the subsequent transfer between individuals, any reversion of interests back to the state, and reallocation of land holdings (as for example in land reform). It will also include arrangements for financing land transactions and providing security for investments. Depending upon the legal and administrative arrangements, both the public and private sector (e.g. legal and surveying professions, financial institutions) play a role in land transfer.

Estate Management: This is the management of usually large landholdings by individuals such as landlords, by groups such as native organizations, and by governments at all levels.[33] It reflects the fact that on these large holdings, there are many lesser interests (e.g., leases or permits) that are delegated to others and these require special management, including the monitoring of conditions and collection of rents. It is for estate management, particularly of state lands, that many land registration systems are maintained for special interests.

Regulation: Land administration is responsible for implementing many policies and laws affecting land use and ownership and is also concerned with monitoring land-related activities to identify problems that should be addressed in the planning and policy processes of land management. An example of this regulation function is the development and use of criteria to evaluate whether a building permit or mining lease should be issued. This regulatory function is often included in land use planning in the literature, but can be considered part of managing tenure interests.

Adjudication: This involves the resolution of conflicts and uncertainties related to land tenure, including both boundary and title issues, and making decisions about the status of the ownership of interests and of the parcel limits. In some cases (e.g., first registration), adjudication will be the first formal confirmation of existing tenure and involves collecting evidence to support and resolve claims based on customary land use and occupancy.

Revenue: Land administration plays an important role in generating public revenue that in turn can be used for land development and other operations. In most jurisdictions taxes are levied on property and/or on land transactions. Fees are also collected for various land administration services, but especially in the registration of interests and in

the provision of information. The purchase of interests from the state and payment of rents can also produce significant revenue.

Information Management: The management of land tenure information is a specific role for which land administration exists because this information is essential in the distributive function of land management. Thus, for example, it is insufficient to grant rights to land and resources without knowing who owns those rights and where they are located. It is recognized that this knowledge can be part of customary or informal arrangements within certain societies[34] and the information may simply be evidence such as boundary markers that provide physical notice. But in most societies today, tenure is described in written and graphical form.

2.3.2 Processes

Figure 2.7 depicts the primary processes that comprise land administration. There may be others of more importance in specific jurisdictions resulting from specific land administration objectives. Land consolidation or reordering (which is included more generally here in the allocation of interests) may be such a process. Each of the processes shown here is described in detail in Chapter 3 and land registration will be highlighted here to show its role in land management.

In Figure 2.8, the direct relationship between land management, land administration, and land registration is illustrated. Land administration helps to fulfill the distributive function of land management by organizing, directing, and controlling the land tenure system. In turn, land registration is the major means by which the information management function of land administration is achieved, since it is the official, systematic process of managing land tenure information. Information not related to land registration such as land use, resource, and other administrative information may

also be collected and maintained in land administration, but the primary information describes the interests, interest holders, and the parcels to which the interests apply.

Land registration also plays other roles in land administration and land management. These include:

- provision of notice and priority of interests;
- validation of interests and thus increased reliability and security;
- monitoring and enforcement of laws and regulations affecting land ownership, land transactions, and even in some cases, land use;
- generation and collection of revenue.

But as described in Chapter 5, each of these functions is very dependent on the management of information.

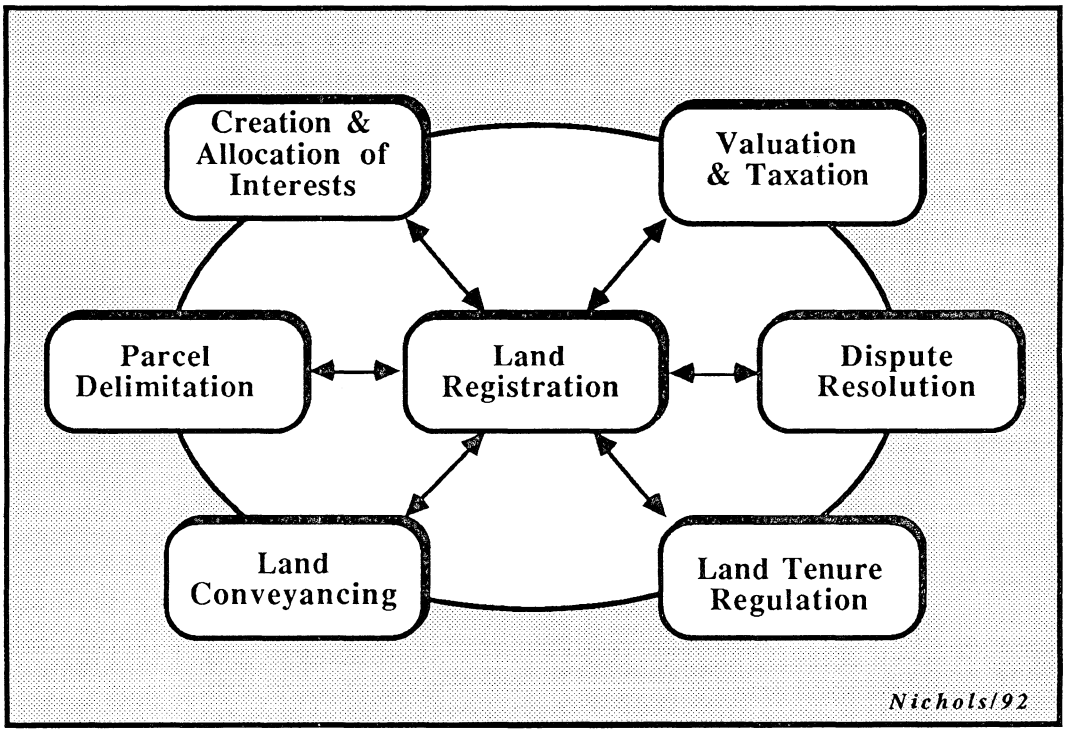

FIGURE 2.7: Primary land administration processes

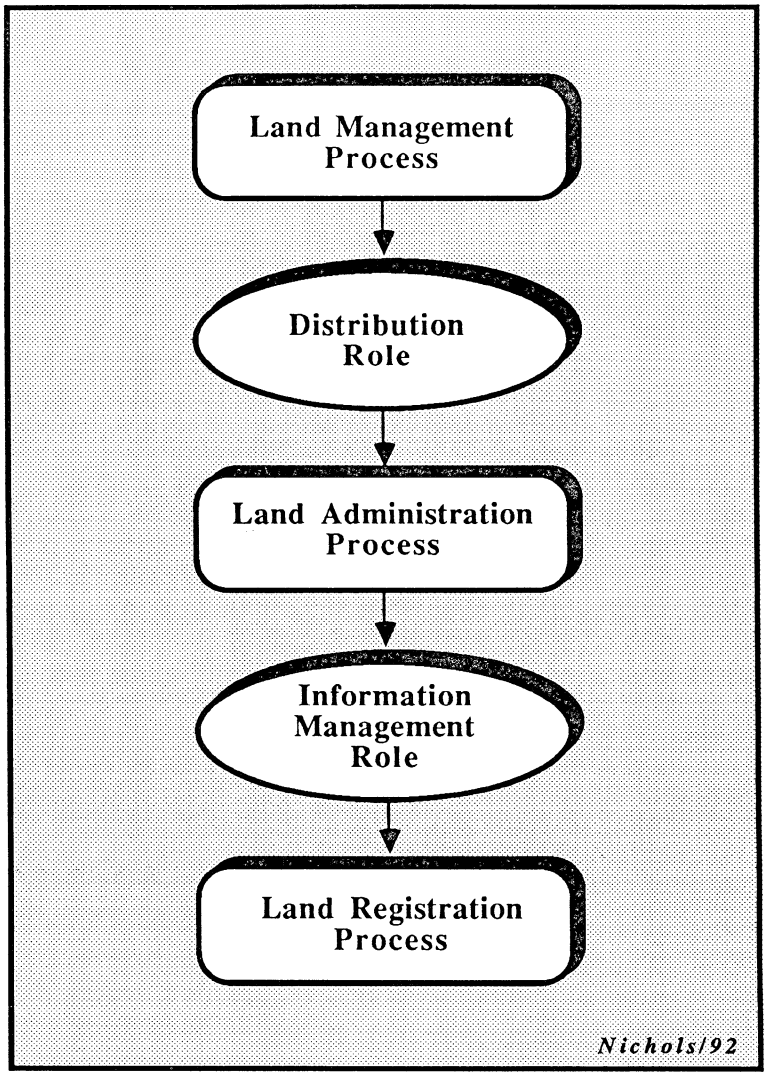

FIGURE 2.8: The information role of land registration in land management

As depicted in Figure 2.7, land registration is separate from such processes as conveyancing, parcel delimitation, and land allocation. This is perhaps an unconventional approach with the consequence that land registration is viewed here rather narrowly. For example, most discussions of systematic land adjudication present adjudication as part of land registration. The opposite relation exists here because, in theory, adjudication and each of the other processes can exist without any public,

systematic records being made. On the other hand, land registration may be an integral part of each process whether carried out by the same or different organizations.

2.4 Land Management Trends and their Implications for Land Registration

The purpose of this section is to outline a small selection of trends and issues in land management and to discuss their potential impact on land registration. In effect, this is a discussion of general requirements for land registration. Chapter 3 provides a more rigorous analysis of requirements in land administration.

2.4.1 Integrated management

One major trend is recognition of the need for integrated land and resource management. As Lang and Armour point out, this does not mean trying to encompass everything, but rather:

> *Emphasis switches from total understanding and control to selected systematic action attempting to gain understanding of and control over those key aspects of environmental and institutional systems necessary to achieve specific objectives... [it is a] way to proceed gradually from immediate problem-response to larger sets of initiatives aimed at wider sets of environmental problems, at causes and not just symptoms, and at preventative as well as corrective action.* [35]

Since land tenure is a key institutional system in this respect, integrated land management has several important implications for land registration. Land registration can help to effect desired changes in the tenure system (e.g., in providing more security and in preventing and resolving disputes over resources) that may be part of an integrated management plan. Land registration systems also have a potential role in providing greater monitoring and enforcement facilities for land regulation. This implies,

however, that information about individual rights can be easily related to other information such as environmental restrictions. For planning and policy evaluation, tenure information must also be in a form suitable for vertical integration (e.g., from local, regional, to national levels).[36] Information about restrictions and community rights will also become more important as environmental issues give rise to policies attempting to balance exclusive private rights (traditionally the focus of land registration) with the broader rights of society.

As long term and not just short term goals are considered, a better understanding of the relationship between tenure and land management objectives is required. Land tenure is a dynamic institution both impacting on and influenced by land policies. Trend information, including property values, transaction difficulties, and land holding patterns, will be required by planners and policy makers to evaluate and reformulate goals and means.[37]

2.4.2 Multidisciplinary approaches

In striving for such objectives as sustainable development, there is a growing trend towards multidisciplinary research and problem solving in land management. Land issues are complex and have many dimensions; they can no longer be addressed within the institutional confines of a single discipline or organization. Interdisciplinary management helps to ensure that environmental objectives are harmonized with economic and social needs. The major implication for land tenure information is that it must be available in a form and format that allows effective integration with many kinds of information from various sources.

Traditional institutional barriers have caused extensive duplication and inefficiencies in information collection and maintenance. In the NWT, for example, at least seven separate agencies prepare specialized cadastral mapping with different scales, types of parcels, and levels of data integrity. In Newfoundland a project rather than

programme approach to managing land tenure information over the years has meant that there is still no reliable graphical or textual inventory that can be used by the many land management organizations that require it. Multidisciplinary management calls for rationalization of data collection, storage, and access in order to reduce duplication[38] and to ensure that fundamental requirements are met. This includes development of common standards for the reliability of the information, since uncertainty about data quality is often the reason why an organization will gather information that another has already collected. Table A.1 in Appendix I, showing the sources of land tenure information in Newfoundland, illustrates the magnitude of the information management problems.

Taking a multidisciplinary approach implies that many different types of organizations, groups, and individuals will be involved in the management process, each requiring specialized subsets of tenure information. They will not necessarily be familiar with the legal complexities of current land registration systems, especially the ways in which land tenure information is documented and indexed. Therefore more effective means to access and present the information will be required. This may involve, for example, simplification of the terminology used in documents and provision of graphical indices so that information can be located by geographic location.

2.4.3 Informed citizen participation

Part of the changing approach to land management is increased involvement of private citizens, special interest groups, and related organizations.[39] This is especially evident in environmental impact assessment. The MacKenzie Valley Pipeline Inquiry which involved issues such as native land claims is an example of the power of involving those most affected in the decision making process. During extensive public forums and interviews with the citizens in the north, the focus shifted from how the project should be implemented to when, if at all. In his report, Justice Thomas Berger wrote:

> *Today, we realize more fully what was always implicit in the Inquiry's mandate: this is not simply a debate about a gas pipeline and an energy corridor, it is a debate about the future of the North and its peoples.* [40]

Such a conclusion might never have been reached without public participation.

Today environmental issues are of increasing concern to individuals and communities. In England, for example, new legislation makes landowners responsible for any environmental hazard on their property, whether this problem was caused by previous owners or not. This has created a special requirement for new property information by potential purchasers, credit institutions, and local authorities.[41] Citizens also want to know about changes in their communities that will affect the use and value of their property.

Land registration systems must be able to respond to new requirements and new types of users. There is a need to be able to access and understand information easily. Information must be accessible by location (e.g., by address or easily recognizable parcel identifier) and by name. But increasingly land registration will also have to provide access to information services in communities and areas not served directly by current systems. This is especially important in considering access to the many public registries of land tenure information related to resources that are nearly always centralized in the capital city.

2.4.4 New types of interests

Not only land management, but the land tenure system itself is changing. Information about new types of interests, from aboriginal rights to expanded environmental restrictions, needs to be available. For example, should communities have the same opportunity to have their collective interests in land recognized and secured through land registration as a developer has to obtain a certified title? Should unpaid child support payments be registered directly as a charge against a parent's

property? Renewed emphasis on land stewardship also implies that there will be new forms of obligations – not just restraints but positive actions that must be taken as part of the responsibility for land as a shared resource. Should these be registered and if so how?

Most land registration systems would leave such interests unregistered (e.g., as overriding interests) to obtain the simplicity required for efficient conveyancing. But for land management, there is a need for more flexibility in systems and procedures. This may include better mechanisms to link information that is held in various official record systems so that complete information affecting tenure can be obtained. There is also a need for more flexibility in land registration systems to accommodate various tenure arrangements (e.g., group and community tenure, leaseholds, and different procedures for resolving land conflicts) that are increasingly significant in many jurisdictions.[42]

2.4.5 Managing rapidly growing urban centres

While this is a concern in every country, major urban centres in many developing countries are expanding at a rate that is nearly impossible to manage effectively. Problems include implementing property taxation to finance basic public services and formally recognizing customary or squatters rights to enhance social stability and economic growth. The solutions depend on knowing who has what interests in which tract of land.

The challenge in most developing countries is to find efficient means of collecting and maintaining this information with very few resources. In many cases, the approaches taken in more developed nations are too expensive, too time consuming, and too dependent on specific administrative arrangements (including interagency co-ordination, long range planning, education, technical assistance, and stable political and economic environments). Therefore there is a need to develop more flexible approaches in land registration.[43] This includes understanding what the local requirements and

constraints are and creating and improving systems to meet these requirements appropriately.

2.4.6 Summary of requirements

Building systems to meet yesterday's needs has never been a rational approach. But to develop land registration systems to meet future needs effectively, the trends and issues in land management must be understood. In this section only a few concerns have been identified, but the requirements may be summarized as:

- provision of services to an increasing number of diverse information users, encompassing governments at all levels, industry, private citizens, and special interest groups;
- efficient access to information and services at the local level;
- information and access procedures that are not dependent on specialized knowledge;
- flexibility to provide a wide variety of information in different formats and through a variety of mediums to enable it to be easily integrated with other information (including other tenure information) from various sources;
- capabilities to provide information on trends at the community, regional, and national level for formulating and evaluating land policies and plans;
- development of common standards, especially standards for reliability, referencing, and completeness, that can facilitate this integration;
- flexibility to enable new types of interests to be incorporated as land policies change the tenure framework;

- development of systems and land registration procedures that can be improved incrementally to meet special requirements and constraints.

In general, the need for simple, efficient systems must be balanced with the competing requirements for more information, more flexibility, and more capabilities. It is often argued, for example, that cluttering the register will reduce efficiency. What is needed are approaches to land registration that will assist in striking an appropriate balance.

2.5 Issues for Further Research

This chapter has examined the potential role of land registration in land management and outlined general land management requirements. Many issues and concerns have not been discussed or have only been touched upon briefly. Among the issues that require further research are:

Environmental Management: Land management was defined in this thesis to describe a very wide group of activities and was chosen to emphasize the land or parcel component of land tenure information. Environmental management is a broader term which incorporates activities related to oceans, wildlife, the atmosphere, and other resources more easily. But it is also a term that has recently been used in the surveying profession without much clarity about what is included and what is excluded. In future research, there is a need to relate what has been presented here to environmental management.

Land Reform: One important issue that has not been addressed directly in this thesis is land reform, in part because of the specific requirements needed to achieve particular reform objectives. Figure 2.9 shows examples of the types of reforms that might be considered. Although the land registration requirements for first registration or land titling have been addressed by many, less attention has been given to systematically analyzing the requirements in other types of reforms. One major obstacle is a confusing use of terminology. There is a need for a conceptual framework to outline the types of reforms, their relationship to land administration and management, and the role of land registration within these activities.

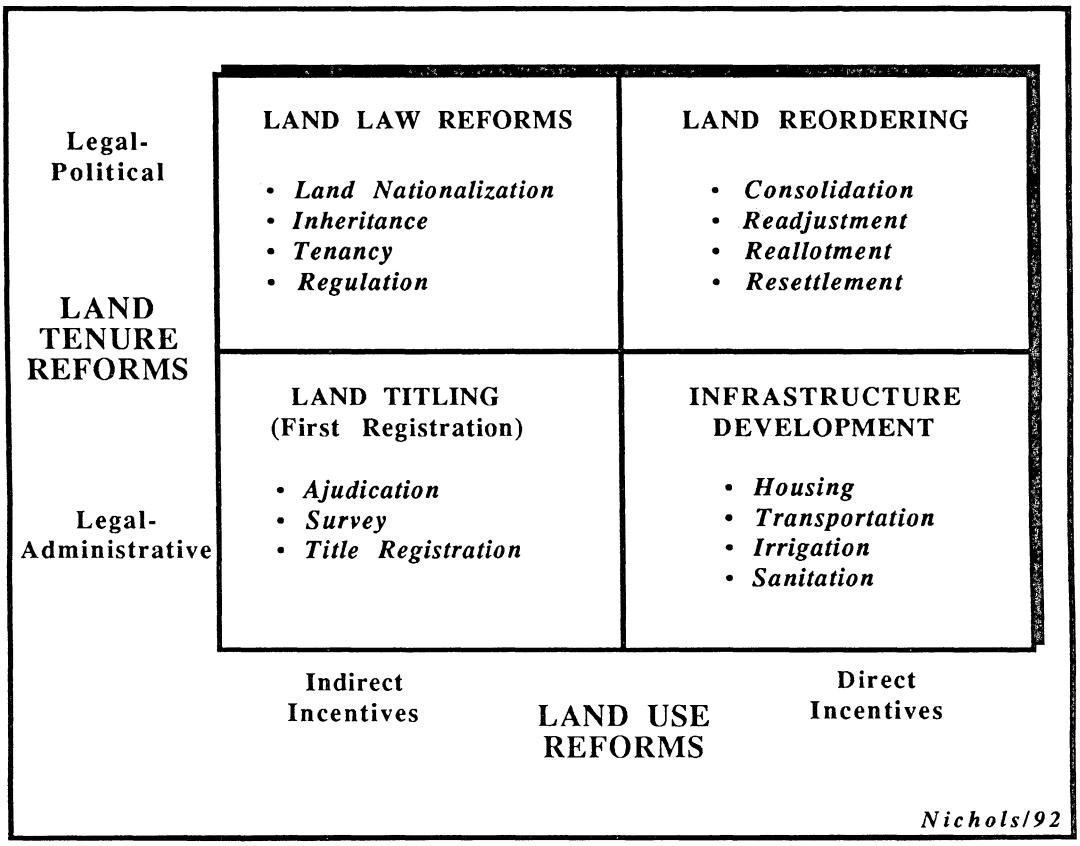

FIGURE 2.9: An initial framework for land reform with examples

Refined Models: Although a major objective of this chapter was to define the relationship between land registration and land management, the model for land administration is a potentially useful tool for analyzing arrangements in other jurisdictions. It was derived from Canadian institutions and practices, although an attempt has been made to eliminate terminology that is jurisdiction specific (such as Crown land management) and to generalize functions. But there is a need to test and refine these models in other countries where land tenure systems, land problems, and administrative structures are different.

More Detailed Requirements: In this thesis, the emphasis has been placed on land administration. Although requirements for land registration in other land management processes have been considered, the analysis is less rigorous. There is a need to broaden the focus in subsequent research to obtain more detailed requirements in land management. What this chapter has accomplished is to provide a general framework for such an analysis.

2.6 Endnotes

1 D. R. Denman [1979], "Property, liberty, and land use sanctions," Chapter 11 in *Land in America*, R.N.L. Andrews, ed. Toronto: D.C. Heath and Company, at p. 138.

2 C.B. MacPherson [1978], "The meaning of property," Chapter 1 in *Property: Mainstream and Critical Positions*, C.B. MacPherson, ed. Toronto: University of Toronto Press, pp. 1-13.

3 Ackerman, B. [1977], *Private Property and the Constitution*, at p. 26f; as cited in K.J. Gray and P.D. Symes [1981], *Real Property and Real People: Principles of Land Law*, London: Butterworths, at p. 9.

4 See, for example, D. M Walker [1980], "Property," In *The Oxford Companion to Law*, Oxford: Oxford University Press, at p. 1007.

5 Walker [1980], *supra*, note 4, at p. 432 and p. 1235.

6 Some equitable interests are not registerable but may be protected by caveat against a title. See, e.g., T.W. Mapp [1978], *Torren's Elusive Title*, Alberta Law Review Book Series, v. I, Edmonton: University of Alberta, Faculty of Law; also see P. Butt [1981], "Torrens system – indefeasibility of title – extent to which affected by equitable rights or rights in personam," *Australian Law Journal*, 55, March, pp. 145-149.

7 See, for example, K.J. Gray and P.D. Symes [1981]. *Real Property and Real People: Principles of Land Law*. London: Butterworths. The authors examine the history and current status of legal and equitable interests in England, including the effect of reforms to land law in 1926. Since other common law jurisdictions adopted British law before this reform and operate under various registry systems, the status of interests such as mortgages (equitable or legal interests) may vary.

8 MacPherson [1978], *supra*, note 2, at pp. 4-6.

9 C.F. Runge [1985], "The tragedy of the commons and resource management in Botswana," In *A Colloquium on Issues in African Land Tenure*, LTC Paper 124, Madison: University of Wisconsin, Land Tenure Centre, pp. 1-7, at pp. 4 & 5.

10 After G.C. Bjork [1980], *Life, Liberty, and Property: The Economics and Politics of Land-Use Planning and Environmental Controls*. Toronto: D.C. Heath and Company, at p. 22. Bjork considers the role of private property and the points given here have been modified to also reflect other systems.

11 G. Hardin [1968], "The tragedy of the commons," *Science*, 162, pp. 1243-1248.

12 See, for example, the classification of tenure forms in W.A. Doebele [1983], "Concepts of urban land tenure," Chapter 3 in *Urban Land Policy: Issues and Opportunities*, H.B. Dunkerley, ed., New York: Oxford University Press (for the World Bank), pp. 63-107.

13 Zoning restrictions are described as a collective property rights by R.H. Nelson [1977], *Zoning and Property Rights: An Analysis of the American System of Land-Use Regulation*, Cambridge: The MIT Press, at pp. 45-47.

14 One example of an important nonregisterable interest is a short term lease. Building registers linked to the land registers provide an opportunity to include such interests for property management.

15 J.D. McLaughlin [1975], *The Nature, Function, and Design Concepts of Multipurpose Cadastres,* Ph.D. Dissertation in Civil and Environmental Engineering, Madison: University of Wisconsin.

16 For example, Gray and Symes [1981], *supra,* note 7, at pp. 10-20 and MacPherson [1978], *supra,* note 2. Both works describe a similar evolutionary pattern for property. Gray and Symes discuss the evolution related to land and MacPherson's text considers the development of property in general.

17 The evolution of land tenure arrangements in Newfoundland is described by A.C. McEwen [1978], *Newfoundland Law of Real Property: The Origin and Development of Land Ownership,* Ph.D. Dissertation in the Faculty of Laws, London:University of London.

18 R. Barlowe [1986], *Land Resource Economics: The Economics of Real Estate,* Englewood Cliffs, NJ: Prentice-Hall, at p. 3.

19 See, for example, R.T. Ely and G.S. Wehrwein [1940], *Land Economics,* Madison: University of Wisconsin Press.

20 See, for example, H.B. Dunkerley, ed. [1983], *Urban Land Policy: Issues and Opportunities,* New York: Oxford University Press (for the World Bank)

21 T. O'Riordan [1971], *Perspectives on Resource Management,* London: Pion Ltd.

22 Many have addressed the institutional component, including D.R. Denman [1977], *The Place of Property: A New Recognition of the Function and Form of Property Rights in Land,* The Keep, Berkhamsted, U.K.: Geographical Publications Ltd; and Doebele [1983], *supra,* note 12. The three perspectives are discussed in J. McLaughlin and S. Nichols [1989]. "Resource management: the land administration and cadastral systems component." *Surveying and Mapping,* 49(2), pp. 77-85.

23 An example is the on-going debate over nuclear power where such questions as what is an acceptable risk usually evoke very different responses from the various interest groups. E.g., A. Mazur, A. Marino, and R. O. Becker, "Separating factual disputes from value disputes in controversies over technology," *Technology in Society,* 1, pp. 229-237.

24 *The Economist* [1988], "The greening of the invisible hand," Dec. 24, pp. 107-108.

25 U.N. World Commission on Environment and Development [1987], *Our Common Future,* G.H. Brundtland, ch., Oxford: Oxford University Press.

26 Barlowe [1986], *supra,* note 18, at p. 227.

27 E.g., Environment Canada [1990] *Implementing Sustainable Development,* Report of the Interdepartmental Workshop on Sustainable Development in Federal Natural Resource Departments, Ottawa: Environment Canada.

28 These processes are incorporated as management functions by R. Lang and A. Armour [1980], *Environmental Planning Resourcebook,* Chapter 5, Ottawa: Lands Directorate, Environment Canada, pp. 230-312. However, they are viewed as processes here which are designed to carry out the land management functions, where a function is a role or activity for which something exists. Land management does not exist for policy-making, policies are one means by which functions are realized.

29 R. Lang and A. Armour [1980], *supra,* note 28.

30 R. Lang and A. Armour [1980], *supra,* note 28, at p. 233.

31 R. Lang and A. Armour [1980], *supra*, note 28, at p. 242.

32 Planners are sometimes referred to as "information scavengers." In part, this reflects the poor organization of the information resources in a jurisdiction and the related need to get whatever information is available from whomever. It may also be the result of a poor definition of requirements.

33 Estate management has been defined as " The direction and supervision of an interest in landed property with the aim of securing the optimal return; this return need not always be financial, but may be in terms of social benefit, status, prestige, political power or some other goal or group of goals" by M. Thorncroft, *Principles of Estate Management*, London: Estate Gazette, as cited in J.S. Kirkwood [1984], *Information Technology and Land Administration*, London, Estate Gazette, at p. 147. Kirkwood's discussion of land administration is limited to estate management and project management.

34 This knowledge may be part of the tribe or clan heritage in customary societies for example. Some North American aboriginal groups created "mental maps" preserving relatively accurate details of tribal areas for generations who had never visited these areas. Another example is the practice in England where each year the community retraced boundaries to ensure that knowledge of the landmarks that defined various parcels was passed down to succeeding generations. See, for example, A.C. McEwen [1983], "Beating the bounds," *Survey Review*, 27(207), pp. 13-19.

35 R. Lang and A. Armour [1980], *supra*, note 28, at p. 235.

36 Vertical and horizontal integration of data are described in J. McLaughlin [1991], "Towards a national spatial data infrastructure," In *Proceedings of the Canadian Conference on GIS*, Ottawa, March, pp. 1-5.

37 Poor monitoring of land use and land trends is one of the deficiencies in current land title systems noted by P.F. Dale [1990], " International trends in cadastral reform – or registration of title, is it time for a change?" In *Proceedings of the National Conference on Cadastral Reform '90*, Melbourne: University of Melbourne, Department of Surveying and Land Information, pp. 1-9, at p. 6.

38 Some redundancy is usually always necessary. One goal of information management should be to reduce, not necessarily eliminate, duplication.

39 The initial proposals for a multipurpose cadastre in North America also stressed the need to provide information at the local level to encourage local participation in land management decisions. E.g., McLaughlin [1975], *supra*, note 15.

40 T.R. Berger [1977], *Northern Frontier, Northern Homeland: The Report of the MacKenzie Valley Pipeline Inquiry*, vol I, Ottawa: Ministry of Supply and Services Canada, at p. 1. The Inquiry resulted in a moratorium on the pipeline construction. With falling oil prices in the 1980s, exploration and development slowed in the Beaufort Sea and the pipeline was not built. One result of the Inquiry was greater recognition of the need to speed settlement of aboriginal land claims.

41 *The Economist* [1991], "Nightmare in Acacia Avenue," July 20, pp. 71-72. The article points out the potential implications to purchasers, credit institutions, and insurance companies and notes that a new provision in the *Environmental Protection Act* also requires local authorities to compile public registers of land that may be contaminated.

42 See, for example, Dale [1990], *supra*, note 37; also W.A. Doebele, *supra*, note 12.

43 E.g., Dale [1990], *supra*, note 37; also L.C. Holstein [1990], "The cadastre as a tool of resource management in developing countries," In *Preprints of Surveying 2000, the RICS-CASLE Technical Seminar and 6th General Assembly*, London, Sept., pp. 25-51.

3. THE LAND ADMINISTRATION REQUIREMENTS

...the underlying factor in a community's land use and growth is neither the regulation nor the development of its land, but the ownership of it....But despite the importance of land ownership, we know surprisingly little about it...

Popper, 1978[1]

Chapter 2 has outlined some of the general land management requirements for tenure information and land registration. The objective in this chapter is to examine land administration to derive more specific requirements. Land administration processes are reviewed and examples are drawn from the case studies.[2] Additional examples of the processes and requirements for Newfoundland are given in Appendix I.

Studies on land information requirements (often called user needs studies) are frequently directed at a specific product or type of system (e.g., mapping, geographic information system (GIS), or land titles). A different approach was used in the Canadian case studies for this research:

- The land management arrangements in the public and private sector were examined in detail to determine functions, objectives, and processes in which land tenure information played a role, to determine the existing information management activities, and to determine constraints and opportunities.

- The processes were evaluated to determine what information management arrangements would best meet the objectives, given the jurisdictional constraints;

- The existing situation was then evaluated against these requirements to determine priority problem areas, special opportunities, and a strategy for improvement.

Several levels of requirements were considered including: information type, information flow, information quality, capabilities and use; organizational; management and policy. Appendix I which describes the Newfoundland case study illustrates this methodology.

This methodology evolved during the research and the mandates of each of the studies varied. Therefore, there are inconsistencies in the information gathered, in the presentation of the results in the various documents referenced in Chapter 1, and in the examples shown here. Although the analysis is based primarily on Canadian jurisdictions, an attempt has been made to determine processes and requirements that would be typical of arrangements in other countries. What will differ significantly are the priorities given to certain activities (i.e., the objectives), the organizations involved, the constraints, and the opportunities.[3]

3.1 Parcel Delimitation

Parcel or boundary delimitation provides the monumentation and/or description of the parcel. A parcel is a three dimensional unit of space to which a unique set of homogeneous interests apply although in most cases only two dimensions are considered (see Figure I.1.2 in Appendix I). In practice the term parcel is only used to define rights, but in this thesis the term is also applied to define the land units affected by such restrictions as land use regulations. Similarly cadastral mapping is generally only used to describe maps of freehold tenure or surface land ownership. But in this thesis, cadastral map is used to describe any graphical index or inventory of interests in land. Thus even a zoning map is a form of a cadastral map since it shows units of land to which restrictions apply.

3.1.1 Background

Delimitation includes three related processes: definition, delineation, and demarcation. Definition is the process of describing the locus of the boundary (e.g.,

high water mark, in cardinal directions specific distances as in mining claim regulations, 20 metres from the centreline of the highway). Demarcation is the physical monumentation of the boundary and provides actual notice of the boundary location. Delineation is the description of the boundary location in words (e.g., a description by metes and bounds)[4] or by depicting the boundaries graphically on a plan, map, chart, or other visual display.[5]

Which of these processes are involved for a particular parcel will depend upon the type of land tenure system, including laws and regulations for specific types of interests. In some cases field surveys will be conducted to assess evidence of the boundary location and their relation to other features (e.g., buildings, highways, or rights-of-way). In others, parcel boundaries are only delineated on maps (e.g., topographic map, cadastral map) or in diagram form.

There are various systems for parcel and boundary delimitation and they are most often classified as general or fixed boundary systems.[6] General boundaries are those in which the precise location is left undescribed and the bounds are usually, but not always, marked by a physical feature that is then shown in a diagram or on a map. So-called fixed boundaries are more precisely delineated and are usually marked with some form of survey monument. But this distinction can be misleading.[7] Dale and McLaughlin[8] provide a more useful classification in which boundary systems and parcel delimitation are distinguished by the degree of precision (general or specific) and by how their location is referenced (e.g., physical features, monuments, or co-ordinate values).

3.1.2 Activities

Parcel delimitation spans a range of activities from field surveys to mapping and writing descriptions. Figure 3.1 depicts cadastral surveying activities in the NWT. The variations in jurisdictions are great and affect the information collected, the survey

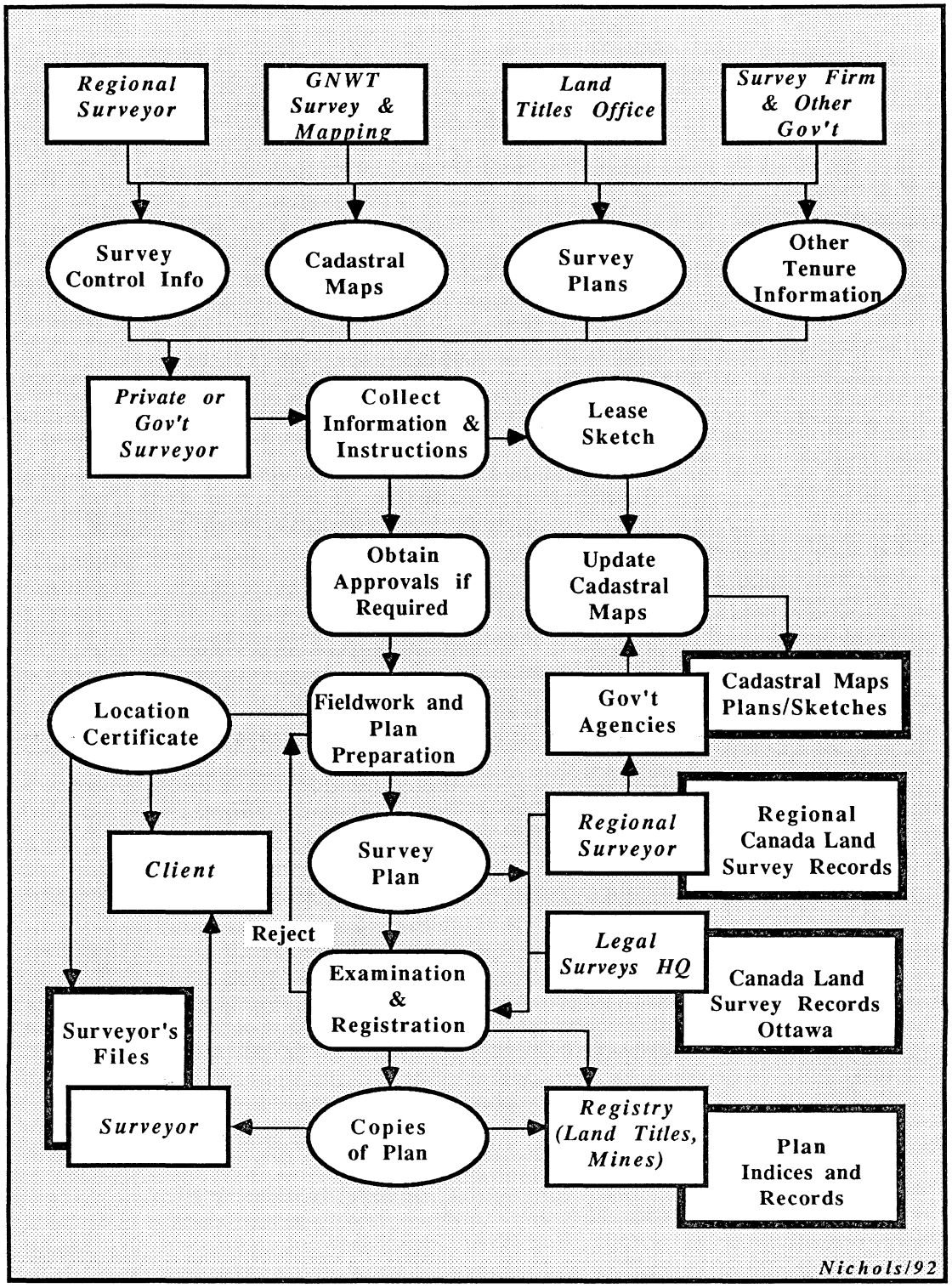

FIGURE 3.1: Example of NWT cadastral survey activities (c. 1985)

methods and precision, and the examination and recording of the information. The parcel delimitation process may include:

- collection and evaluation of evidence of the parcel boundaries (this may include instructions as to how the parcel is to be located or subdivided, descriptions of adjacent parcels and the parcel of interest, and collection of field evidence);
- measurement, sometimes including measurement of land use and physical features;
- monumentation, including the establishment of any witness monuments;
- preparation of a field plan, final plan, and/or a diagram showing parcel size, shape, and location (usually specific dimensions are shown);
- preparation of a written description;
- verification and certification of the information by the surveyor and/or a public officer;
- distribution, filing, registration of plans (this may be private or public);
- updating the cadastral map from the plan, diagram, or description.

3.1.3 Priority requirements

In each of the descriptions of requirements given in this chapter, only priority concerns related to the particular process are listed. There are other requirements that are also considered in the summary of requirements in Section 3.6.

Graphical indices of all relevant survey data, including monumentation, survey plans affecting the parcel (current and historical), plans for adjacent parcels, and pointers to other records such as field notes.

Public records of plans and field notes, including co-ordinate values, and other pertinent data. These should be easily accessible to all surveyors, cadastral mapping personnel, and others. Historical data is often as important as current information in boundary delimitation, including adjudication in cases of disputes.

Cadastral maps of all tenure interests. There may be several series of maps for different tenure interests. The maps should be up-to-date, complete, and provide a reliable index to identify all parcels. There should be parcel identifiers shown on the maps that reference more precise boundary descriptions and tenure information.

A standard parcel identification system: The most important quality of a parcel identifier (PID) is its uniqueness, i.e., there should be a one-to-one correspondence between parcels and identifiers. Parcel identification systems should be relatively simple (e.g., for recording and for user familiarity), flexible (e.g., to allow for subdivision, amalgamation, or new types of interests), efficient to use, and permanent.[9] There should either be a standard PID for all organizations referencing information about the same tenure interests or identifiers that can be easily related to one another (see Section 5.3.1).

Standards for data reliability, verification, and certification, including: standards for the quality (including precision and accuracy) of surveys, descriptions, and mapping; standards for examination and verification that include checking boundaries of adjoining parcels; and standard procedures for improving the reliability of

cadastral maps over time. Another important standard is a requirement to reference all parcel descriptions, graphical and written, to a common spatial framework (e.g., co-ordinate system) to facilitate surveying, verification, and mapping.

Certification and registration of plans and maps: Either a public organization or a professional surveyor should be responsible for the reliability of the information shown on plans and cadastral maps. Cadastral plans and maps should be public records, easily accessible to all users.

Common standards among organizations involved in maintaining cadastral maps so that information from various organizations can be easily related and integrated. These standards include, but are certainly not limited to, map scales and reference systems, parcel definition, PIDs, updating procedures, and standards for data reliability.

3.1.4 Problems identified in the case studies

Parcel delimitation provided many examples of land tenure management problems. More specific examples are given in Appendix I, because poor parcel delimitation was a major concern in Newfoundland. Only two issues are considered very briefly here.

In almost every jurisdiction visited, there were at least two (and often more) parcel identification systems for surface land title – one assigned for assessment and one for legal purposes – based on different parcel definitions for the same interests. Although there are many benefits of having common identifiers, as in Prince Edward Island (See Appendix II), there are often historical and system management reasons why this is not possible. What is needed is a way to relate the different systems, although it is recognized that this is much easier to recommend than to effect.

Another problem was the lack of public survey records. This was mainly an important issue in jurisdictions that have deed registry systems, since most title systems are based on survey plan examination and registration. Although subdivision and other special plans are now filed in the registries in the Atlantic Provinces, for example, there are many parcels for which there are no public survey records, and metes and bounds descriptions in deeds and other documents are often poor.[10] Location certificates required for mortgages often provide much better parcel descriptions but most are not filed in a public office. This is a lost information resource.

3.2 Allocation of Interests

The allocation of interests from the state (whether federal, provincial, municipal or other level) is part of the land transfer function but also usually involves a regulatory role. Thus, for example, applications for land (e.g., building permit, absolute title, water rights) may be reviewed by the responsible authority or by many organizations to ensure that there are no conflicts with existing tenure interests or with laws and regulations. In the Northwest Territories, where jurisdictional issues are complex and native land claims are a concern, this review process can be extensive. Similarly, applications for land in coastal areas (e.g., for aquaculture) can involve reviews by many levels of government as well as different departments. The requirements for this review process are considered in more detail in Section 3.3.

3.2.1 Activities

Figure 3.2 presents a simplified model of the allocation process from the Northwest Territories (NWT) where applications for mineral rights are especially significant in the land tenure arrangements. Another feature in the NWT is the fact that relatively little of the surface land was held in fee simple[11] and in most communities

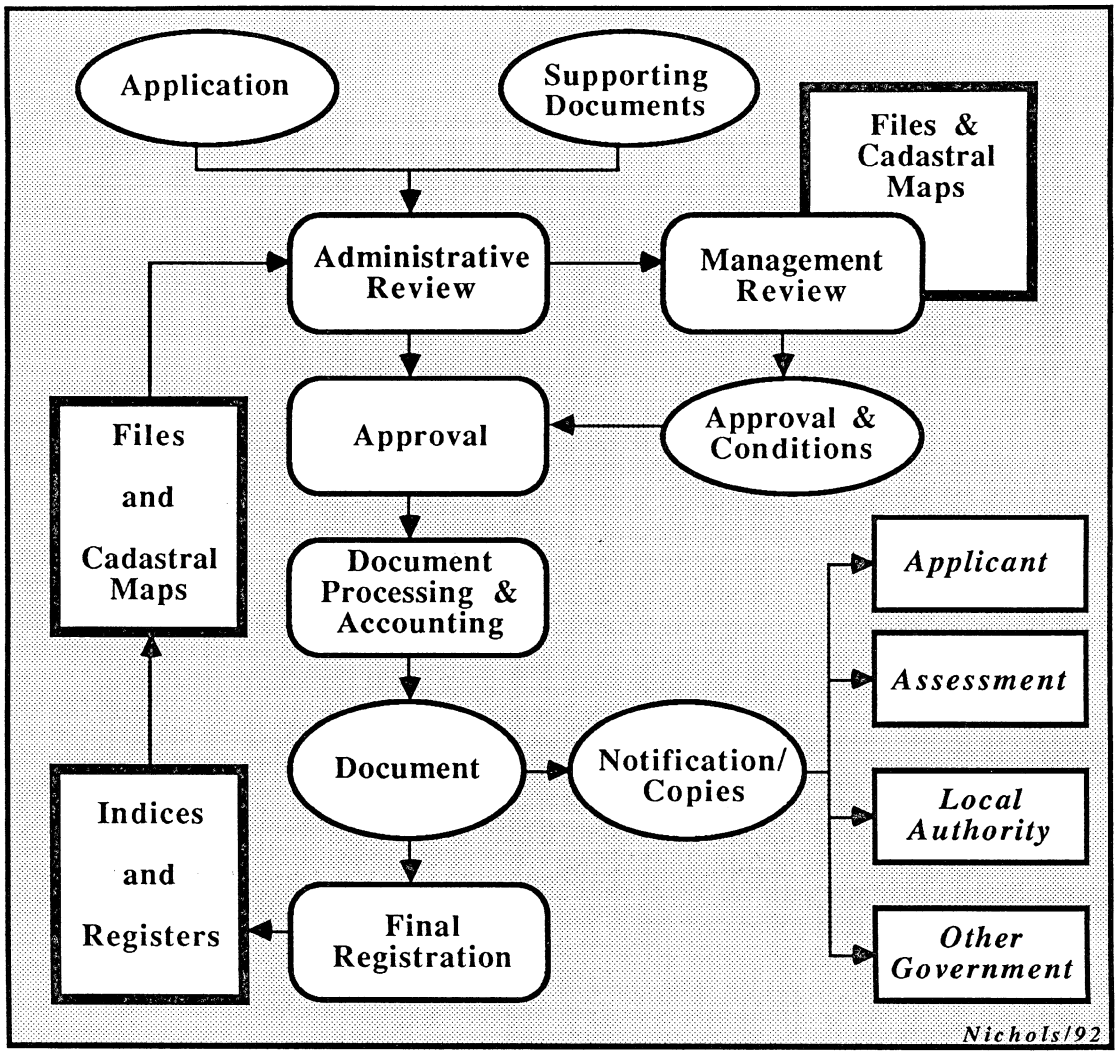

FIGURE 3.2: General process of allocating interests in the NWT

leases and other native interests form a significant part of the tenure arrangements.[12] The allocation process in communities is shown in Figure 3.3 and the requirements for the allocation of fee simple interests from the Crown in Newfoundland are described in Appendix I (Figure I. 2.4). The main activities in land allocation are:

- initial examination of the application contents by the administrating organization, including checks to ensure that the application is complete;

- recording (on index maps and in files) that an application is pending;

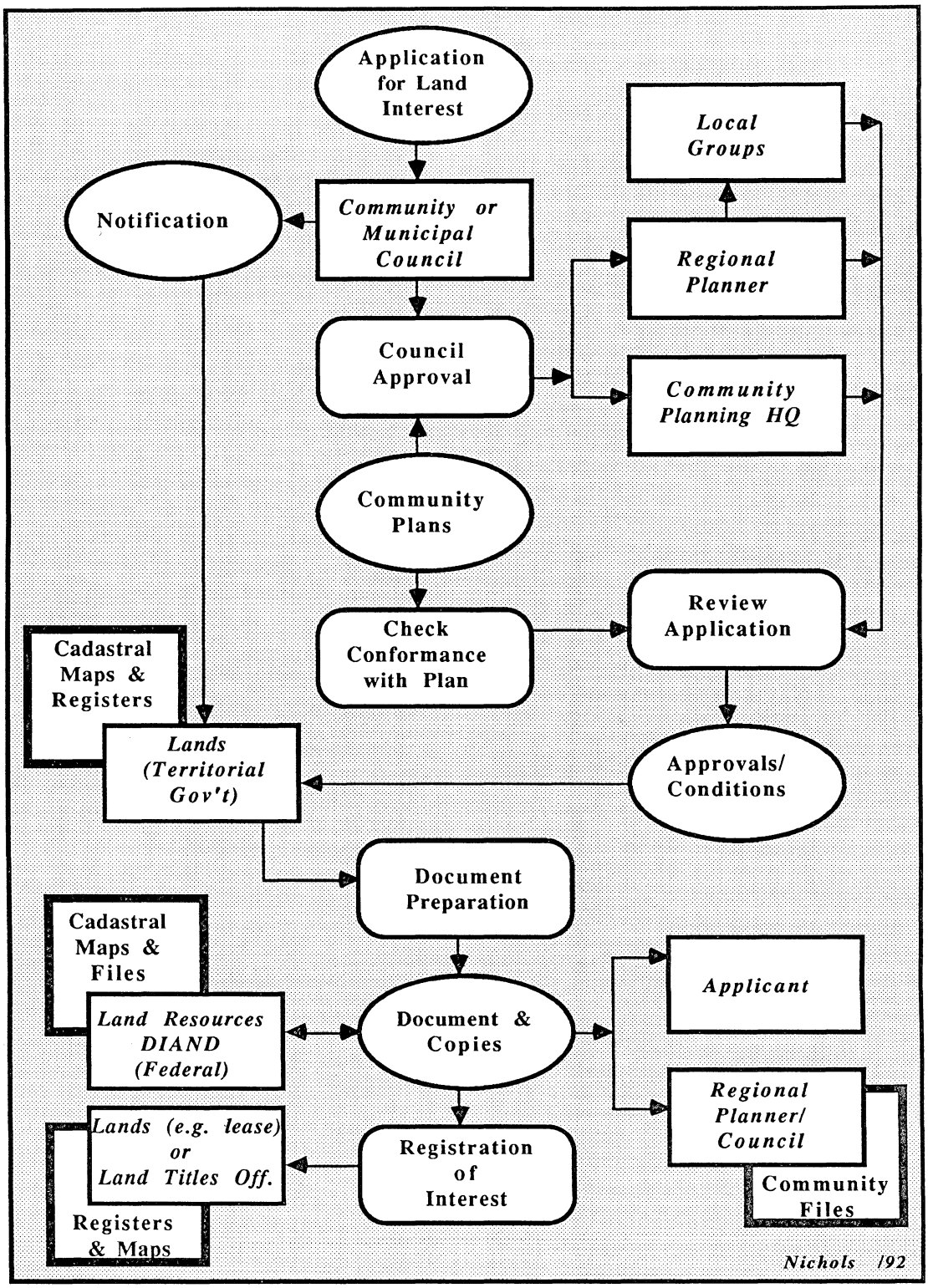

FIGURE 3.3: Example of NWT allocation process in communities (c. 1985)

- examination of the application by the allocation agency and any other organization concerned to ensure compliance with regulations (e.g., survey required) and to ensure that there are no conflicts with existing tenure or laws;

- specification of any conditions that must be met;

- preparation of documents;

- verification and approval of the application;

- registration of the interest, including updating internal indices, maps, and files;

- notification of the tenure status change to taxation authorities and other organizations;

- monitoring to ensure that all conditions of approval are met.

3.2.2 Priority requirements

Cadastral maps of interests concerned and of surface tenure. The maps should be standardized to permit easy comparison (e.g., overlay) with similar maps for previous granted lands, resource interests, land use restrictions, land capability.[13] They should be sufficient to identify parcel location and adjoiners and provide a unique PID that is a reference to more detailed information about the parcel and the interests.

A graphical description (plan or diagram) and/or textual descriptions for the parcel giving more precise information about boundary location. A similar description for any adjacent parcels or parcels of other interests should also be easily accessible to check potential conflicts. The description does not necessarily involve field surveys or measurements, but may be a large scale diagram that shows reference

features sufficient for cadastral mapping, for subsequent field location, and for preventing and resolving disputes.

Complete, up-to-date inventories of previously granted interests and their current ownership. These should include the type and status of interests, pointers to records of more detailed information, the name of the interest holder, and other information such as owner classification (e.g., corporation), and the parcel value. The information should be reliable and accessible by PID, location, and name.

A monitoring system of records indicating: any conditions (including rent payments) that must be fulfilled by the grantee; the time those conditions must be met; and the duration of the interests. There must be procedures for keeping records up-to-date and providing notification of deadlines to authorities and parties concerned.

Effective notification and up-dating procedures for sending notices of status changes to any affected parties or organizations and for updating records upon notification of changes from other authorities.

3.2.3 Problems encountered in the case studies

The most common information management problems in land allocation were poor parcel descriptions, the lack of (or poor quality) of cadastral maps, and the incompatibility of information among organizations. Applications for many interests (e.g., permits and leases) are sometimes accompanied by a sketch that may not be sufficient to determine overlaps. Written parcel descriptions make the administrative and management review processes difficult. Most organizations keep some form of index map but the major problems were the unreliability of the information (accuracy and up-

to-dateness) and the lack of common map standards which hindered the comparison of information from different sources during the review process.

3.3 Regulation

The enforcement and monitoring of regulations related to land tenure is one function of land administration. This includes not only regulations affecting, for instance, who can own or transfer interests, parcel subdivision, tax incentives, or the conditions in a lease, but also land use regulation. This inclusion of land use planning is based on the premise that a land use restriction is also a collective interest in land which is administered by a designated public authority.

The problem related to the management of land tenure information is the fact that regulatory systems such as building, development, and land use planning authorities are often not viewed as being part of the tenure structure. There are significant institutional barriers based on organizational arrangements (many of these activities are at the local level), disciplinary background, and objectives. As found in the case studies, the consequences include a multiplicity of unco-ordinated registries of interests, no record of these restrictions against the title of the property (Sweden is an exception),[14] and poor delimitation of the land units to which the interests (or restrictions) apply.

3.3.1 Activities

The activities will vary depending upon the type of regulation, the interests affected, and authority responsible. Figure 3.4 presents an example of land tenure monitoring in the allocation of land interests in the NWT. It was chosen as an example because of the complexity of the management review process – the number and type of organizations that may be involved. Most applications would be not be forwarded to all

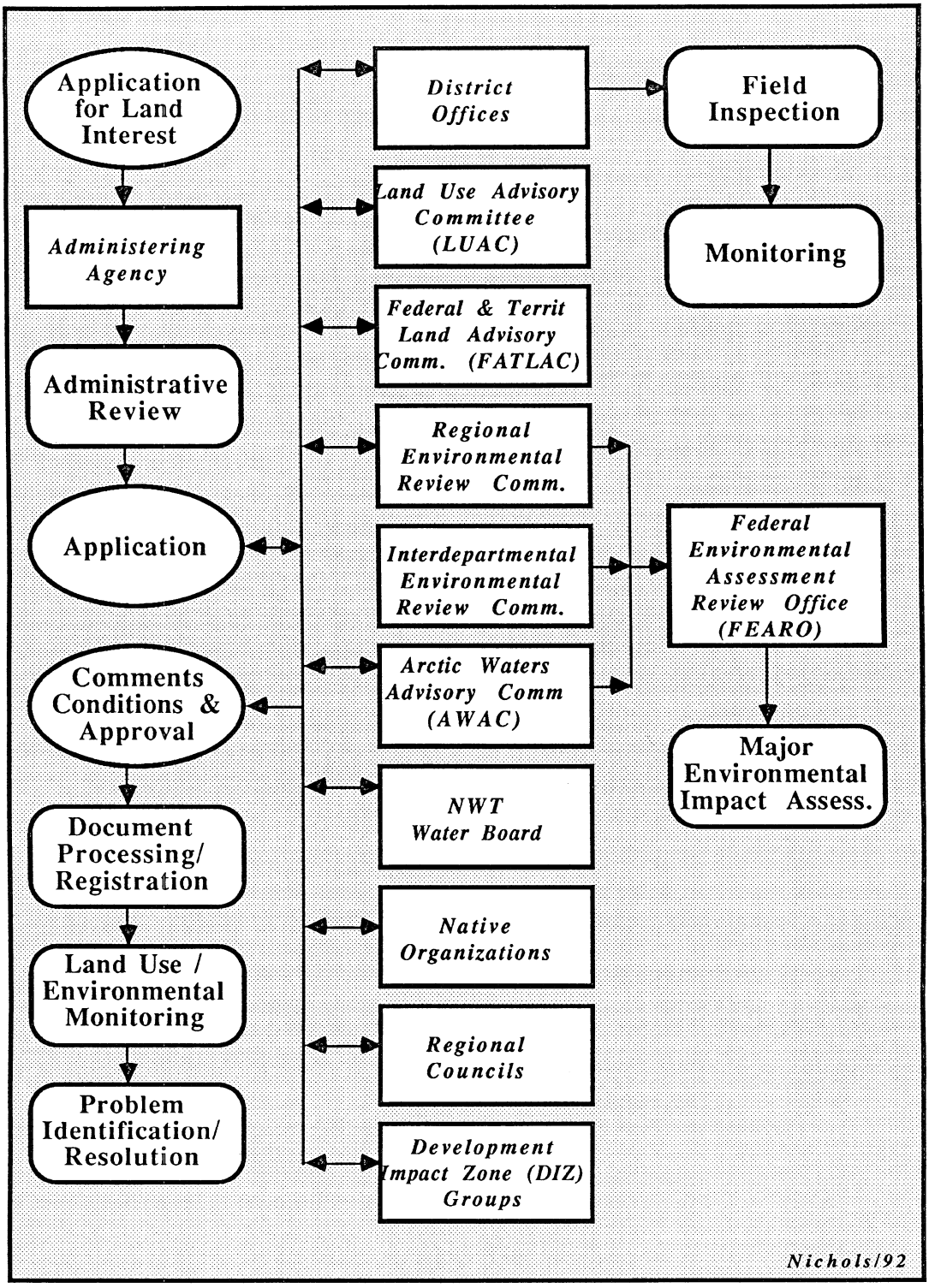

FIGURE 3.4: Example of the NWT Mangement Review Process (c. 1985)

of these organizations for comment. However, large projects (such as an application for rights[15] associated with oil and gas development near a national park) would involve these and other groups and probably an environmental impact assessment.

The general activities in land regulation include:

- official recording of the regulation (e.g., providing constructive notice in legislation or by-laws, describing the nature of the interest and boundaries in a document such as land use plan, or mapping the boundaries of zones);

- notification that an action related to a tenure interest is pending (e.g., through filing of transfer documents, a subdivision plan, or a building application);

- examination to verify whether the action is in conformance with the regulation, including review by any other organization concerned;[16]

- rejection, or acceptance (conditional or unconditional) by granting the interest or allowing the action to take place;

- notification to any parties affected;

- monitoring to ensure conditions are met.

3.3.2 Priority requirements

• ***Cadastral maps and graphical indices of regulations*** which can be used to readily and accurately relate the boundaries of lands affected by the regulation to the location of the application. The application must also have a sufficient description of location for clear identification.

• ***Capability to relate many types of information*** for review of the application. For example, an application for mineral development rights should be related to existing

surface tenure, environmental information, and other resource rights that might be affected.

• ***Procedures to monitor land tenure changes*** to identify possible regulatory conflicts and to provide new information about problems for policy and planning evaluation.

• ***Notification procedures:*** If an approval (or rejection) of an application affects other organizations, they should receive notification. Another major concern is notification to existing title holders (and potential purchasers) that a new regulation affects their interests, beyond the constructive notice provided by legislation. This does not necessarily mean including all restrictions on a title but providing effective means for identifying parcels affected.[17]

3.3.3 Problems identified in the case studies

The issue of notice is emphasized here because this appears to a problem in most jurisdictions in conveyancing, in monitoring, and in the management review process. For example, the organizations reviewing an application may up-date their records to reflect that a new interest exists. But if the application is rejected or significantly changed after their review, they often receive no further information. In conveyancing, a purchaser or a mortgagor may not be aware that a parcel is affected by a regulation for a number of reasons, including the fact that there is a poor description of the parcel.

In all of the Canadian case studies, there were examples of land planning and land management organizations that had relatively poor graphical descriptions of the areas affected by regulations. In Newfoundland, for instance, agricultural zones were delineated on available mapping (1:12,500 in this case) with a marker. Since there were also no cadastral maps of land ownership, there was no reliable way to determine

whether parcels near the boundary were affected by the regulations. Even where better mapping exists, boundaries defined by regulation, including administrative boundaries, frequently do not conform to the boundaries of parcels.

3.4 Valuation and Taxation

Although valuation and taxation are performed in land administration for several purposes (e.g., transfer taxes based on property values, and valuation for conveyancing and land acquisition) the focus here is property taxation and the associated valuation or assessment activities. Property taxation is less important in some jurisdictions such as Sweden as a direct source of government revenue, but in most countries it is a major source of funds for local services. It also provides a means to implement land policies (through incentives such as tax deferment and disincentives such as higher taxes on vacant lands).

3.4.1 Background

In the valuation process for property taxation, the emphasis is on equity and efficiency in contrast to the accuracy required for many other land administration processes such as conveyancing. For instance, it is more important to identify most property owners and to ensure that the taxes paid on each parcel are equivalent to those on another with similar improvements and location than it is to determine an accurate market value. In Indonesia, for example, a pilot project was conducted in which potential tax payers were identified by the value of electricity bills on the assumption that higher bills meant high value properties. In this way, the properties that would bring the most tax return were quickly identified.[18] The law of diminishing returns also applies in collecting precise information on parcel dimensions.

The essential information for property taxation includes the property value. As described in more detail by Dale and McLaughlin[19] and others,[20] there are many ways to determine the value. Three which are common in North American jurisdictions and affect information requirements are:

Market Comparison: All recent transactions in land are monitored to determine the current values for specific classifications of properties. Over time sufficient information is available to determine an approximate value for properties in the same or similar neighbourhood, with similar improvements, services, land use, etc. This method is appropriate where reliable market data is available, including sufficient transactions for value, and where properties tend to have the same general characteristics (e.g., residential properties). Among the disadvantages of this method are that it tends to emphasize location and may overly reflect short term trends in property values.

Replacement Cost: If properties (especially improvements) are unique and market comparison is inappropriate, then properties may be valued in terms of an estimate of the current land value (e.g., by market comparison), the current cost of replacing the improvements, and an allowance for depreciation. The major disadvantage of this method is the time and site-specific information required for valuation.

Income-Capitalization: In this method, the present value of all future land rents or income is calculated to determine the property value. Rents can be estimated from contract rents (e.g., leases), property comparisons, general economic trends, or the potential productivity of the land (e.g., for agricultural areas). Major problems include determining the capitalization rate because small errors can have relatively large effects on present value.

3.4.2 Activities

Figure 3.5 shows the activities in property assessment in Prince Edward Island. The process in Newfoundland with information requirements is shown in Appendix I (Figure I.2.3). These activities may be summarized as:

- discovery and identification of all properties;
- collection of pertinent information on the property (this will depend on the valuation method used);
- identification of the current owner and/or taxpayer;
- preparation of an inventory of the properties and their characteristics;
- analysis of land and improvement values (including collection and analysis of market data) and assignment of a value to each property (this is usually a uniformly indexed value, and not current value);
- creation and distribution of the assessment role and tax notices;
- collection of taxes and processing of appeals;
- on-going monitoring and maintenance of the inventory (e.g., ownership, parcel, and value changes).

3.4.3 Priority requirements

Cadastral maps of all parcels,[21] including resource interest parcels where these are taxed, with the capability of being overlayed with other maps of zoning, infrastructure, soil capability, etc. for valuation.

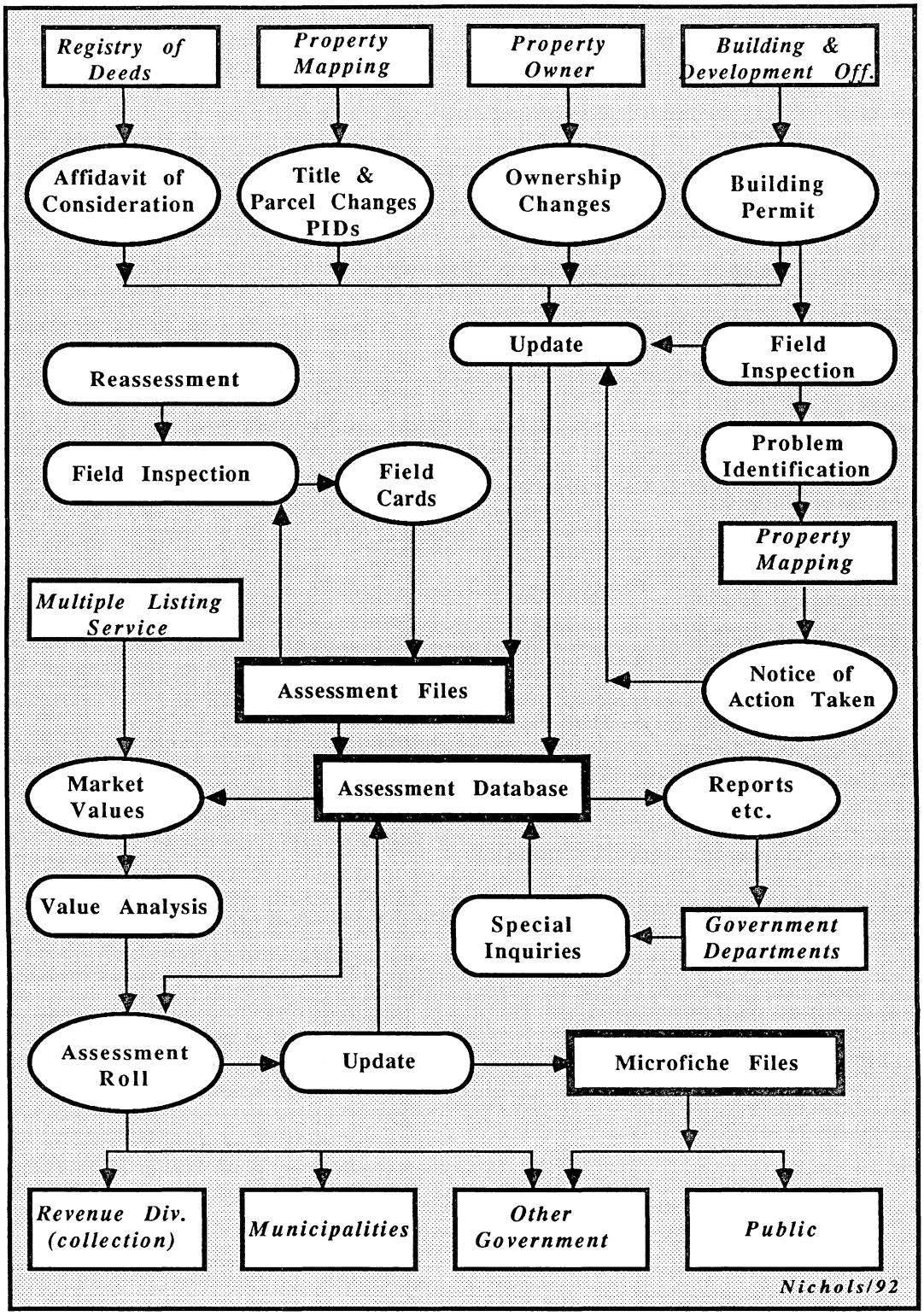

FIGURE 3.5: Example of property assessment in PEI (c. 1986)

A parcel referencing system. The parcel identifiers used in assessment should either be compatible with other primary identifiers or related to them in order to facilitate the collection of information on tenure status and status changes.

Inventory of current ownership, accessible by location and parcel identifier (including assessment code if different), and that provide current ownership, ownership status (e.g, government), type of tenure, and owner addresses. Addition of an owner identifier, although controversial can aid the assessment process.[22]

Information on the property value for each land transaction, including the location of the property and its characteristics.

Notification procedures for all tenure status changes, including ownership, parcel, and owner address changes. There should also be notification of all land use changes that affect property value (e.g., building permits).

Efficient procedures for collecting and processing large quantities of information during first assessment and reassessment.

3.4.4 Problems identified in the case studies

The major problems related to property assessment basically stem from institutional problems. In many jurisdictions property assessment organizations developed independent information systems to meet internal requirements which are based on special parcel referencing systems. Property assessment systems were often the first computerized land records because they are important economically and are relatively straight-forward textual databases. As other property inventories develop for legal and other administrative purposes, there is often significant redundancy which is

difficult to eliminate unless the different parcel referencing systems are compatible or relatable.

This system independence is an obstacle in managing land tenure information for two other reasons. In the first place, property assessment systems usually contain a wealth of information that would be of value to other organizations if it could be accessed easily. Secondly, effective property assessment depends on being able to keep records up-to-date and therefore is dependent on obtaining value and status change information efficiently.[23] Appendix II describes some of the ways in which Prince Edward Island has managed data sharing and exchange, but in this case there is a common parcel identifier for assessment and the cadastral mapping associated with land registration.

3.5 Conveyancing

Conveyancing is part of the land transfer function. It may be entirely a private sector process, but in most cases it involves both the private and public sector. In Sweden, for example, most conveyances are handled by financial institutions and real estate agents; the final legal verification is carried out by the government (registration of the title). In the United States, the insurance of the title by private companies adds an additional activity. How the conveyancing process is carried out, who is involved, and the specific requirements are very dependent upon the particular jurisdictional legal and financial arrangements, parcel delimitation specifications, and the type of land registration systems and how the land tenure information is managed.

3.5.1 Activities

Figure 3.6 presents a simplified illustration of the conveyancing process in the NWT where there is a land titles system for fee simple interests and each parcel is described by reference to a registered survey plan. The diagram also includes conveyance of other types of interests registered by government authorities (e.g., leases). In Appendix I, Figure I.2.1 illustrates the conveyancing process for Newfoundland with information requirements for the deed registry system. The common activities in conveyancing for most jurisdictions include:

- selection of an appropriate parcel (based on purchaser's criteria);
- initial purchase arrangements (e.g., legally binding agreements, price);
- verification of the parcel status, including (but not limited to):
  - nature of the interests and their ownership (e.g., title search)
  - restrictions on the owner affecting the property (e.g., title search)
  - restrictions on the parcel or interest such as taxes, mortgages, or easements, land use restrictions (e.g., title search);[24]
  - boundaries, encroachments, and possession (e.g., survey)
  - condition, location, and value of improvements (e.g., appraisal/survey);
- arrangement of financing which may depend on the above verification;
- recording of the parcel description and if new boundaries are created, as in parcel subdivision, this may involve certification and recording of a survey plan;
- certification and recording of the interests and their ownership, including any financial interests (this may be recording of the documents describing the interests or the interests themselves) ;
- arrangement for private insurance which also may depend on verification.

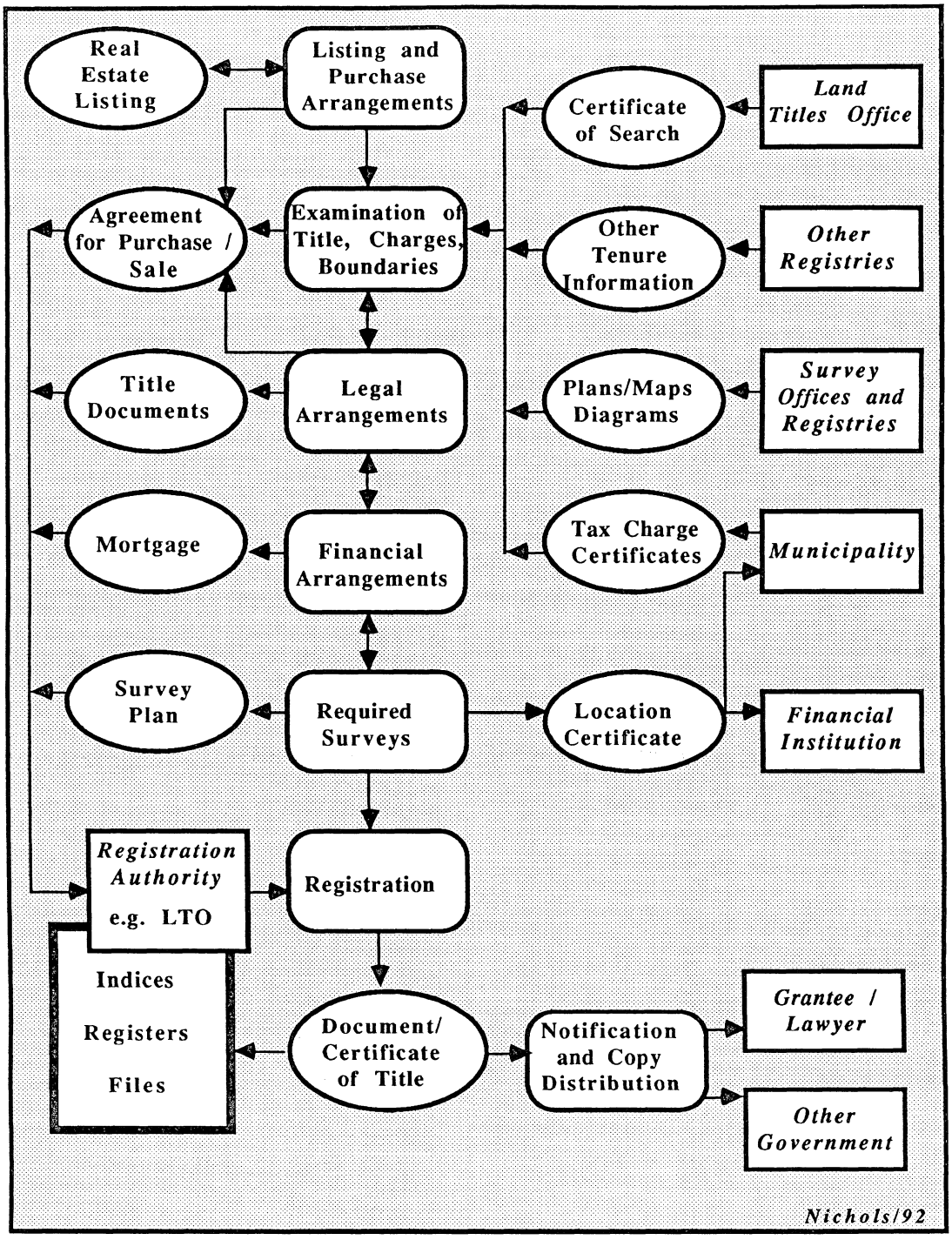

FIGURE 3.6: Example of NWT conveyancing process (most interests)

3.5.2 Priority requirements

Cadastral maps to identify tenure interests and a parcel identifier to facilitate parcel referencing and searching for other information.

Accurate descriptions of the parcel sufficient to describe the verified parcel location and boundaries unambiguously (i.e., can be retraced in the field) and to ensure that no overlaps or gaps occur with adjacent parcels. The descriptions should be graphical (plan or diagram) or make reference to a plan or diagram through a unique parcel identifier;

Accurate information on the condition and location of improvements that will effect the use or value;

Complete and accurate information on the current ownership and any interests that will affect the ownership, use, or value. This includes information on any interests affecting the condition of the parcel (e.g., easements, land use restrictions, resource interests) and on all other interests affecting the title (e.g., taxes, mortgages, personal liens, pending interests).

Efficient and effective public access to this information. The length of time it takes to effect a land transaction directly influences financing, investment, and development of land. Since the collection and verification of information is a major part of the conveyancing process, all parties involved should have efficient access to complete, up-to-date inventories of current interests and their ownership, property values, and parcel details. Access should be available through parcel identifiers, location, and owner's name.

Assurances of the quality and reliability of the information collected to reduce redundant verification and of the information created from the conveyancing process (e.g., plans, documents, certificates) to establish responsibility for the information in cases of dispute and to ensure that investments in land are secure.

3.5.3 Problems identified in the case studies

Many of the problems concerning land registration arose in the conveyancing process. These included the need to collect information from numerous registries in order to have complete information (both in land titles and deed registry jurisdictions), inefficient access to information in local areas (i.e., most sources of information are centralized), the unreliability of the information available from many of the registries, poor parcel descriptions and the lack of appropriate survey information and cadastral maps. Another problem included the fact that little attention was given to searching for planning and other restrictions on property. As Ouellet notes for New Brunswick:

> *...despite the fact that zoning and planning regulations are now the rule and not the exception, clients and their lawyers still often ignore these regulations, and many property lawyers seem to find it hard to accept that they must always check out the local planning laws.... Indeed, depending on the client's wishes or the circumstances, the lawyer may have to check not only for zoning but also for other matters outside the registry, such as demolition orders, work orders, and the kinds of services available to the land being sold.*[25]

3.6 Summary of Requirements for Land Registration

Land registration has been defined as the official, systematic process of managing land tenure information. In this chapter the priority requirements in land administration have been examined. The objective of this section is to summarize these

requirements in terms of land registration and to include additional management and policy requirements.

3.6.1 Information requirements

Land registration is concerned with information about parcels, interests, and ownership. From the analysis above (and others in the case studies) the priority requirements include:

An inventory of current land tenure: This may be of a set of inventories for particular types of interests but together should include information on the following:

- all interests affecting land and land resources including duration, type, and effect;
- people or authorities holding or responsible for those interests, including name, address, status or classification, other specific socio-economic data as required by the jurisdiction, and any personal obligations that affect land;
- the location of the land parcels to which the interests apply, including dimensions, boundaries, absolute location and location relative to other parcels and features. This information should be in graphical format (i.e., cadastral maps, plans, diagrams) with textual information providing specific details;
- other characteristics of the parcel, including land and improvement value.

The inventory should have the following features:

- *completeness* – for all interests and all parcels
- *reliability* – e.g., for parcel location and for certainty of ownership of interests

- *currency* – up-to-date

- *security* – adequate provisions to ensure protection of the information

- *effective public access* – including decentralized access to information

- *parcel-based* – access to information by parcel and location as well as other references

- *official status* – recognized as the primary source of tenure information for legal and other purposes, whether the accuracy of the information is validated by public officials or private professionals

- *multipurpose* – capable of being used for many purposes

3.6.2 Other operational, management, and policy requirements

Effective Procedures: Procedures for collecting, verifying, storing, and accessing the land tenure information should be designed, for example to:

- minimize duplication among sources of the inventories;

- provide data security through off-site storage and appropriate back-up operations;

- provide continual improvement of data integrity, accuracy, completeness, and other qualities over time;

- reference and index information to facilitate access by a variety of user groups.

Effective Management and Organizational Arrangements: These should emphasize, for example:

- co-ordination among various registration organizations, sources, and users;
- development and implementation of standards for parcel definition, parcel referencing, cadastral mapping, simplification of transfer documents and terminology, and other matters;
- provision of decentralized access to all registration services;
- monitoring the changing requirements in land administration and land management to ensure that these can be met effectively.

Development and Implementation of Information Management Policies: Within the context of the particular jurisdictional constraints and opportunities, policy issues that should be addressed include:

- priority objectives for land registration within the broader land policy;
- respective roles and responsibilities of public and private sector;
- co-ordination of the various registration authorities;
- access, security, and privacy concerns;
- appropriate information standards;
- pricing and financing strategies.

3.7 Issues for Further Research

This chapter has shown how land tenure information is created, processed, exchanged, and used within land administration in order to derive requirements for land registration. But it is recognized that there are many issues that have not been addressed in this research. Several of these are outlined briefly here.

Land use regulation: Land use regulations are considered special overriding interests in most land registration systems, i.e., interests such as taxes and personal obligations not shown on the register or certificate of title but which may affect the title.[26] In this thesis land use regulations have been considered a collective interest that should be given more consideration in land registration. Sweden provides one example of incorporating land use plan and building registers within the land title system. The land regulation process has not been examined in depth here and there is a need for further research in this area to determine more specific requirements for land registration.

Dispute resolution: Adjudication was identified as a function of land registration and dispute resolution as a primary process in Chapter 2, but they were not addressed specifically in the case studies (i.e., in deriving processes, activities, information flow, and requirements). Examples of dispute resolution and adjudication for other reasons occurred in Newfoundland (e.g., customary tenure and the importance of Quieting of Titles legislation), in the NWT (land claims negotiations), in Sweden (adjudication for land consolidation), and in New Brunswick (conversion to land titles systems). Chapter I.3 in Appendix I, for instance, outlines options for improving the registration of interests and boundaries in Newfoundland which would involve adjudication.

Many authors have addressed adjudication in first registration, but primarily in the context of establishing land titles systems in developing countries. Among the issues that should be addressed in future research are comparisons of how title and boundary disputes are resolved in various jurisdictions and how land registration can assist in this process. A second issue that is of increasing importance in Canada is how to develop effective means of establishing a system of title registration without extensive examination of historical documents and without expensive systematic field surveys.

Related concerns are the application of risk management in land registration,[27] qualified titles and boundaries,[28] and the need for procedures to effectively improve information over time.[29]

International real estate markets: The last issue considered here is related to the conveyancing process and also to the land development function of land management. Land markets play a significant role in economic development in western countries, where these markets are well established, and in many developing nations. Not only are expedient conveyancing, security, and reliability major issues for land registration, but as the land markets become national and global there is a need for better access to property information outside the registration jurisdiction.[30] As Chatterton points out:

> *Markets are linked globally through sophisticated communications technology and markets have blended into one global trading system....Even minor glitches in telecommunications and computer systems now have the potential to wreck havoc in the financial market place on a global basis. Transactions in land are the touchstone of a market economy. Public records should, therefore, enable a prospective land owner, whether he be located in New York, Los Angeles, Tokyo, or London to determine quickly and unambiguously, the rights, the responsibilities, and the level of risk associated with ownership of a specific tract of land.*[31]

Another concern for land registration in this global real estate market is the fact that the complexity of transactions will probably increase. Not only will state or national laws concerning corporate ownership have to enforced,[32] for example, but information about the potential owner and personal obligations affecting the owner will have to be available beyond national boundaries. Thus there are competing needs for efficient transactions on perhaps even at a global level (implying relatively simple and routine procedures) and for more comprehensive monitoring and enforcement of land transfer and environmental regulations. These requirements will create special challenges for

land registration systems that were, for the most part, designed to meet the needs of the 19th century.

1 F.J. Popper [1978]. "What's the hidden factor in land use regulation?" *Urban Land*, 34(11), at p. 4 & 6.

2 Although dispute resolution is identified in Figure 2.7 as a primary land administration process, it is not considered here partly because the requirements would be specific to the type of dispute and arrangements in the jurisdiction and partly because it was not specifically considered in the case studies.

3 In Newfoundland, for example, economic and institutional constraints were major factors. In Prince Edward Island the study focused on opportunities (See, for example Section II.2 in Appendix II). In the Northwest Territories, the complexity of jurisdictional and thus organizational arrangements pose significant problems in developing a common strategy. In Sweden, the opportunities afforded by land titles registration, complete cadastral mapping, and the use of a well-recognized common parcel identifier have enabled the country to concentrate efforts on automation and integration of land tenure data.

4 A mete is a vector quantity, giving direction and distance; bounds are the external limits of the parcel such as a road, adjoining parcel, or survey monument.

5 These definitions are examined against others in the literature in S. Nichols [1983]. *Tidal Boundary Delimitation*. Technical Report 103, Department of Surveying Engineering, University of New Brunswick, Fredericton, N.B., at pp. 4-7.

6 E.g., S.R. Simpson [1976], *Land Law and Registration*, Cambridge: Cambridge University Press; and P.F. Dale [1976], *Cadastral Surveys Within the Commonwealth*, London: Her Majesty's Stationery Office.

7 For example, in England where a general boundary system is used, there are legal rules or presumptions that define a more precise line of a physical feature in cases of dispute, i.e., it is the delineation not the definition that is "general". Fixed boundaries are no more "fixed" in location than general boundaries, they are simply delimited more precisely. Both systems can provide accurate or inaccurate information about boundaries. Furthermore no country probably has a pure system of fixed or general boundaries.

8 P.F. Dale and J.D. McLaughlin [1988], *Land Information Management*, Oxford: Claredon, Press, at p. 30.

9 The issue of parcel identifiers is discussed further in Chapter 5. See, for example, D.D. Moyer and K.P. Fisher [1973], *Land Parcel Identifiers for Information Systems*, Chicago: American Bar Association.

10 For example, a recently found description in Nova Scotia began as follows: "Beginning on the lower side of the road leading to Angus McAulay's farm and running all the way below the vendor's farm until it reaches the top of the hill above the Wash Brook where the bear tore the blanket..." Letter from F. Hutchinson, N.S.L.S. and A. Owen N.S.L.S., March 17, 1992.

11 There is no estimate, but fee simple interests were at the time of the study mainly confined to municipalities. Since that time native groups have officially acquired title to major portions of the territories, rural and urban and portions of these areas also include title to mineral (including gas and oil) resources.

12 For a description of the kinds of tenure traditionally held by natives in communities, see, for example, W.H. Henderson [1978], *Land Tenure in Indian Reserves*, Report for the Department of Indian and Northern Affairs Canada, Ottawa: DIAND.

13 The major difficulty in this respect is map scale because resource and land use regulation organizations often use small scale maps whereas larger scales are required for surface tenure. One of the advantages of digital mapping systems and GIS is to make information less scale dependent.

14 Each land use plan is referenced to the parcels affected in the Swedish Land Data Bank System.

15 Such projects are usually considered to be "land uses" but they involve acquiring rights not only to the resources, but also to surface lands for construction of roads and buildings for instance. It is recognized that this management review process is often about the nature of the use and its potential impacts, but it will also involve a review of the application for the interests. In other jurisdictions, where most surface lands are privately owned and acquired through the conveyancing process, there will still be some applications for the right to build on or develop the land that will undergo a review process that is usually much more simple than the example given here.

16 For example, in Prince Edward Island the Registrar of Deeds monitors all transfer documents to identify possible conflicts with out-of-province ownership laws. In cases of potential conflict, the matter is forwarded to the provincial Land Use Management Committee.

17 For example, official registration of all land use plans in the title office.

18 Harvard Institute for Economic Development, personal communication, Oct, 1990.

19 Dale and McLaughlin, *supra*, note 8.

20 E.g., R. Barlowe [1978], *Land Resource Economics*, 3rd ed. Englewood Cliffs: Prentice-Hall, Inc., at pp. 326-343.

21 Cadastral maps and parcel identifiers maintained for property assessment and conveyancing are often based on different parcels definitions. For example, a trailer park may be one legal parcel with one unique parcel identifier, but each trailer may be assessed separately. Similarly, a house lot may consist of two legal parcels, yet be assessed as one property. Most assessment organizations will however use standard cadastral mapping for the jurisdiction if it is available. Where there is no standard mapping, assessment authorities usually keep some form of graphical record to ensure that all properties have been identified. In Newfoundland where assessment was being carried out for the first time in many communities, these "maps" consisted of rough diagrams compiled from whatever information was available.

22 Sweden, for example, includes property owners' personal identification number in the computerized land registration system and provides links to other information such as address changes. Swedish citizens must notify local authorities of a change of address within two weeks. In taxation, the tax payer's address is more important than the parcel address.

23 In Newfoundland, for example, property assessment officers were monitoring the deed registry to determine changes in tenure status since there was no notification procedure.

24 Although there are similarities in the interests that should be verified in conveyancing among jurisdictions, they also depend upon the nature of the tenure system and the type of land registration system. Most of the interests not registered in the primary registration system (e.g., land titles or deed registry) are referred to as overriding interests. For examples, see T.W. Mapp [1978] *Torrens' Elusive Title*, Edmonton, Alberta: Alberta Law Review, University of Alberta; Law Reform Commission of Victoria [1987] *The Torrens Register Book*, Report No. 12, Melbourne: Law Reform Commission of Victoria; V. Di Castri [1987] *Registration of Title to Land*, Toronto: Carswell; and for a deeds registration jurisdiction, A. Ouellet [1986], *Professional Liability in Conveyancing in New Brunswick*. Toronto: Carswell.

25 Ouellet [1986], *supra,* note 24, at p. 37 and 39. It should be noted however that the 1984 standards for the practice of real estate law in New Brunswick state that zoning and intended use should be investigated.

26 *supra,* note 24.

27 For example, Ontario ran a successful pilot project in London in which systematic conversion from deeds to title registration was based on limited search of the title in order to reduce the time and costs of conversion.

28 See, for example, P. Zwart [1980], "Limited titles – instruments of change." Cadastral Studies Occasional Paper #5, Fredericton: Department of Surveying Engineering, University of New Brunswick.

29 See, for example, the procedures used in Prince Edward Island described in Appendix II. In Sweden, procedures were also established for verifying the internal and external integrity of data (whether the record in each record is correct and whether there are any conflicts with other records) in converting to the automated system. See Appendix III.

30 This issue is considered briefly in J. McLaughlin and S. Nichols [1991], *Toward the Development of a National Spatial data Infrastructure,* Report for the Mapping Science Committee, U.S. National Research Council, Washington, D.C., December, 1991.

31 W.A. Chatterton [1991], Ross and Chatterton, Madison , WI, Letter to John McLaughlin, Jan. 30, 1991.

32 In an interview with the Assistant Registrar of Land Titles in England in March, 1991, he noted the increasing complexity of land transfer arrangements, particularly within the European Economic Community. The title system has to deal with more than 450 foreign banks and other international corporations. He argued that since private solicitors cannot effectively keep up with the complex laws, regulations, and forms, there was a need for public examination and verification procedures.

4. LAND REGISTRATION: A CRITIQUE

> *...cadastral systems around the world are under significant pressure to deliver their services more cheaply, more quickly and more responsively to modern day needs. Society has changed dramatically over the last few decades – look at the pace of change in Eastern Europe – but what is done in the cadastral field [including land registration] is still rooted in the 19th Century. On the one side, technology has created opportunities for change in the methods for solving old problems. On the other, new problems are emerging with the changing needs of society and the environment. It is a sign of health rather than weakness to question whether one is on the right path.*
>
> *Dale, 1990*[1]

Tradition inhibits innovation and in few places has this been more evident than in land registration. With their deep roots in the local traditions of law and property, land registration systems have been slow to implement reforms even when the need for improvement is well recognized. Some systems have remained fundamentally unchanged for centuries; most have proved inadequate in meeting the emerging information needs.

Three areas of major change are: computerization, cadastral mapping, and conversion of existing arrangements to some form of land title registration. All of these strategies can bring valid improvements, but the problems are often approached from narrow perspectives and the theory that could support more fundamental reform has remained fragmented and incomplete.

Selected problems in managing land tenure information have been presented in Chapter 2. The purpose of this chapter is to discuss the problems in land registration more generally. Although many of the concerns are universal, the emphasis here is primarily on land registration in common law jurisdictions. To provide the background

for this critique, land registration is reviewed from four perspectives prevalent in the literature. Some of the recent trends are also highlighted.

4.1 Land Registration: An Overview from Four Perspectives

Part of the problem in reforming land registration is that the issues are viewed from relatively narrow perspectives derived from disciplinary background, experience, or immediate needs. Figure 4.1 illustrates four of these partial perspectives as a framework for tracing the development of some of the concepts associated with land registration. This review is neither a survey of land registration worldwide nor a comprehensive history of one type of land registration. While both would be worthwhile exercises, the objective here is to provide sufficient background for the critique that follows.

4.1.1 The cadastral perspective: land and information

The cadastre is the oldest official form of land registration carried out on a systematic basis. Its antecedents have been traced to land tenure records in the early agricultural societies of Mesopotamia, Egypt, and China and later to the taxation surveys of the Roman Empire.[2] Efforts in establishing cadastres in Europe based on field surveys and mapping were made, for example, in Sweden (from 1628)[3] and the Austrian-Hungarian Empire (1720s).[4] But Napoleon I is generally credited with the introduction of a systematic cadastre to many European countries in the early 19th century, observing in 1801 that:[5]

> *The only way to sort out the confusion in the field of general land records is to proceed with the surveying and evaluation of each individual land parcel in all of the communities of the Empire. A good cadastre will constitute a complement of my Code as far as land possession goes.*

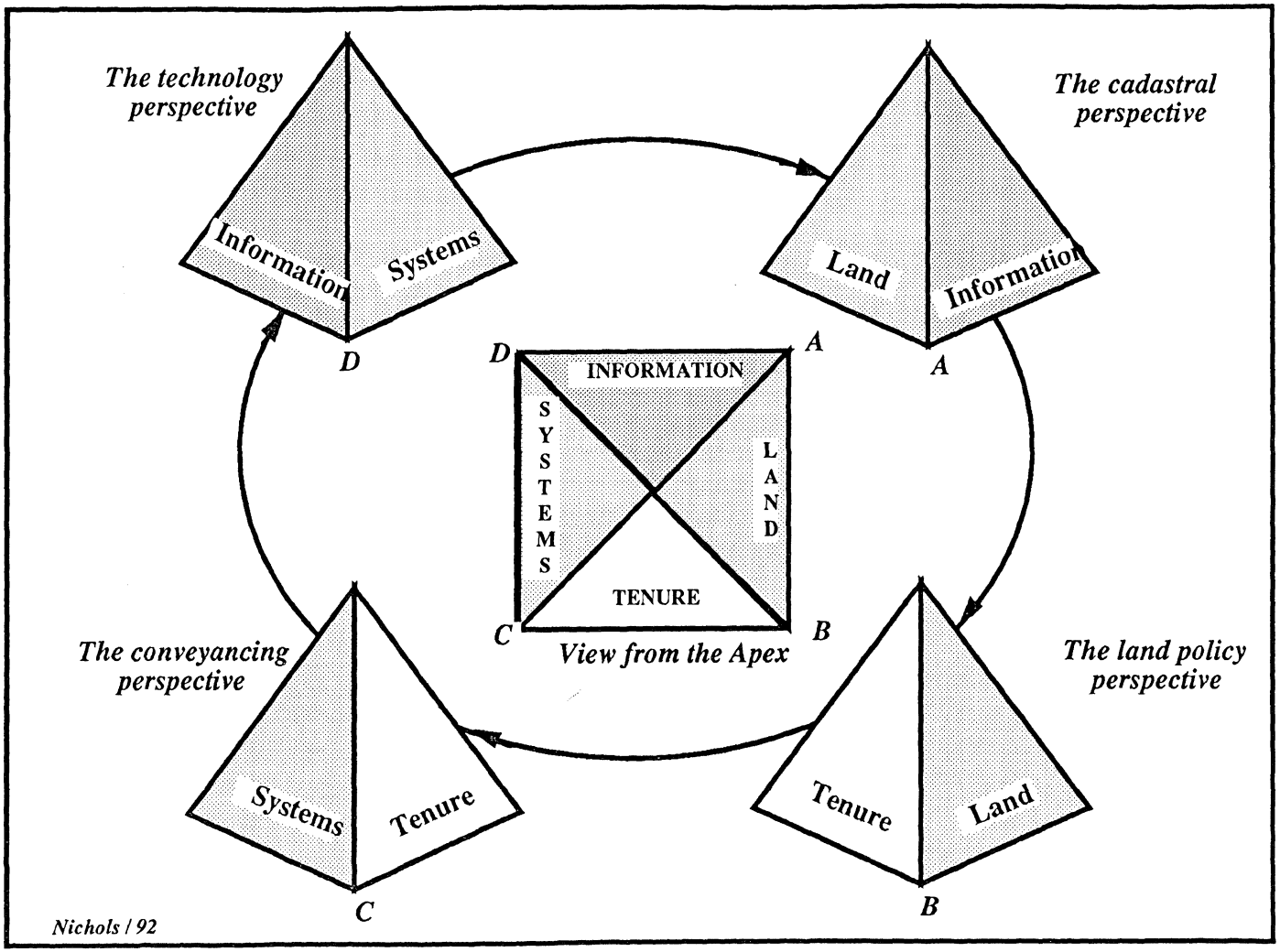

FIGURE 4.1: Four partial perspectives of land registration

Despite these early efforts, however, cadastres were often poorly maintained and divorced from the systems of deed recording and court administration that governed land conveyancing.[6]

Although the form of the cadastre has altered over the centuries, the general concept of a systematic inventory of land holdings to support land administration is unchanged. Today, three forms of cadastral systems are distinguished:[7]

- *fiscal cadastre* – (to support taxation);
- *juridical cadastre* – (to support conveyancing);
- *multipurpose cadastre* – which combines elements of both and is capable of supporting a wider range of land administration and management needs.

From the cadastral perspective, the emphasis in land registration is on the identification and description of land units, or parcels, to which individuals or groups have rights of occupation, use, or ownership. The essential data are the shape, size, boundaries, and relative location of the parcels, and at least some reference to the nature and ownership of the interests. Depending on the purpose of the cadastre, it may also include information about the resources, use and development, productive capability, and value of the parcels. Although the Doomsday Books of feudal England, property assessment files, title registers, and other inventories can theoretically be considered cadastres, the term as it is commonly used today implies at least a graphical index of all parcels in a region to which more detailed textual records are connected by a parcel code or identifier.[8]

Cadastral systems fared less well in Britain and in its colonies than in Europe.[9] For example in Canada, although specialized cadastres have been created for estate management by the Crown (initial grants, mineral leases, etc.), there was no tradition of maintaining a systematic graphical representation of current freehold tenure. Maps prepared for taxation were usually nonstandardized, were rarely based on field survey information, and frequently did not represent the legally described parcels of the title

records. Even in the Province of Quebec, where civil law is based on the Napoleon Code, cadastral maps were not kept up-to-date and major reforms are currently underway.

Since the late 1960s, projects have been undertaken to establish cadastres in all Canadian and Australian jurisdictions and in many American states. The driving force has been LIS development where the cadastre is viewed as an essential linkage mechanism between title records, assessment files, and a range of other land information. Figure 4.2 shows the U.S. National Research Council's concept of a multipurpose cadastre[10] which captures the prevailing view that the cadastre is the graphical component of land tenure information and title records are a separate

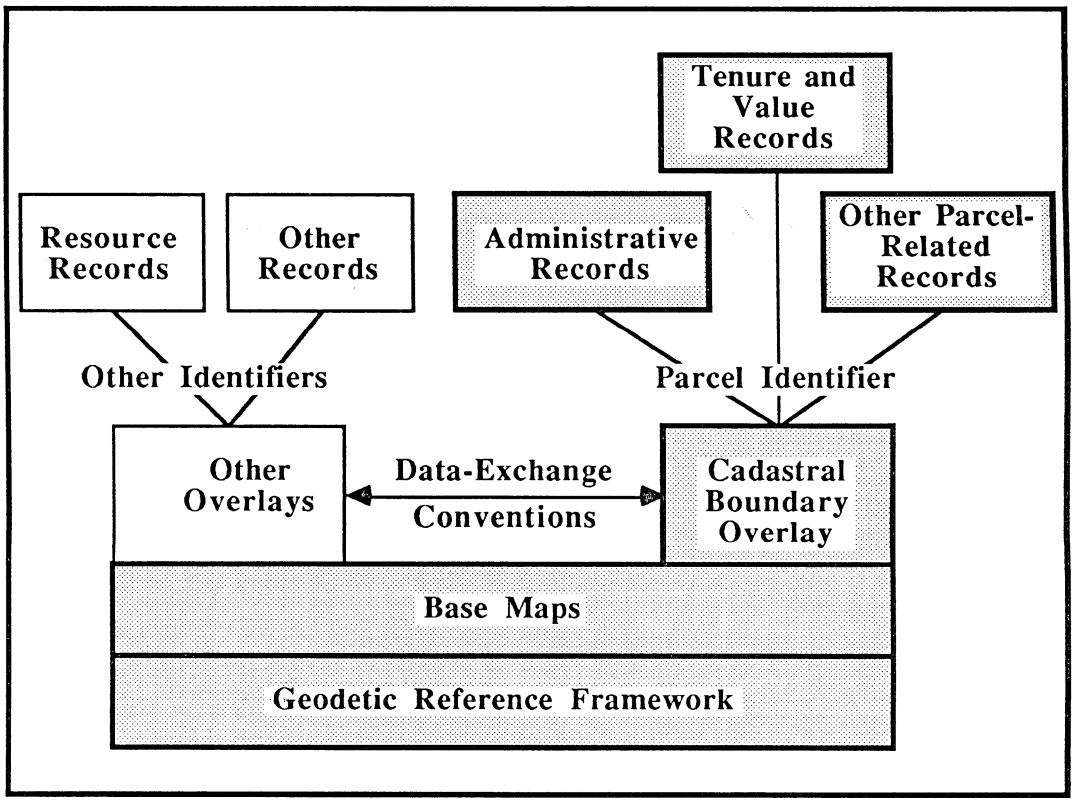

FIGURE 4.2: The multipurpose cadastre concept [from NRC, 1980]

subsystem. This same perspective is illustrated in most Australian models for parcel-based LIS.[11]

4.1.2 Land policy perspective: land and tenure

Another perspective of land registration is as a means of implementing and enforcing land policy. Land registration is viewed as providing official recognition, security, and regulation of tenure. While the emphasis is usually on the benefits of establishing land registration systems in the initial policy implementation stage, the potential monitoring role of land registration systems in the identification of land policy concerns is given less attention.[12]

Recognition of the power of land registration in land policy is not new. The Doomsday survey of England not only provided William I with information required to administer the lands he conquered, but also helped to entrench the feudal system of land holding by establishing the principle of *nulle terre sans seigneur* (no land without its lord).[13] Looking back on the building of an empire in 1816, Napoleon I also captured this policy perspective of land registration:[14]

> *...that cadastre just by itself could have been regarded as the real beginning of land ownership, providing for every citizen certainty of independence. Once the cadastre has been compiled, and once legislators have determined the tax rates, every citizen can for himself control his own affairs, and need not fear arbitrariness of the authorities. This, therefore, is the safest means to win over the support of the citizens.*

In another historical example, the Swedish National Land Survey was established in 1628 with a mandate to map the country to determine economic development potential. The resulting compilation of records and maps of land tenure (still referred to today as economic rather than property maps) revealed severe fragmentation of the land holdings and became the basis for three national land consolidation programmes beginning in 1749.[15]

Among the more recent land policy issues in which land registration is an important component are:

- *socio-political:* redistribution of rights among certain sectors of society (e.g., the breakup of large estates by converting tenancies and occupational interests into title);

- *political-economic:* conversion of customary or informal tenure to legally recognized interests (e.g., to protect group interests or to give more recognition to individual rights);

- *economic:* land reordering to provide more productive land units (e.g., land consolidation and readjustment);

- *legal-political:* regulation of land ownership (e.g., monitoring foreign and corporate ownership or limiting the acquisition of land through occupation);

- *environmental:* restriction of land use (e.g., enforcing environmental, development, or agricultural regulations).

The land policy perspective has been important in demonstrating some of the weaknesses in current system models and the need for new strategies. Three major areas of concern have been: the registration of customary group interests;[16] methodologies and precision in cadastral surveying and mapping;[17] and the need for low-cost, but effective and maintainable, systems in many developing countries.[18] Experience in international aid projects has shown, for example, that "imported" land registration strategies are not usually appropriate without significant adaptation to local conditions.

4.1.3 The conveyancing perspective: tenure and systems

The conveyancing perspective is characterized by an adherence to the traditions of law and a focus on systems to facilitate land transfer. It is the tenure interest (rather than the parcel) that is of primary concern and in the common law, tenure is defined very narrowly as the system of estates derived from feudal England.

In common law jurisdictions, the history of land registration from a conveyancing perspective is well documented as a nearly 500 year battle to introduce public registration in Britain (only approximately 70% of the country is included as yet)[19] and debates over the merits and limitations of various alternative systems that developed in other countries. One result has been the evolution of a classification of land registration-conveyancing systems from a legal perspective which may be summarized as private conveyancing, registration of deeds, and registration of title.[20]

In private conveyancing, the state has no involvement and the transfer is usually effected through a legal representative such as a notary public or lawyer. The result is that there is no control of transactions, no public notice that a transaction occurs, and little security for the vendee in cases of fraud or lost documents. The Statute of Enrollments (1535) attempted to remedy this situation by requiring that all freehold transfers be made by deeds which were to be publicly filed. The statute was circumvented on technicalities and, with very limited exceptions, subsequent attempts to establish public registration of deeds in England failed.[21] Deed registration systems were, however, introduced in British colonies and became the model for land registration throughout the United States and in eastern and central Canada.

Although particular features of systems vary, deed registration is based on three principles:

Security: Registration of a document gives the interest holder greater security that documents will not be lost or destroyed. In most systems, a duplicate of the document is made and thus there are two copies in existence;

Evidence: Registration provides evidence but not assurance of title. Although systems differ, the contents of the documents (including parcel plans and descriptions) are examined only superficially upon registration. To establish the validity of the title and

any restrictions on it, the history of the interest must be traced through previous documents. Not only is this time consuming and repetitive (the process must be duplicated for every transaction on the same parcel), but often older documents are missing or of poor quality (or as Lord Westbury claimed, *"difficult to read, impossible to understand, and disgusting to touch."* [22]). Defects in title or boundaries can be rectified by registration of new documents, but the erroneous documents will remain in the system.

Notice and Priority: Registration of a document gives public notice that a property interest may exist and, in most jurisdictions, registration gives priority to interests in documents registered first if the interest was acquired without actual or constructive notice that an adverse interest existed.

Registration of title was designed to remedy the defects in deed registration and to simplify the conveyancing process. In this system, the state assumes a greater role in the transaction and the information contained in the current register becomes proof of title. The three well-known principles of title registration are:[23]

Mirror Principle: The register reflects accurately and completely the current state of the title, although in practice there are many overriding interests that are not shown in the register. To achieve the mirror principle, the register must be based on parcels, not documents, and an adequate description and identification of each land unit is required. A certificate of title is issued to the vendee in many systems.

Curtain principle: The register is the sole source of the title information; in theory there is no need to check historical documents to verify the information.

Insurance principle: The Registrar is responsible for verifying the information contained in the register and if an error occurs, an injured party will be compensated for any loss. In many jurisdictions, a fee is levied on each transaction to build a compensation (or assurance) fund.

The concept of title registration in England was first raised in comments at the 1830 Royal Commission on Real Property, but it took until 1862 before the first Land Registry Act for land titles registration was introduced. Subsequent problems related to requirements for parcel description, optional registration, and real property law delayed the effective implementation of the land titles system until after 1925, and system conversion is still underway. In contrast, a system of title registration was implemented for example in Germany in 1843 and in South Australia in 1858.[24] The latter was designed by Sir Robert Torrens, and it is this 'Torrens System' that became the model for land title systems in Australia, New Zealand, the western Provinces and northern territories of Canada, and other jurisdictions. Although Torrens title legislation has been introduced since 1895 in several American states, constitutional requirements and the private title insurance industry (which developed in that country to reduce the risks of deed registration) are cited as the major reasons for its general failure.[25]

Once implemented, title registration was accepted as representing the ideal system in terms of conveyancing, i.e., the system to which all jurisdictions should strive. It has only been in relatively recent years that some of the features, procedures, and even principles have been challenged. For the most part this challenge has not come from the legal community which the systems were designed to serve, but from system administrators who must reduce costs and increase efficiency, by LIS managers and users, and by those involved in evaluating and designing land registration systems in developing countries.

Figure 4.3 presents Simpson's model for classifying land registration systems from the conveyancing perpective. In the model, deed registration systems are distinguished on the basis of the effect of registration; title systems are classified primarily on how parcels are delimited for registration. Simpson views land registration as serving a private function with the cadastre being a separate system with the wider role in land administration.

Although this is a useful model, it is limiting and the legal distinctions do not adequately reflect the variations in actual systems. For example, some deed registration systems (e.g., South Africa and Zimbabwe) have all the features of title registration, such as extensive public examination procedures for title and boundary delimitation, but do not guarantee title. And in both deed and title registration systems, effectiveness in conveyancing and in land administration usually depends more on the quality of the information management arrangements (e.g., regional rather than large centralized offices, completeness, and parcel indexing) than specific legal rules.[26] Automation is further blurring the distinctions.

4.1.4 The technology perspective: information and systems

Compared with the long history and tradition of the cadastral and conveyancing approaches to land registration, the technology perspective has hardly begun. Except for improved surveying and mapping techniques, until recently the technology of land registration was limited to typewriters, photocopiers, and telephones. Microfilm, microfiche and optical disc technology can change how information is stored and disseminated, but the major impact has been the introduction of computers and database management systems for administration, indexing, mapping, examination, and provision of user services. Data networks linking systems to users and other LIS,

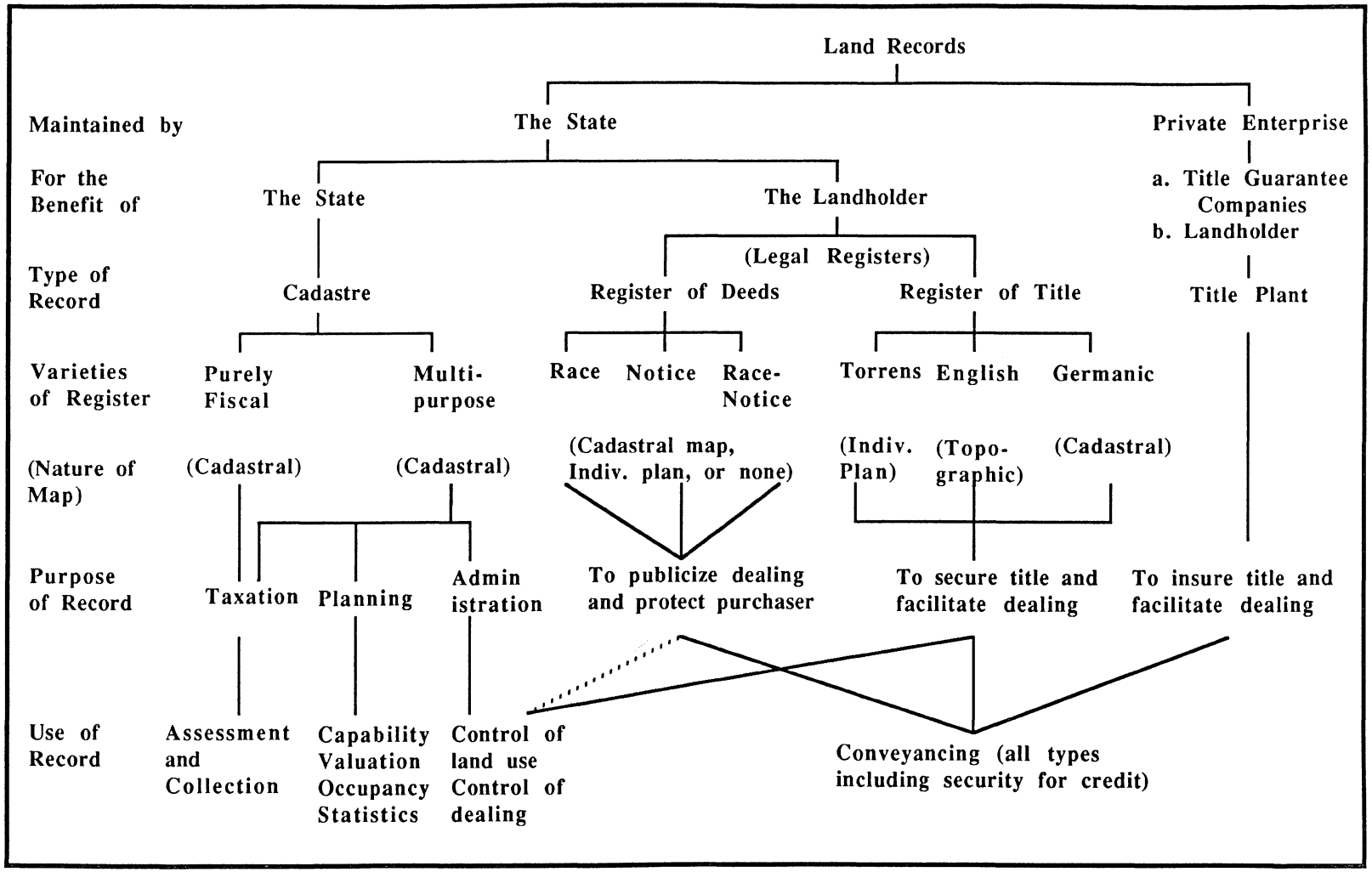

FIGURE 4.3: Simpson's classification of land record systems [from Simpson, 1976]

expert systems, and satellite positioning systems for parcel delimitation are beginning to bring both new opportunities and new issues to be resolved.

The technology perspective on land registration may actually be divided into three different views:

Technology must be avoided at all costs: Technology has been perceived as a threat by many responsible for and working in land registration systems. Resistance to change is often related to job insecurity, age, education, and even pride in the traditional procedures and records. Although slowly disappearing as the general population becomes more familiar with computers, this resistance is real and must be taken into account in the implementation of reforms.[27]

Technology will solve all the problems: Sometimes those most familiar, or least familiar, with computers or other technology may hold this point of view and it can result in an inappropriate use of resources. While it is important to have technological optimists who lead the way to new ways of doing things, it is as essential to balance this perspective with an understanding of the fundamental problems and implications. This perspective will wane as the technology is actually implemented and the limitations are realized, but it will probably be encountered in every new project.[28]

Technology is a catalyst for other improvements: If there is hope for fundamental land registration improvement, it will be helped by this perspective. Technology is inevitable; how it is used is not. If the introduction of technology is managed well, it gives an opportunity to reevaluate what is being done and why and to identify what options exist. Often these questions have never really been asked before.

The primary benefit of the technology perspective is that it has emphasized the role of land registration as an information system. This has led to a new way of looking at mandates, organizational structures, procedures, products, and services. It has also enabled land registration systems to be viewed as components in much larger land information and land administration systems and no longer simply the province of the conveyancing community. In both Sweden and South Australia, for example, title information has been integrated with other tenure data and is accessed through on-line networks by a variety of users such as municipal and planning authorities, real estate agencies, banks, etc. In Sweden the land title database also contains a personal identifier which enables linkages to socio-economic and other administrative records and a register of buildings linked to parcel identifiers is in development. Alberta and British Columbia are also developing on-line access to tenure data.

4.2 Land Registration Systems: A Critique

The following critique is limited to general problems in the practice of land registration. Four major problems have been identified: specialization, complexity, inflexibility, and incompleteness. Information for the critique was obtained from the case studies, site visits, other discussions with those involved in the land registration process, and the literature. It is therefore restricted for the most part to systems in common law jurisdictions.[29]

4.2.1 Specialization

Multiplicity of registries of land tenure information in each jurisdiction: Each organization responsible for the management of specific types of interests generally has established its own registration system. Among the reasons for this proliferation are: the traditional administrative structure; the fact that information is maintained by agencies that also perform other functions; and the divisions of power among various levels of government. For example, there were approximately 9 sources of generally incompatible and incomplete cadastral maps identified in the NWT. Table A.1 and A.2 show the number of sources of land tenure information in Newfoundland. To obtain complete information about all of the interests affecting a specific parcel of land many of these sources must be contacted.

Development of specialized standards and procedures in each registry: Each registry has developed its own standards in isolation and they are usually at least partially incompatible with those of other registries and other information systems. This incompatibility is a major obstacle in the comparison and integration of information from various sources and in the development of multi-agency LIS. Standards that cause particular problems include: parcel definition; parcel referencing schemes; classification of the type of ownership and interests; administrative boundaries (and thus often regional data sources); cadastral mapping scales; and the reliability, accuracy, and completeness of the data.

Development of systems to serve a narrow user community: Most secondary systems (e.g., planning, Crown lands management, taxation) are designed to meet the needs of the organization responsible and perhaps a limited number of other users. Access to the information is often restricted to other users explicitly (e.g., by

law) or implicitly (e.g., cost, time, and difficulty in obtaining information). Most primary systems are designed to serve those involved in the conveyancing process. Although deed registry systems, for example, are open to the public, it often requires specialized knowledge to find and interpret the information about parcels and titles.

4.2.2 Complexity and inflexibility

Complex and often inadequate parcel descriptions: Metes and bounds descriptions still abound in North American land registration systems and probably in many systems elsewhere. Some of these descriptions may have been written over a century ago and refer to land owners and features that no longer exist. Not only are they difficult to understand and often ambiguous, they also hinder automation,[30] indexing, and development of short, standardized forms for conveyancing and document storage. Even when a survey plan is registered and referred to in a deed, the metes and bounds may be retained or a new one written.

Complex and outdated legal terminology and distinctions: The recent study by the Canadian Joint Land Titles Committee which recommended a revised and standard model for land titles legislation for all provinces and territories has probably summarized this problem as follows:

> *Existing interest recording/title registration statutes are based on precedents more than a century old. Their language is opaque, misleading, and not suited to modern conditions. Their organization does not disclose the principles on which they are based. Their inclusion of much substantive law and administrative matter further obscures those principles. They require rationalization and modernization.*[31]

Complex procedures and associated costs: Although not the only problem, examination procedures for titles and plans of survey can sometimes be ineffective. For example, great attention in plan examination may be given to checking survey calculations, plan form and format, and whether the survey closes; yet the survey may not be tied to any spatial reference framework and the examination may not consider whether the adjacent parcel boundaries are compatible. Frequently, the tendency of anyone who knows their work will be checked for them is to not take as much care themselves. There is a need to reconsider what a procedure is designed to accomplish, who should be responsible, how it should be carried out, and whether it is necessary at all. Many deed registry jurisdictions have, for instance, limited the time period required for title searches to reduce redundant and often unnecessary checking.[32]

Inflexibility and inability to easily adapt to new circumstances: Both survey and title systems are dominated by tradition and legal procedures and operate within a larger institutional framework. New types of interests and new technologies are sometimes difficult to incorporate within existing regulations and procedures[33] and systems may be slow to develop the flexibility and changes required. For example, laws regarding the acceptance of computer records as evidence have often been changed after a land registration system is automated or have delayed reforms. Another example is running dual systems (the old and the new) side-by-side for an overly long period of time. The problems related to inflexibility become even more acute when systems developed in one set of institutional circumstances are introduced elsewhere without making appropriate adaptations.

4.2.3 Incompleteness

Incomplete information: Figure 4.4 illustrates various kinds of tenure information. Land registration systems in general have handled the shaded information well, but there are many other kinds of tenure information that are not included. Often this information resides in specialized systems (if at all) and access to the information is poor. Ineffective access may result from such problems as the potential user not knowing whether the information exists or where to get it, the location of the information being difficult to reach, or the referencing system being incompatible.

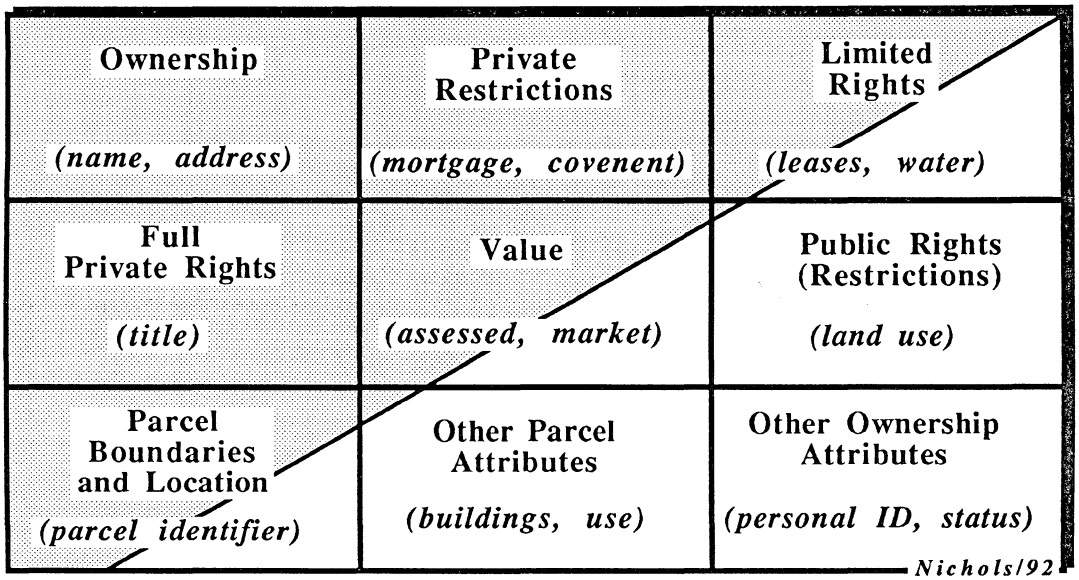

FIGURE 4.4: Examples of tenure information currently available in most land registration systems (shaded)

Incomplete systems: Reforms are introduced at some point in time and part of the jurisdiction or part of the information is converted, but remnants of the old system remain. Conversion to land titles is a classic but not the only example. Even in Australia and New Zealand, it has only been in the last decade that special efforts have been taken to eliminate the remaining deed registry parcels that were granted before land titles

systems were put in place. But incomplete mapping systems, multiple types of survey systems, and incomplete inventories of information collected for specific purposes can be found in nearly every jurisdiction.[34] It may not be desirable or even possible to always finish these projects given priorities and constraints, but more effective management of information and system reforms may help to reduce these problems in future efforts.

4.3 Current and Future Trends in Land Registration

Many land registration systems have experienced more change within the last decade than in any previous era. Some of this change has been inevitable, driven by external forces such as information technology, restructuring of government priorities, and the growth of real estate markets. Other reforms have resulted from a new information perspective on land registration. The points outlined here are in no way complete, but have been chosen to represent the wide spectrum of trends related to a changing information environment. In some cases points have been included that are in the planning or "the near future stage", and represent the direction of land registration reform.

4.3.1 LIS development

Before addressing some of the other trends and issues, it is important to consider the impact that the development of land information systems has had and will continue to have on land registration. Basically this can be considered as two parts: development of land information systems and networks external to land registration offices but incorporating land registration systems as one component or node; and greater recognition internally among land registration authorities of their systems as

information systems. From the external LIS perspective, the Law Reform Commission of Victoria has pointed out, for example that:

> *Efficiency in conveyancing and in Government administration is impeded by the lack of an integrated network of land-related information. That problem should be rectified by the automation of the land registration system and its integration with the Government's land information network...* [35]

Other trends include:

- development of compatible parcel definitions and identifiers and other common standards;
- increasing demand for parcel-based computerized indices and inventories of current tenure interests with official standing for use in integrated information systems;
- increasing demand for information concerning property values collected through land registration;
- greater integration of information and services among primary and secondary systems.

Perhaps the greatest changes, however, will occur as the perception of the primary role of land registration shifts from facilitating land transfer to information management. Although this is the subject of the remaining chapters, some of the expected trends are highlighted here:

- a greater emphasis on risk management;
- more effective procedures, including procedures to enhance data quality;
- decentralization of services and processes, including collection and dissemination of data in digital format through data networks;
- shifting of the responsibility for data accuracy and updating to data sources;

- improved security measures including duplicate data storage offsite;
- reference to the parcel as the primary (although not necessarily only) access key;
- development of new products and services;
- less distinction between registration of deeds and registration of title systems.

4.3.3 Technology

Some of the technology trends have been included above and more are considered under surveying and mapping, but more specific trends include:

- bar coding to track the flow of documents;
- scanning technology to convert documents and plans to digital format;
- mass storage technology such as optical discs and microfiche to reduce storage requirements, to provide duplicate storage for safety and decentralized services, and to connect document data with index databases;
- relational database management systems to provide more comprehensive and flexible indices;
- expert system technology in title and plan examination, including verification with a wide range of external regulations.

4.3.3 Cadastral surveys and mapping – parcel delimitation

Some of the trends include:

- greater capabilities to overlay and integrate graphical data for resource and planning interests with data on freehold parcels;
- emphasis on completing cadastral mapping and conversion to digital format;

- emphasis on developing procedures for improving the reliability and accuracy of map data over time;

- integrated surveys tied to a common spatial reference framework and provision of co-ordinate data to upgrade digital cadastral databases;

- changes in priorities of evidence to give more weight to co-ordinate information;

- complete automation of the survey process from data collection to the submission of parcel data for examination and registration, including increasing use of satellite positioning systems;

- simplification of parcel descriptions with a greater emphasis on reference to survey plans and/or cadastral maps;

- more complete surveys to provide other parcel data, such as the location of buildings;

- greater responsibility on the survey profession for ensuring data quality and for managing data within the land registration process.

4.3.4 Law and administration

In most jurisdictions there is an ongoing process of reviewing and reforming the law to respond to new situations and problems. Many areas of these law reforms have a direct impact on land registration, from changes in real property law and registration regulations to new laws affecting access to information and environmental regulation. Some of the trends include:

- compulsory registration and increased limitations on adverse possession;

- standardized forms for land transfers, with information provided in a format to facilitate computerized data entry;

- simplification of the terminology in land transfer documents, including codification of commonly used phrases and descriptions;

- legal recognition of digital data and other formats as evidence;

- clarification of the ownership and legal responsibilities for information;

- reduction of the number of overriding interests, including environmental regulations, by inclusion of data on these interests within the registration systems or by networking various registries;

- standardization of land registration legislation to facilitate interjurisdictional land transactions and information flow.

4.3.5 Policy

Trends include:

- greater emphasis on cost-recovery and revenue generation;

- integration of organizations responsible for managing land tenure information to rationalize resources, facilitate the integration of information, and to improve services;

- increasing role of the private sector and state corporations in land registration activities, including system management;

- decreasing government responsibility for the quality of information and greater responsibility placed on information sources;

- increasing pressure to develop clearer policies on issues such as access to information, privacy, and copyright.

4.4 Issues for Further Research

A review of existing land registration arrangements in one chapter can only be an overview and the emphasis throughout was on English common law jurisdictions, systems, and models. The following are areas that should be addressed in future research on land registration:

Comparative analyses and case studies: Updated comparative analyses of land registration systems and the various system reforms should be undertaken. The analyses of Dowson and Sheppard,[36] Simpson,[37] Dale,[38] and Larsson[39] have provided researchers with tools for understanding the models and history of land registration. But these works have become dated, for example, with the rapid changes in computer technology. There is still a need to address the wide range of developments using a common framework. Larsson, for instance has just completed such a work for many parts of Europe.[40]

Case studies are the basis of comparative analyses.[41] Both case studies and comparative analyses should give more emphasis to textual records of interests than current cadastral research. The research should also address other forms of tenure than freehold or equivalent interests, including resource rights. And most importantly it should be concerned with why and how certain developments occurred, e.g., what conditions caused this different solution. Emphasis should be given to institutional and management factors that contributed to change. Countries with legal systems not based on English common law including less developed nations should also be a priority in this research.

Eastern Europe and other regions: Related to the above issue is the need to specifically address land registration systems and issues in Eastern Europe. What are the requirements and constraints, what are the current models for managing land tenure information, and how can they be adapted to meet the rapidly occurring changes in land and land tenure policies? All of these questions need to be answered if reforms are to be appropriate.

Already western consultants have been asked to address some of these issues, but many projects will be controlled by the politics of international aid and, as in related projects in other countries, the documentation may be sporadic and difficult to access. There is a need for more fundamental and systematic research to understand the problems and opportunities in Eastern Europe (and elsewhere) from an information management and land policy perspective, as well as in terms of legal or technological systems. Political change is making such research possible and we have much to learn.

4.5 Endnotes

1 P.F. Dale [1990], "National Cadastral Reform Conference '90 – some observations by Prof. Peter Dale." *Australian Surveyor*, 35(3), p. 305.

2 See, for example, J.D. McLaughlin [1975]. *The Nature, Function, and Design Concepts of Multipurpose Cadastres*. Ph.D. Dissertation in Civil and Environmental Engineering, University of Wisconsin, Madison.

3 Swedish National Land Survey (LMV) [1978]. "LMV-Information" No. 6, April, p. 32.

4 McLaughlin 1975, *supra*, note 2 at p. 3

5 T.J. Blachut [1975]. "What constitutes a land records system – a cadastre?" *Proceedings of the North American Conference on Modernization of Land Data Systems*, Washington, DC, April.

6 E. Dowson and V.L.O. Sheppard [1952], *Land Registration*. Colonial Research Publications No. 13, London: Her Majesty's Stationery Office at pp. 45-51.

7 McLaughlin, *supra*, note 2; P.F. Dale and J.D. McLaughlin [1988], *Land Information Management: An Introduction with Special Reference to cadastral Problems in Third World Countries*, Oxford: Claredon Press.

8 McLaughlin, *supra*, note 2; National Research Council (NRC), Panel on the Multipurpose Cadastre [1980], *Need for a Multipurpose Cadastre*, Washington: National Academy Press.

9 I.P. Williamson [1985], "Cadastres and land information systems in common law jurisdictions." *Survey Review*, 28(217), pp. 114-129; McLaughlin, *supra*, note 2.

10 after NRC [1980], *supra*, note 8. This is based primarily on the concepts and design criteria presented by McLaughlin [1975] *supra*, note 2. Although McLaughlin provides a broad framework for the multipurpose cadastre which is the basis for many of the ideas presented here and includes incremental improvement models for interest and boundary registration, the emphasis is on the cadastral survey and mapping systems and the principles for organizing a cadastre. This is common in most cadastral models.

11 Jeyanandan, D. and G.J. Hunter, eds. [1990]. *Papers and Proceedings from the National Conference on Cadastral Reform '90*, Melbourne: University of Melbourne, Department of Surveying and Land Information.

12 This potential role is discussed by P.F. Dale [1990], "Strategies for cadastral reform." in *supra*, note 11, at pp. 292-299.

13 Trevelyan, in *History of England*, as cited by Dowson and Sheppard, *supra*, note 6, at p. 5

14 As cited in W.F. Roberts [1979]. "An assessment from a political point of view." Presentation to a Panel on Land Records and Resource Information Systems, in *Proceedings of the American Congress on Surveying and Mapping*, Washington, DC, March, pp. 372-379, at p. 379.

15 Supra, note 3; Scott, F.D. [1977], *Sweden: The Nation's History*, Minneapolis: University of Minneapolis Press, at p. 187 discusses the significance of the mapping program and notes that the Swedish national land survey office became a model for similar offices in other European countries.

16 For example, G. Larsson, "Land registration in developing countries,"*World Cartography,* XI, pp. 33-67.

17 E.g., P.F. Dale [1976], *Cadastral Systems within the Commonwealth,* London: Her Majesty's Stationery Office; L.C. Holstein, and I.P. Williamson[1986], "Options for marking the cadastre." Appendix 19 in *Feasibility Study into a Co-ordinated Cadastre for South Australia,* v. 2, Report #1/86. Adelaide: Department of Lands, Survey Division.

18 E.g., Dale and McLaughlin [1988], *supra,* note 8; L.C. Holstein [1987], "Considerations for land registration improvement for less developed countries." Papers from the 3rd World Bank Seminar on LIS, Washington: World Bank; C. Hedberg [1991], *Information Systems for Land Resource Management in Developing Countries,* Development and Environment Occasional Paper no. 7, Aas, Norway:NORAGRIC; H. Dunkerley [1988], "LIS in developing countries — the requirements and the resources," In *Proceedings of the International Symposium on Low Cost LIS:State of the Art and Future Implications,* Gold Coast, Queensland, Sept 1988, pp. IIB1.1-IIB.1.9.

19 There an estimated 20-22 million parcels, and approximately 14 million titles were registered by 1991.

20 The best illustration of this classification is by S.R. Simpson [1976], *Land Law and Registration,* Cambridge: Cambridge University Press, at p. 124.

21 Dowson and Sheppard [1952], *supra,* note 6.

22 Lord Westbury, as quoted by Dowson and Sheppard [1952], *supra,* note 6 at p. 11.

23 S.R. Simpson [1976], *Land Law and Registration,* Cambridge: Cambridge University Press.

24 Dowson and Shepherd, *supra,* note 6.

25 D.D. Moyer [1977], *An Analysis of the Land Title Record System,* Ph.D. Dissertation in Economics of Information, Madison: University of Wisconsin.

26 For example, the large centralized offices in Australian states, together with poor information procedures, have caused delays in the registration of subdivisions and conveyances (up to 4 months in Melbourne in 1986). An entire division in the Melbourne land titles office was devoted to finding documents within the land titles office. Similar problems exist in Britain where "paper keepers" searched for documents in 16 district offices. Document tracking systems based on bar coding have been major improvements but have delayed implementing other components of a computerized land title system.
In contrast an efficient deed registry system with parcel indexing and plan examination can provide nearly the same security of interests in terms of information reliability. And complete automation of decentralized land title offices in British Columbia [approximately 2 million titles] and Alberta was effected much more readily than in Australia. Since Alberta's referencing system and PID is geographic rather than document based, it has also been much easier to develop linkages with other registries.

27 In the early 1980s, the main public advice of the retiring Registrar of Deeds in Newfoundland to the new Registrar was to avoid computers at all costs because the system had always worked well enough. B.Gillies, Registrar of Deeds, St. John's, Newfoundland, personal communication, 1984. Opportunities were lost in the late 1970s to implement improved registration to support a new property taxation programme. [See Appendix I).

28 Again in Newfoundland, the general discussion from many of the participants at the first LIS workshops, centred around a "land data bank" with all information on computers and a Torrens system as the solution to all the information problems. In fact the real problems were a lack of information and information quality. Similarly GIS is considered by many at first to be the solution to all map scale problems.

29 See, for example, P.F. Dale [1990], "International trends in cadastral reform – or registration of title, is it time for a change?", *supra,* note 11, at PP. 1-9, which reviews another selection of problems.

30 In the New Brunswick land titles pilot project titles are indexed by a unique PID, but no survey is required and many parcels are describe by metes and bounds. Each description had to be entered in the word processor used to generate titles. Storage requirements quickly became an issue and this also provided some obstacles in trying to integrate the title system with the parcel index and remaining deed registry system.

31 Canada, Joint Land Titles Committee [1990]. *Renovating the Foundation: Proposals for a Model Land Recording and Registration Act for the Provinces and Territories of Canada.* Edmonton: Alberta Law Reform Institute.

32 Title should in theory be traced to a good root of title, which often may be a 200 year old Crown grant. Restricting the search to 20, 40 or 60 years is usually based on the limitation period for adverse possession.

33 One example has been the difficulty in registering the Inuvialuit land title in the NWT because each parcel must be surveyed before a title can be issued and there were approximately 11,000 km of boundaries involved in the settlement. The surveys, conducted by the federal government, were estimated to cost over $10,000,000 (Can 1985$). In Australia, the tradition of having a diagram of the parcel on the certificate of title, in addition to the registered plan, was an issue in the mid 1980s as automated title systems were beginning to be introduced.

34 New Brunswick's 16 year old pilot project for integrated surveys is an example of incompleteness and the land titles pilot project in another county may be another.

35 Law Reform Commission of Victoria [1987]. *The Torrens Register Book,* Report No. 12, Melbourne: Law Reform Commission of Victoria, 36 pp. at p. vii.

36 Dowson and Sheppard, [1952], *supra,* note 6.

37 Simpson [1976], *supra,* note 23.

38 Dale [1976], *supra,* note 17.

39 Larsson [1971], *supra,* note 16.

40 G. Larsson [1991], *Land Registration and Cadastral Systems: Tools for Land Information and Management,* New York: John Wiley and Sons.

41 For example, I.P. Williamson [1990], "Considerations in assessing the potential success of a cadastral project in a developing country – a case study of the Thailand land titling project." *Australian Surveyor,* 35(4), pp. 313-325.

5. DESIGN OF INFORMATION MANAGEMENT MODELS FOR LAND REGISTRATION

> *Determine right from the start, the purpose (or purposes) the land or cadastral registration system will serve. There are a number of benefits to be derived from registration and if the goals are clearly stated and understood then chances of success will be enhanced.*
>
> *Hennsen, 1983*[1]

Chapters 2 and 3 have examined land management and administration to determine requirements for land registration. In Chapter 4 some of the limitations of the existing systems, with respect to those requirements, have been discussed. To develop systems that are more effective, the information management function of land registration must be made more explicit. Although theoretical models are beginning to reflect this information role, the impact on land registration has not been systematically reevaluated.

The purpose of this chapter is to initiate a more rigorous examination of land registration from an information management perspective. A framework for the analysis, shown in Figure 5.1, highlights a set of models that have been derived from the requirements in Chapters 2 and 3. The models build progressively on each other and are described in the sections below. They include the following:

- a ***land information management model*** that links requirements and system development (Figure 5.2);
- a model of land registration ***objectives*** (Figure 5.3);
- a model of land registration ***functions*** (Figure 5.4);

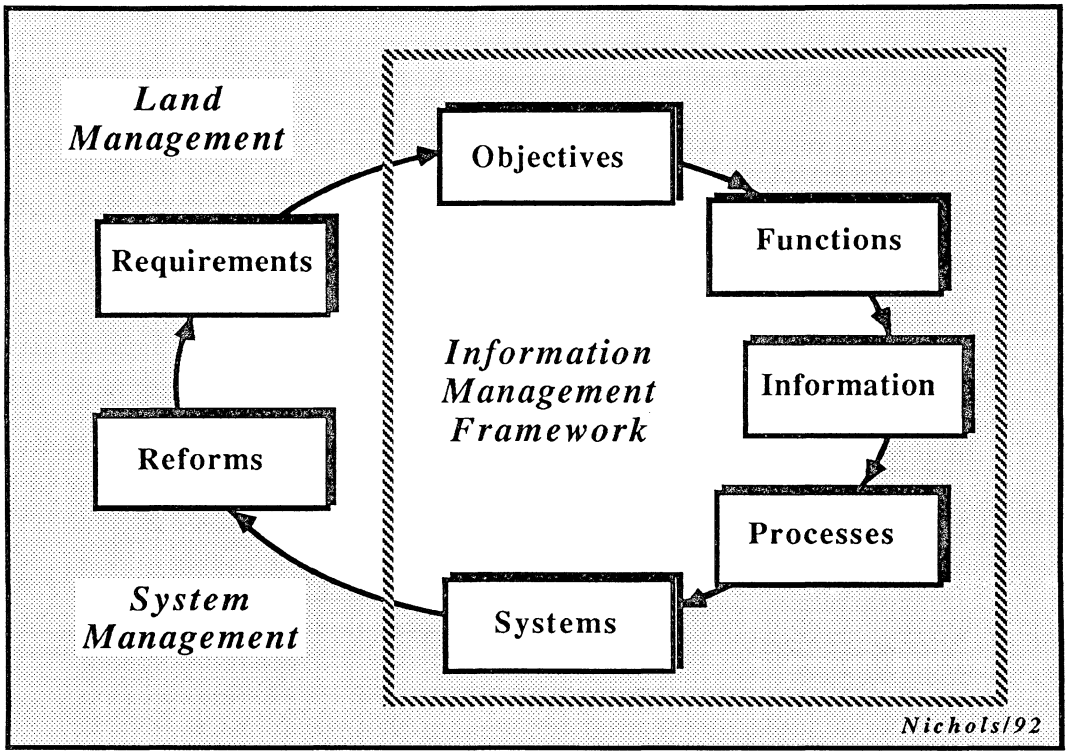

FIGURE 5.1: An information management framework for land registration

- models for land registration ***information*** , including
  - classification of information by function (Figure 5.5);
  - model of information requirements with examples (Figure 5.6);
  - relational model for managing information (Figure 5.7) with examples (Figures 5.8 and 5.9);

- a model of land registration ***processes*** (Figure 5.10);

- models for land registration *systems*, including:
  - the system components (Figure 5.11) with examples (Figures 5.12 and 5.13);
  - the community of primary and secondary land registration systems within a jurisdiction (Figure 5.14);
  - the system environment (Figure 5.15).

As in any modelling exercise, certain features are given more emphasis than others. The focus here is on the information and processes as tools for system evaluation and reform discussed in Chapter 6. The primary objective has been to design models that are independent of specific institutional arrangements. A second objective has been to provide a framework for further research. Examples of how the models might be applied are given for Newfoundland in Appendix I.

5.1 Designing information management models

The models represent a different way of thinking about the land registration process – from the perspective of information management – and provide the basis for designing systems and possible reforms more effectively. In this section, the design criteria for the models and the information management perspective are discussed.

5.1.1 Design criteria

The models represent a systems analysis approach rather than specifications for a particular form of land registration. In most jurisdictions land registration systems are well-established and the emphasis is on improvement, not introduction of a completely new form of registration. Furthermore, as will be discussed in Chapter 6, systems should be designed to meet particular jurisdictional objectives, requirements, and constraints. What is of interest from a theoretical standpoint is what these systems have or should have in common and what guiding principles for system reform can be developed.

Therefore the primary objective in designing these models was to develop more effective tools for describing, comparing, evaluating, and improving land registration arrangements. More specifically, the design criteria are that the models should:

- be general and flexible, i.e., not dependent on any specific legal, administrative, or technical environment nor based on specific system types or land tenure interests;

- be simple, yet capable of describing land registration arrangements completely, including the boundary or parcel component;

- provide a basis for developing effective evaluation criteria for land registration arrangements, e.g., criteria that can assist in identifying significant differences, problems, advantages;

- be effective in designing and reforming land registration to meet new as well as traditional requirements by isolating and relating critical components, but allowing the characteristics of the components (e.g., sequence, responsibility, degree of accuracy or reliability) to vary to suit particular needs and constraints.

5.1.2 An information management perspective

To meet these criteria the models view land registration from an information management perspective. In one sense this is an integration of the perspectives presented in Section 4.1, but at the same time the focus is on management of land tenure information as a resource for land administration. Information management is concerned with the development and implementation of strategies related to how information is collected, processed, accessed, and used. Among the implications of this perspective are the following:

- The focus is on information (not particular records), on information processes (not specific rules and procedures); and on systems for managing these processes (not theoretical legal and administrative principles).

- Management of land tenure information is the primary objective and any other benefits sought from land registration, such as efficient conveyancing ultimately depend upon how well the information resource is managed.

- Land tenure information is recognized as a shared resource, with value to individuals (private good) and value to society (public good) and therefore both private and public functions must be reflected.[2]

- The effectiveness of land registration arrangements can be measured in terms of the degree to which this value is realized and the associated problems (including costs) of the management arrangements.

- Land registration can be viewed as incorporating many related systems or subsystems, as well as processes that extend beyond the boundaries of well-defined administrative systems such as the Registry of Deeds or the Planning Office.

- Land registration is viewed as a dynamic set of interrelated processes, capable of responding to new requirements, constraints, and opportunities.

- The potential responses to these requirements range from public policy to technical level responses (see Figure 5.2).[3]

This perspective represents a major departure from the standard manner of describing land registration systems. It is a perspective that evolved during the case studies in which significant features were identified that could not adequately be described, critiqued, or redesigned effectively using the traditional approaches to land registration.[4] In the evaluation presented in Section 5.6, some of the advantages and limitations of this information management approach are outlined.

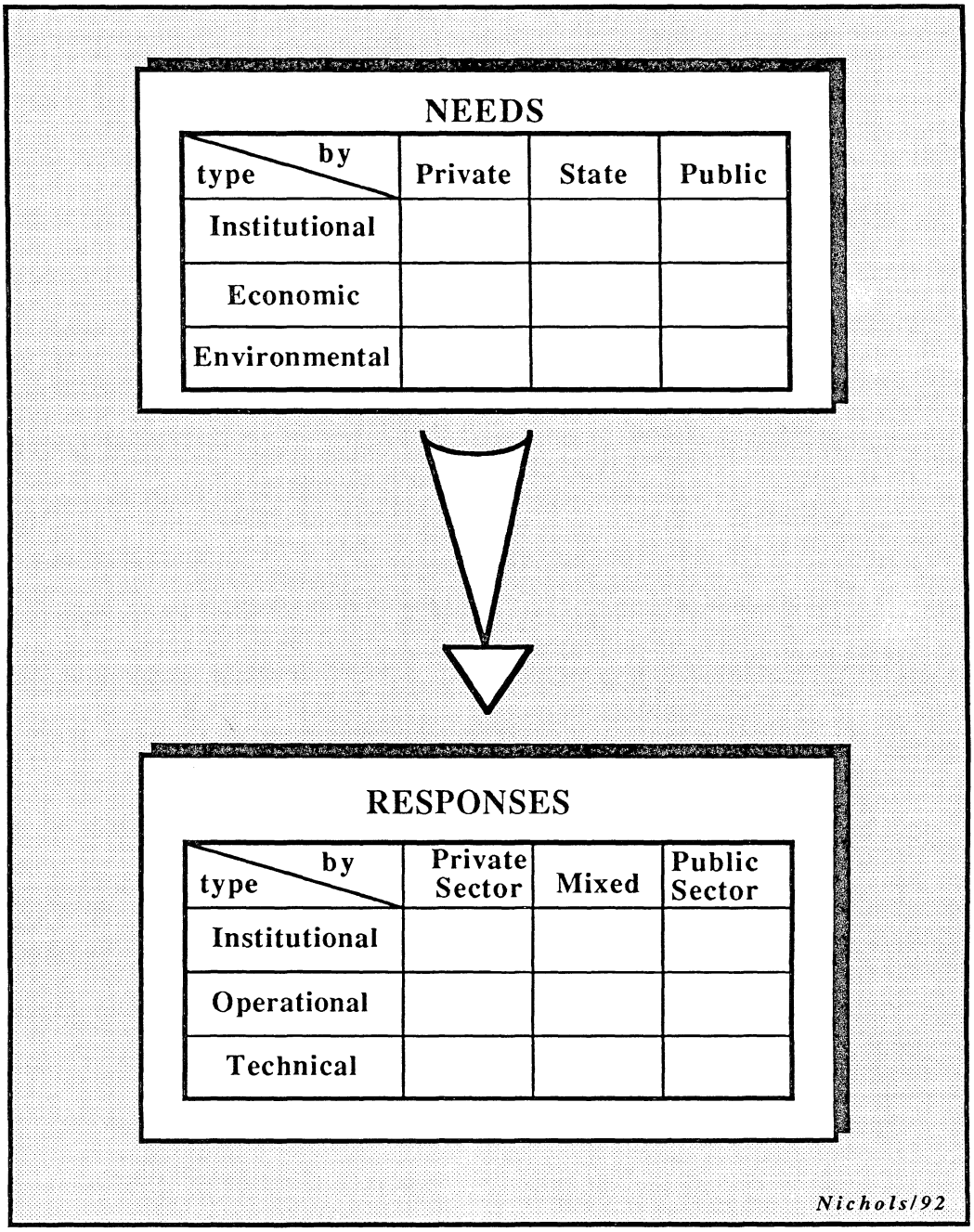

FIGURE 5.2: A needs-response model for land information management [after McLaughlin, 1981]

5.2 The Objectives and Functions of Land Registration

As Henssen noted above, the first step in designing appropriate land registration systems is knowing what purposes or functions the system is to serve. In most of the literature, the terms objective and function are used interchangeably and often very loosely; occasionally they are also discussed as benefits, advantages, or desirable features of land registration.[5] An attempt has been made here, as in previous chapters, to be more systematic.

Objectives define the specific ends that land registration strives to achieve. Objectives are both time and situation dependent; they reflect priorities which can change and they include some parameter (e.g., efficiency, completeness, or security) that, at least in theory, can be measured. Benefits, which are not considered here, are derived from land registration when the objectives are met either partially or completely. Functions are the more general actions or roles for which something is specifically designed and are common to most systems or situations.

5.2.1 Objectives

Based on the requirements in Chapters 2 and 3, the primary objective of any set of land registration arrangements should be to effectively manage information about land tenure to support land administration and management. Effectiveness can be measured in many ways, as for example, in terms of efficiency (net costs or time[6]) or the quality of information and information services (how well defined needs are met). Although usually treated separately, equity may also be a measure of effectiveness, especially when considering who has access to information, services, or even the benefits of land registration.

Simpson[7] lists the following features of a land registration system, which may be considered objectives of an effective information management strategy: security; simplicity; accuracy; expediency; cheapness; suitability to circumstances; and

completeness of the record. But striving to meet all of these objectives simultaneously involves trade-offs. For example, accuracy and completeness are often only achieved by sacrificing cheapness and simplicity. Therefore, effective management of information also means setting priority objectives.

While management of land tenure information may be the primary objective as shown in Figure 5.3, each jurisdiction will have specific objectives. These commonly include:[8]

- to ensure that land transactions are expedient and cost-effective;
- to support efficient and equitable valuation and taxation of property;
- to provide information for effective land planning and development decisions;
- to reduce and more efficiently resolve title and boundary disputes;
- to raise revenue through land transfer taxes and service fees;
- to minimize the direct public cost of land registration.

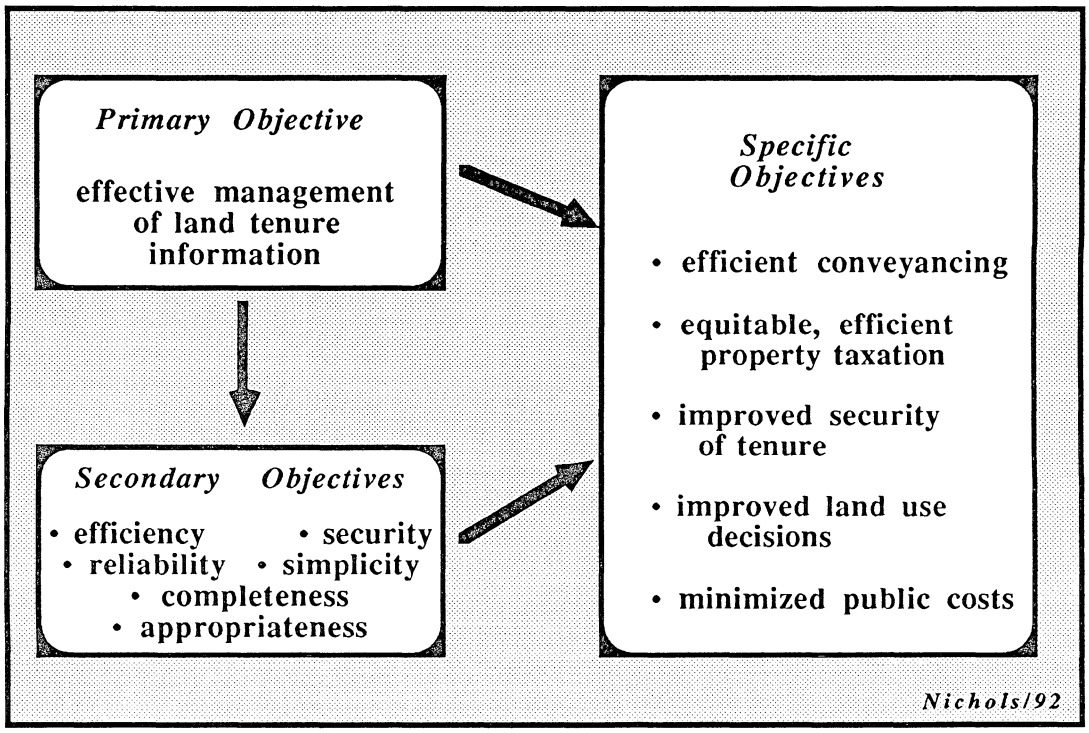

FIGURE 5.3: Model of land registration objectives with examples

The degree to which each of these objectives can be met ultimately depends on how well the information resource is managed. To take just one example, improved security of tenure is an often cited but little described benefit or objective of land registration. It may refer in a limited way to conveyancing, in that grantees are assured that their titles are indefeasible (free from defects and defensible against any other claims) or are privately insured. Or security may be measured in terms of the number of disputed boundaries and titles in a jurisdiction. Alternatively, security may refer to the degree to which landholders are willing to risk investing in improvements or that financial institutions are willing to accept property as collateral for loans. At yet another level, security may be reflected in social stability where tenure arrangements are enforced (and perceived to be enforceable) through community or state authority.[9]

What role does a land registration system play in improving security? The answer is in managing the information effectively, where management in this case includes the provision of a reliable, complete, and official public record of clearly defined interests and parcels that can be used as evidence to resolve disputes and that provides notice of competing interests (including public interests) for land transactions. In other words, security of tenure can be enhanced by the completeness, accuracy, clarity, and availability of information about tenure. Other land administration processes such as parcel delimitation (e.g., physical demarcation) or dispute resolution (e.g., efficient and equitable tribunals) will also play a role in providing security, but the objective for land registration is to manage the information appropriately.

5.2.2 Functions

Simpson divides the functions of land registration into a private function, to simplify conveyancing, and a public function, to support property taxation and land administration in general.[10] While this is a valid distinction, it is not helpful in this

analysis because both may be considered specific objectives. He notes for example that the English land title system was not designed to perform a public function.

The purpose in this section is therefore to define a set of functions which are common to all land registration arrangements (as defined in this thesis), enable land registration to meet the requirements and objectives previously defined, and are useful in further modelling of processes and information. Figure 5.4 illustrates the functions that have been identified as fulfilling these criteria and each is described below.

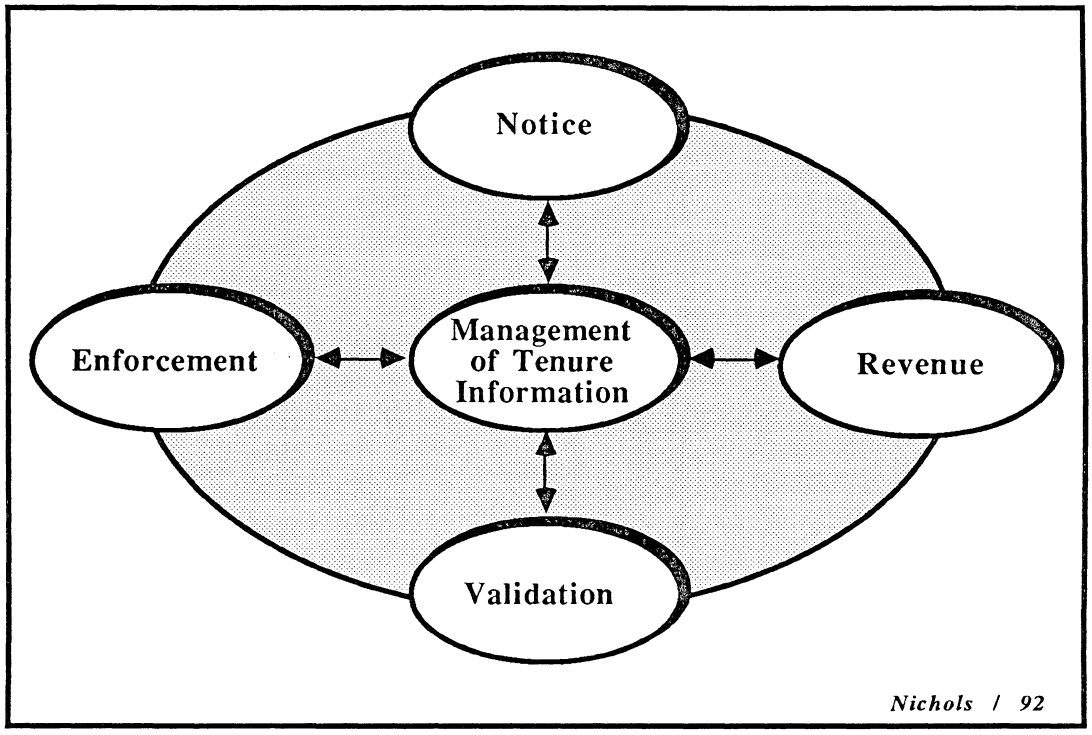

FIGURE 5.4: Model of land registration functions

Notice: Registration provides constructive notice of land tenure interests, whereby a person through inquiry in official public records or registers can find evidence that such an interest exists. The notice may be passive (e.g., a search of the records is required) or active (official notification of all status changes are forwarded to certain organizations). There are many registers for different types of interests in each jurisdiction, and the only register for some interests may be the official gazette or record of judicial rulings, laws, and regulations affecting tenure. The legal effect of this constructive notice will depend on the law of evidence and the relevant land law in a jurisdiction. For example, actual notice of possession or boundary location may have priority over constructive notice as evidence in cases of dispute.[11]

Validation: Land registration is an official process which establishes evidence of interests in land. Public validation ranges from a rudimentary check that documents being filed or registered meet basic criteria such as plan size, signatures, and seals to a more rigorous examination and certification of the contents of a document, a plan, or the title register itself. The validation may be confined to examination of documents, but in some cases, validation may also include a field inspection to confirm the status of documentary evidence.[12] In many systems, part of the validation function is also conducted by the private sector (e.g., professionals such as lawyers and surveyors, private insurance companies,[13] banks[14]) who take at least partial responsibility for the validity of the information concerning interests, ownership, and boundaries.

One important part of the public validation process is establishing priority of interests based on the sequence (time) of registration.[15] Thus for example, in land titles systems, the time a document is filed is officially recorded to establish priority over interests described in subsequently filed documents, even though the first document has not been examined and changes have not been made to the official register of titles.

Similarly in deed registry systems the officially recorded sequence of document registration also establishes priority.

Monitoring and Enforcement: A third function of land registration is monitoring land transactions and enforcing laws and regulations affecting land tenure. Examples include laws involving:

- *land transfer* – e.g., lands appropriately described, corporations are registered entities;
- *land allocation* – e.g., foreign ownership limits, limits on the size of lots or lands owned by one party;
- *revenue and administration* – e.g., payment of taxes;
- *land use* – e.g., purpose of land acquisition and compliance with zoning, building, or environmental conditions.

In some cases, interests may only be conditionally recognized, as for example, when agricultural or mining leases are granted subject to further evidence of productive activity within a specified time period or payment of annual rents. Another example is registration of an interest on condition that a cadastral survey plan will be prepared and filed by some future date.

Revenue: Public revenue in the form of land transfer or other taxes, and fees for registration, information, and services (e.g., certified searches) is collected through the registration process. Many registration systems are self-financing through this function, although the moneys actually collected may not appear as direct revenue for the organization involved.[16] In most Torrens land title systems, an extra fee is levied on each transaction to provide the insurance (or compensation) fund. Over the past few years more attention has been given to this revenue function as organizations have had

to justify and partially pay for major improvements, particularly the implementation of computer technology.

Management of Land Tenure Information: From an information perspective, this is the primary function of land registration and how well the other functions are carried out depends on the quality of the management arrangements. Even in the collection of taxes, for example, there must be a means of identifying who must pay and how much. Most taxes and some fees, for example, are based on the value of the property and this information must be available and sufficiently reliable. The remainder of the models focus on this management function and what it involves in terms of information, processes, and systems.

5.3 The Land Tenure Information

In deriving the information models, the objective has been to include generic types of information despite the particular form or record source. A relational model for integrating the various types of information is also presented.

5.3.1 Land registration information

In descriptions of land registration systems, a common classification is the format in which the information is presented (e.g., paper, milar, microfilm, digital data), specific products (e.g., parcel diagram, certificate of title, cadastral map, register), or a combination of both. A different approach is used here to identify information components independent of the format.

Figure 5.5 views land registration as a set of information components, where information is collected from external sources, is created during the registration process,

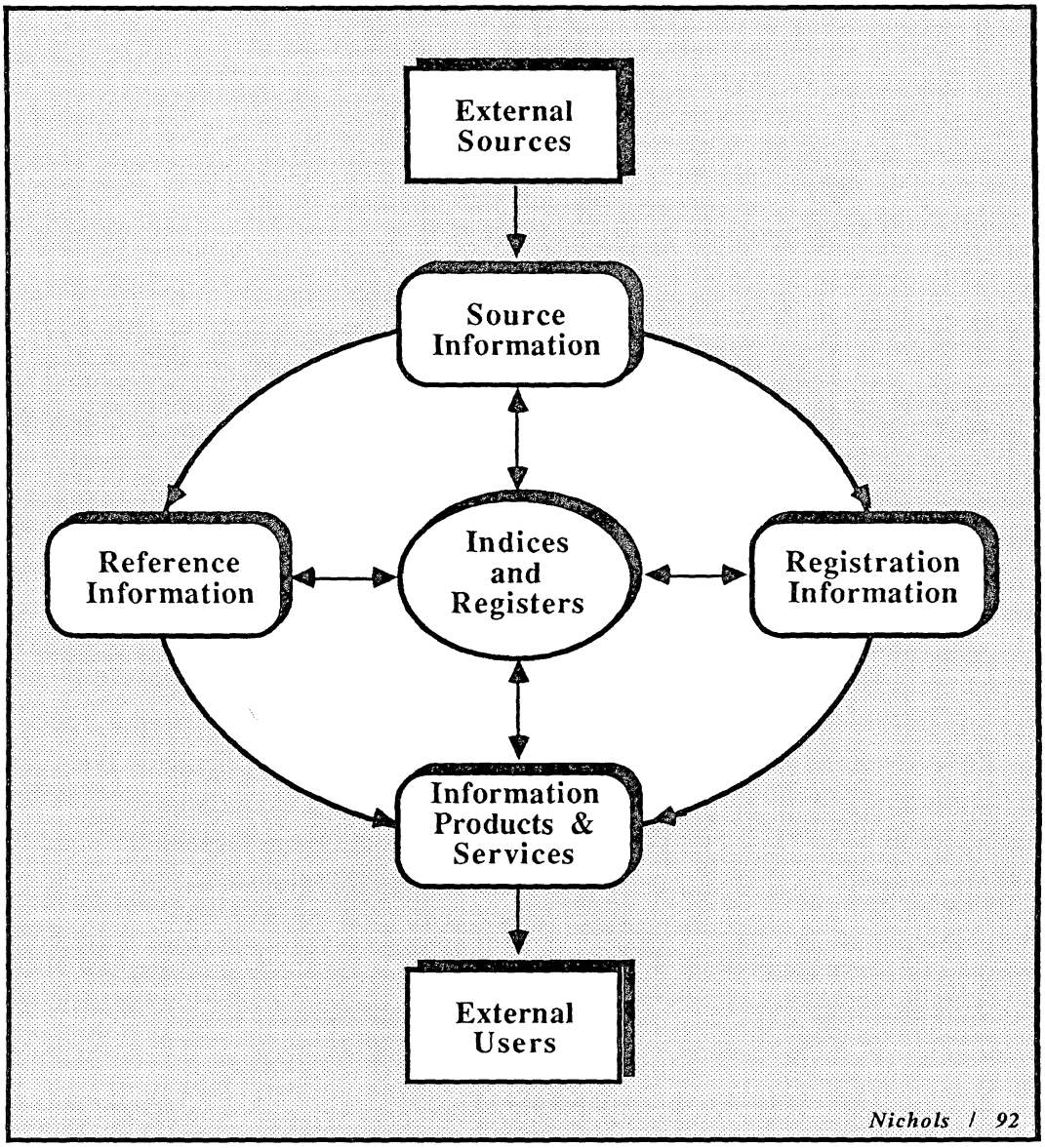

FIGURE 5.5: Model classification of land registration information

and is packaged as specific products or services for external users. What is external to the registration process, particularly in the case of sources, is a matter of perspective. The specific issue is whether activities carried out by the private sector (such as surveys and preparation of transfer documents) or by other organizations (such as creation of restrictions) are part of the registration process.

Whatever the perspective, source information includes any documents, data, notes, diagrams, etc. that are to be validated through the registration process. During registration, the information is processed, reformatted, and augmented. Five important classes include:

- *Registration information* is created to carry out and to expedite the registration processes, including diagrams and certificates, copies of documents, the addition of the date and time for document priority, accounting details, document classification, and signatures;

- *Reference information* includes internal management references, such as bar coding to track documents within the system, and the addition of references such as a parcel or owner identifiers which are then used to create and maintain indices;

- *Indices* are the matrices of metadata – data about the information itself – created in registration to facilitate information storage and retrieval;

- *Registers* are the records of official, validated information and depending on the system and specific definitions in legislation, may physically consist for instance of a primary index, a set of current title certificates or plans, an official database, or some combination of indices, documents, and files.

The final component in this classification is the set of information products and services provided to external users. These products often consist of the information created above (e.g., certificates of title, copies of plans and documents, or the register and index information in digital format). Services have been included here to emphasize

an active approach in managing the information, i.e., one that is designed to meet the specific requirements of users. A traditional example is the creation of a certificate of search (to verify that an official search of the register has been made). A more recent example is the production of special computerized inventories of property information in graphical or tabular format for a state or municipal authority.

Figure 5.6 presents another classification of land registration information: parcel, interest, and ownership information. In the figure, the first set of elements (above the line in each box) is essential information as defined by the requirements in Chapter 3 and the second set gives examples of other possible information.

Parcel Information: In many land registration systems, especially in North America, parcel information has historically been treated as a minor detail (if not virtually ignored). Whether or not the physical unit of space to which interests applied could be identified with any degree of certainty was not a priority concern. Among the factors that are beginning to change this perception are the need to relate registry information to geographically referenced data in other systems and recognition that the parcel provides an effective unit for indexing and accessing information.

Figure 5.6 illustrates examples of the information that is directly associated with the parcel. This information does not necessarily change with changes in ownership or interest status, such as the addition of a mortgage. This inherent stability and the fact that the parcel can be uniquely identified are two reasons for making the parcel (rather than landholders' names or documents) the basis for indexing and referencing in modern land registration and information systems.

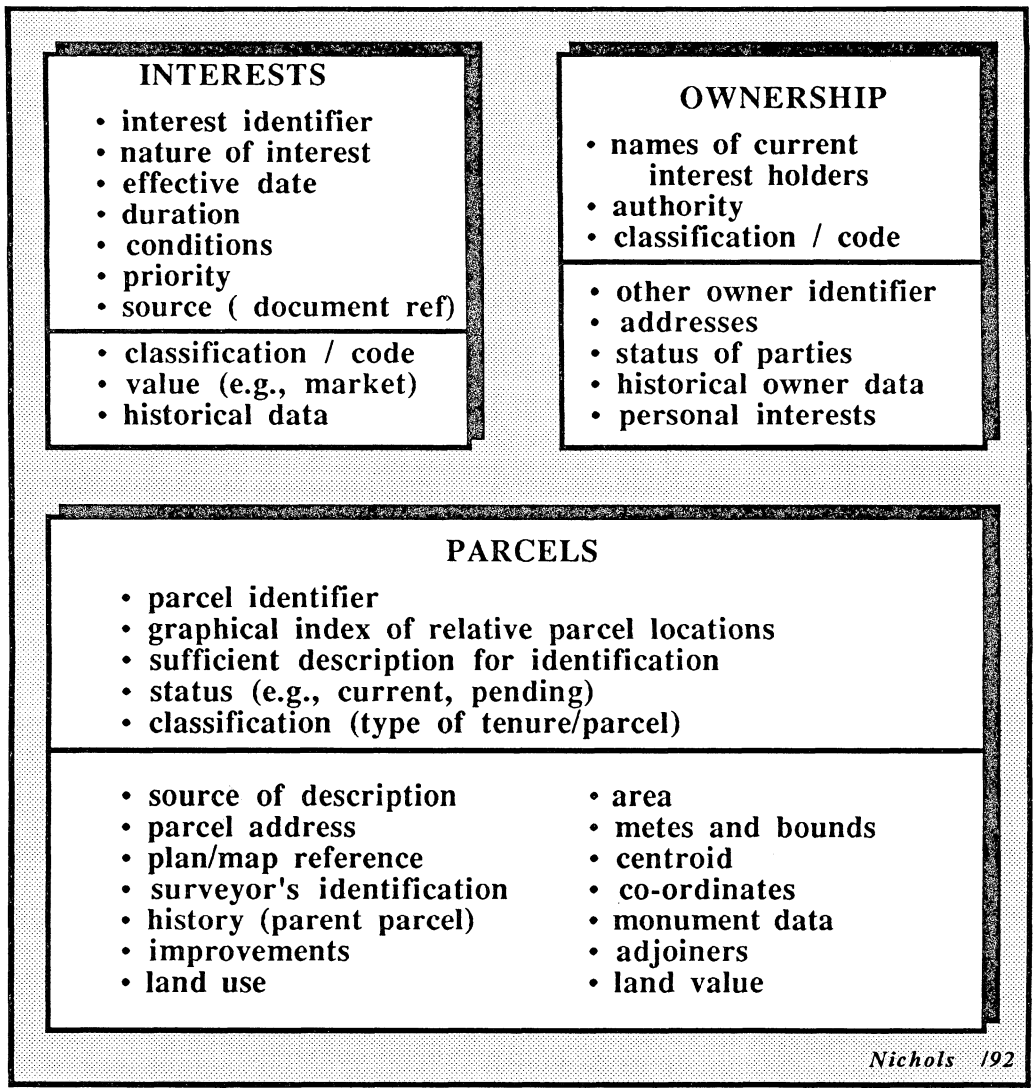

FIGURE 5.6: Model of required types of land tenure information with examples

A unique parcel reference or identifier (PID) is essential for efficient indexing and cross-referencing. Examples of identifiers include a tax assessment code; subdivision lot, block and plan number; a sequential number; parcel address; centroid co-ordinates; and variations on codes containing information about the location or status of the parcel.[17] Among the desirable attributes for parcel identifiers are that they are:

- *unique* – i.e., there is a one-to-one relationship between identifier and parcel;
- *simple and economical*;
- *flexible* – e.g., to facilitate computerization;
- *appropriate to circumstances* – e.g., familiarity may be a factor;[18]
- *permanent* – the code is retired or updated on parcel subdivision or amalgamation.[19]

Names of grantors and grantees have often been the only means of identifying parcels in many deed registration systems, but they meet few of these criteria.

Other essential parcel information include a graphical index of relative property locations and a description of the parcel sufficient to identify its limits or boundaries. Graphical parcel descriptions range from a rough sketch or point on a topographic map to precise definition of parcel boundaries based on field surveys. Most cadastral mapping falls somewhere between these two extremes. Transfer documents may include a diagram of the parcel or refer to a plan or map. But in many North American jurisdictions the parcel is only described in writing by naming adjoining parcels, by metes and bounds, or more recently by co-ordinates. The list of other parcel information in Figure 5.6 is not exhaustive. What will be included in a particular system will depend on such factors as the legal arrangements, the system objectives, the information traditionally available, and storage space.

Interest Information: The literature does not refer to an interest identifier, but it is included here as an important consideration, especially as registration systems with different interests begin to automate, share, and integrate information.[20] The most common interest identifiers are the type of interest or document (e.g., mortgage, fee simple estate, undivided share, exploration lease, or agricultural zone) or a reference to the source of the interest (e.g., specific document or certificate number). An example of the application of the interest identifier is in accessing information in a registry about all

parcels with the same type of interests (e.g., all parcels crossed by a utility easement or affected by an environmental restriction). While such searches can be carried out graphically (e.g., by overlaying different types of cadastral maps), more detailed information can be obtained if conducted on textual or attribute files as well.

While there has been some discussion in common law jurisdictions to simplify terminology, standardize forms and interest descriptions, and even fundamental land law reforms to modernize the tenure system,[21] information about interests is still complex and will vary greatly from system to system. Systems for leases or other short-term interests, for example, must maintain information on expiry, conditions, rent payments, etc.

Ownership Information: Although "ownership" does not necessarily capture the wide variety of tenure relationships, it is used here to include information about those holding interests in land, whether they be individual proprietors, leasees, special groups, or government authorities. Again, an identifier is essential in relating information with parcel and interest data and with information in other systems. The most common identifiers are the names of the interest holder.[22] But these are neither unique nor simple identifiers in many cases and an additional code may be added for administrative purposes (e.g., social security number, corporation number, or a code identifying a member of a special group). Special consideration also has to be given to developing a consistent system for referencing government departments and agencies holding or administering interests in land.[23]

How much information is registered about people and who will have access to that information is becoming a major public policy concern. In Sweden, for example, the computerized public register includes a unique personal identification code (which contains information about sex and date of birth), that can be used as a link to other databases. Although such a policy might be unacceptable in most other jurisdictions,[24]

access to ownership information can be important for public administration and policy making (e.g., monitoring foreign or corporate ownership).

5.3.2 A relational model for land registration information

The purpose of this section is to demonstrate how the various types of information in a land registration system can be integrated and related and how information can be cross-referenced among systems holding different kinds of tenure data. In the literature on land registration and LIS, these types of relations are usually modelled in graphical format, i.e., as a series of compatible overlays for spatial analysis. But much of the information in land registration is in textual format and more attention needs to be drawn to the power of addressing data rather than only maps, documents, or registers.[25]

The tables shown in Figure 5.7 for interest, ownership, and parcel information depict examples of the types of data that can be related through cross-references. The important features of this model are:

- *access keys* - identifiers unique for each set of data by which information can be accessed from the tables and which serve as the primary cross-references;
- *primary index* - which is parcel-based and relates the access keys to one another;
- *tables* - which contain the identifier, more specific data for each type of information, and possibly other references.

In most systems, the relationships among the access keys or identifiers will be many-to-many rather than one-to-one. For example:

- *Parcel 1* may have several types of interests (fee simple, mortgage, lease) and several "owners" for each interest ;

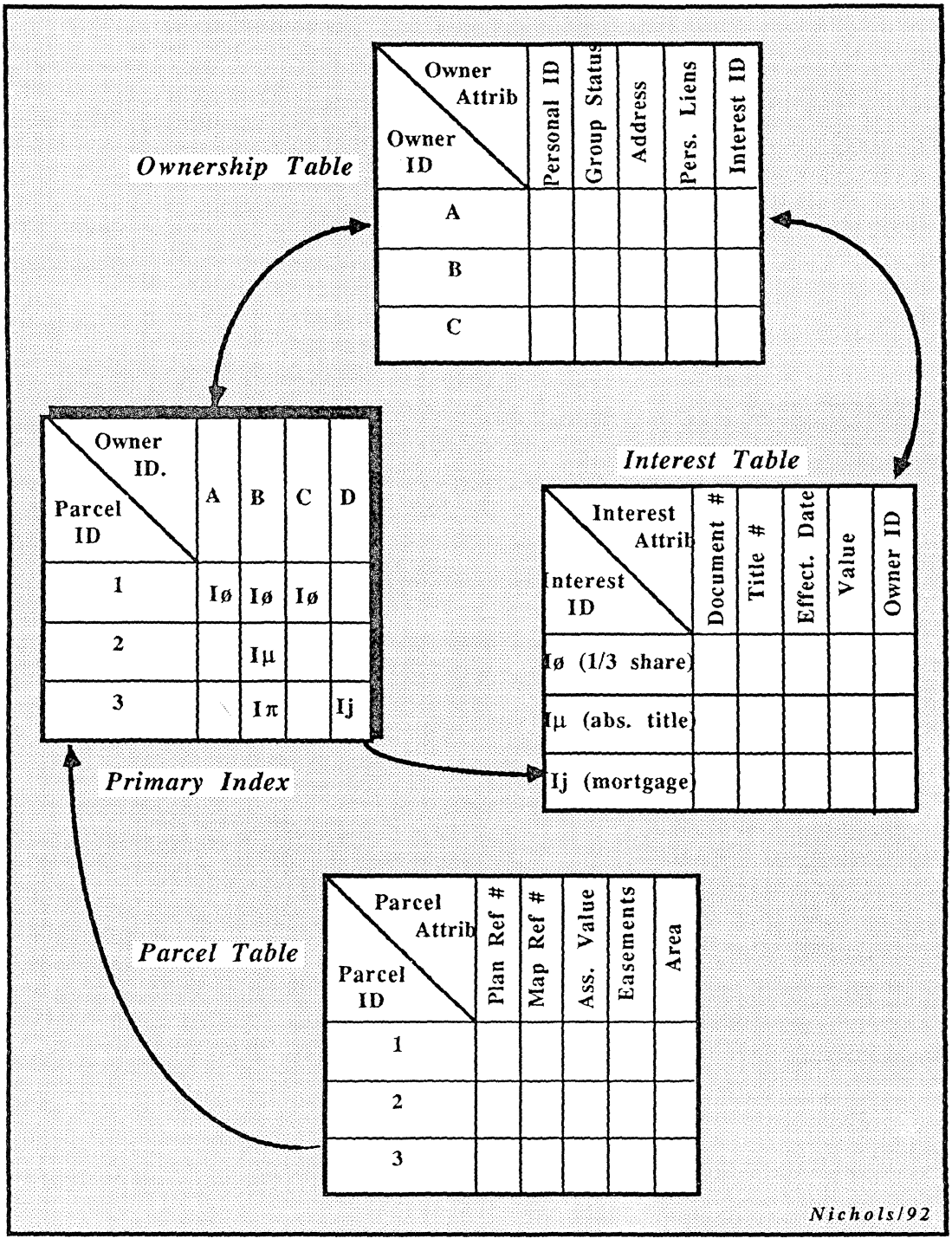

FIGURE 5.7: Model for relating tenure information through cross-referencing and indexing

- *Owner B* may have several different interests in one parcel and interests in several parcels;

- *Interest* ϕ (e.g., fee simple) may be an interest common to many parcels and even for one parcel may have several co-owners.

This is a theoretical model for system development. For instance, the interest and ownership tables really only have relevance in their relation to the parcel index – they are not suitable for separate indices without the parcel reference. To build all of these relations, there would be redundant data. As illustrated here, the complete matrices would be very sparsely populated and at the same time some elements would need to contain large amounts of data (e.g., address).

The advantage of the model is not in its direct application but in the fact that it illustrates land registration relationships from the perspective of information rather than as documents or plans or registers. This provides greater flexibility for introducing change and identifying indexing problems. Although the concepts presented are what many computerization projects are trying to achieve in land registration, theoretically manual systems could also benefit from this approach in designing indices and reference systems. A relational type database structure is shown, but the Swedish system has achieved many of the features shown here using a hierarchical structure.[26] Another advantage of the model is that it separates ownership from interests (and documents) which is important in addressing problems of registering various forms of group tenure and other complex relationships.

A final advantage of this approach is in addressing the problem of integrating or accessing information contained in different types of land registration systems. Figure 5.9 shows how parcel indices can be compiled to relate different types of parcels (and thus interests). Again it should be noted that although this appears quite straight-forward in theory, compiling such a parcel index involves institutional as well as technical

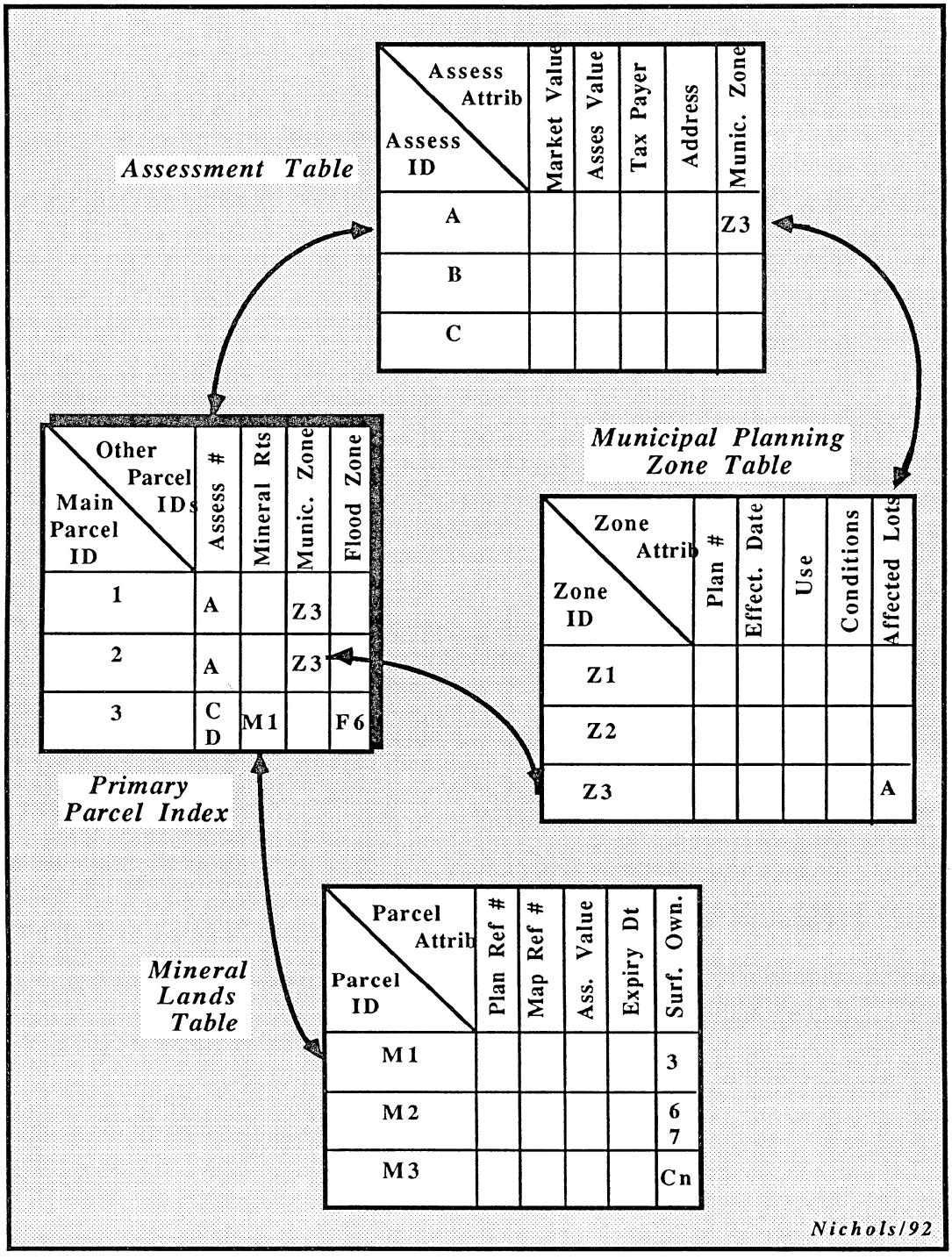

FIGURE 5.8: Examples of cross-referencing parcel identifiers among systems

have taken nearly a decade and major investments have been made in Australia and elsewhere in developing linkages among the legal parcel identifier, assessment parcel identifiers, and title certificate numbers. For most purposes, a graphical depiction, as illustrated in Figure 5.9, may be sufficient. Once spatial information such as co-ordinates are available through digital spatial databases, developing the linkages among various types of parcels (and thus registries) may be achieved more efficiently.[27]

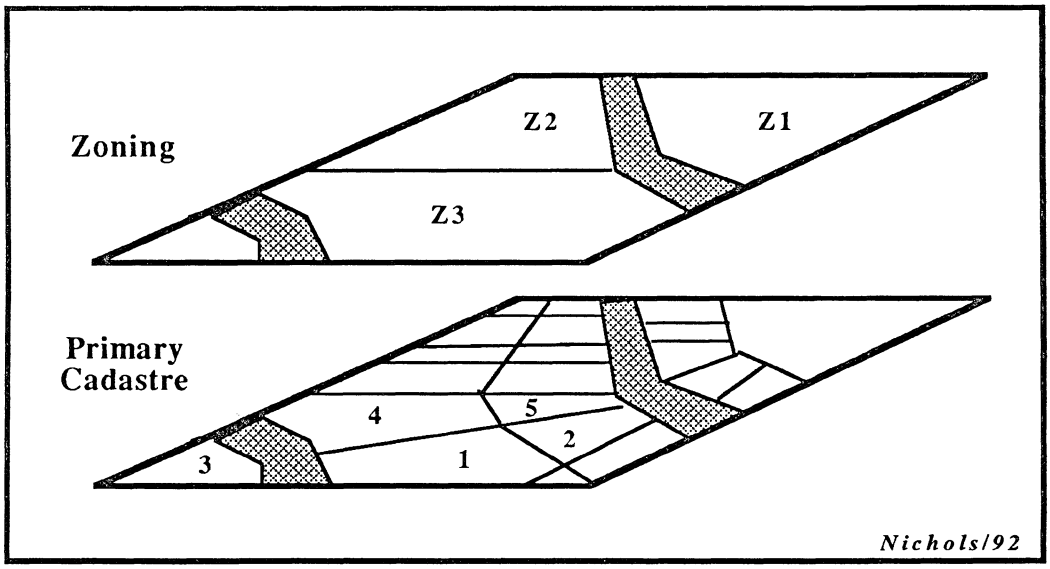

FIGURE 5.9: Example of parcel relations with graphical indices

5.4 The Land Registration Processes

The requirements and the functions form the basis for the model of processes for land registration illustrated in Figure 5.10. As in the case of the analysis of functions, the intention here is to consider operations that are common to all land registration arrangements, even if in some jurisdictions these processes may occur outside the public registry system and be carried out in a very limited way. Although there is a logical sequence in the processes, many will actually be carried out concurrently.

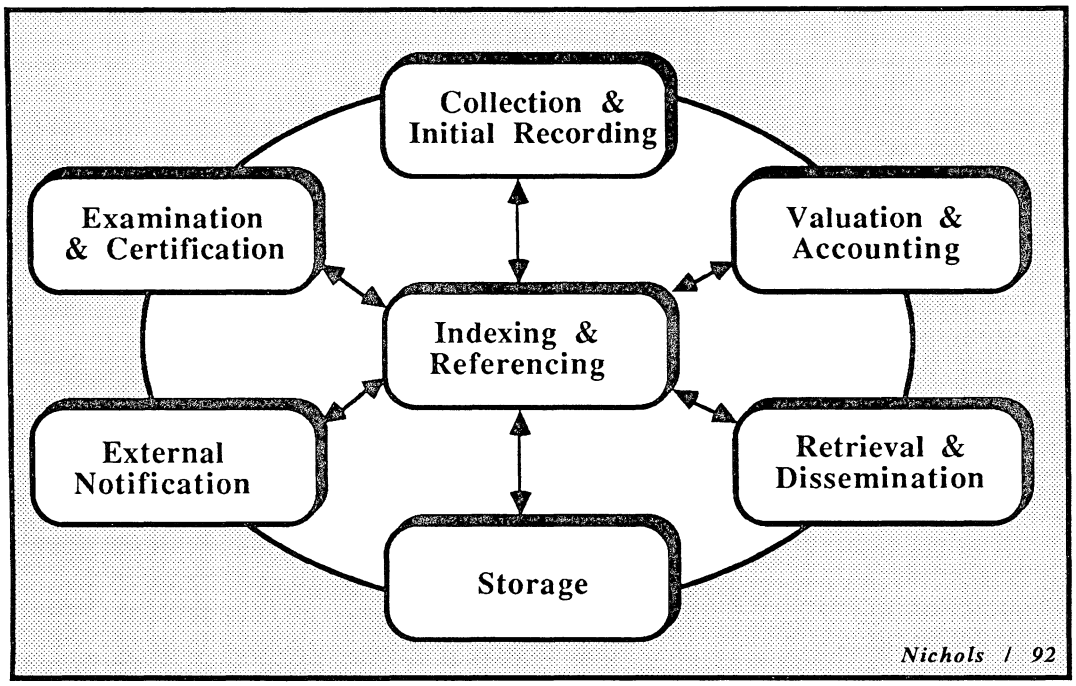

FIGURE 5.10: Model of land registration processes from an information management perspective

Collection and Initial Recording: This concerns the flow of information into the registration process from a variety of sources and the first application of the validation and enforcement functions. In most land registration systems the collection process is passive, i.e., documents are presented for registration or data has been transmitted from external computer terminals. But the individuals involved in preparing the documents or records have also actively collected land tenure information from various sources (e.g., from municipal or state office certifying that property taxes have been paid, or from field surveys and planning authorities). Depending on the purpose of the description or evaluation of land registration arrangements, these external collection processes may also be significant.

Initial recording includes the compilation of the information externally into documents, plans, forms, or other records. Within a public system, it involves for

instance the recording of the date and time of filing (to establish priority), metadata describing the information itself (e.g., names or codes of parties in a transaction, types of instruments or interests, parcel references), and other information related to the particular registry system (e.g., addresses, tax codes, corporation numbers, references to exploration or land use permits). At this point, a cursory examination of the information may be performed and if deemed unsatisfactory, the registration process may cease. The initial recording also usually involves assignment of special codes such as a sequential document number or a parcel identifier later used in tracking the flow of the document through the registration process and/or in indexing and cross-referencing. These initial records, sometimes called daily journals, become part of the official register and are essential to the notice and validation functions.

Examination and Certification: As mentioned in Section 5.3, this process may also be wholly or partially carried out by professionals or other parties outside the recognized registration system. Thus, for instance, in a deed registry system, title searching – including checking all registries for overriding interests – and certification is generally the province of the legal profession, private title search firms, and title insurance companies. Within the particular registry system the examination of interests may range from form and format to more extensive regulation enforcement. Some systems have very limited procedures for examining survey plans and this may be carried out by other organizations or registration authorities (e.g., the Regional Surveyor's Office in the Northwest Territories).

Certification completes the validation function and involves provision of an official statement about the legal responsibility for the accuracy of the information being registered. It is this certification and the associated public warranty or guarantee that distinguishes land title systems under the insurance principle. However, warranties with certain limitations may also be given in other systems by the private sector. The

certification may simply be an official seal or entry in a register, but in most land titles systems an official certificate containing information about the interests or title is prepared. Special certificates may also be requested and issued to verify that there has been an official search of the registers and/or records to verify the status of an interest or title.

External Notification: The provision of certificates described above is an example of external notification. But this process involves other forms of notification, including the compilation of the register (generally a set of indices with references to documents or files and the documents themselves) and provision of this information to the public within the registry or through data networks. In special situations, such as decisions in judicial proceedings or in first registration of a title, notice may be given in public newspapers and gazettes. External notifications may also be issued to specific users or organizations whenever changes in the tenure status occur, such as the registration of an oil exploration permit or a plan of subdivision. Often the organizations have already reviewed the information in the land use regulation process, but only through official notification after registration can the organization be sure that the change has in fact occurred.

Storage: Storage is probably the most straight-forward process, but it is also a critical factor in the evaluation and reform of land registration systems. The first consideration is what information is stored (copies of all relevant documents including historical records, certificates, survey plans, etc.). In deed registry systems for example, most documentation is stored and is part of the register. But despite the curtain principle, historical documents supporting titles are also maintained in many land title systems. Similarly in registries of resource interests, documents may be kept even if the interests have expired.

The second consideration is the format of the information. Increasingly microfilm, microfiche, optical disc, and computer technologies are being used to reduce storage space, to provide more efficient access to records, and to minimize damage to historical paper records. But these improvements also have another advantage related to storage and that is to provide effective means of duplicating the registry information for off-site storage for security.

Indexing and Referencing: As discussed in the information models of the previous section, this process is essential to the information management function and thus to all other functions and processes. Referencing includes assigning unique identifiers to documents, plans, computer files, or other sets of information in order to facilitate indexing and retrieval of information. Common referencing systems in land registration are sequential record numbers,[28] but a preferable reference is the parcel identifier since this not only provides geographical information, either directly or indirectly, but it also facilitates searching and enables information from one registry to be related to information in another. References for owners and interests may also be assigned at this point. Indexing relates the access keys to other pertinent data (i.e., metadata) about the records stored in the system. There may be several indices (e.g., plan index, name index, title index) to enable retrieval by different types of access keys.

Retrieval and Dissemination: Retrieval and dissemination are related to external notification, but are concentrated more on the day-to-day accessing of the registers, indices, and information for a variety of purposes. What is of concern in retrieval is the efficiency and flexibility with which the required information can be obtained – i.e., the content, quality (e.g., reliability, precision, up-to-dateness), format, and timeliness needed by the user. Efficiency is directly related to the manner in which information is referenced and indexed and to such factors as decentralized registry access, sufficient

terminals or map and book indices within the registry to prevent line-ups, and even the layout of the registry.[29] Flexibility refers to the ability to obtain information using various access keys such as name, address, parcel identifier and in being able to obtain various types of products and services (e.g., parcel histories, certificates, inventories, and updates).

Retrieval and dissemination are areas where technology has and will continue to make a significant impact. The ability to request information in person, by mail or facsimile, is being superseded by automated data networks for primary registries in several jurisdictions. In France and Sweden, for example, information is also available through public videotex systems and in South Australia and British Columbia on-line services are available for Land Titles Registry and other provincial/state databases. Accessing computer graphics through networks is a more complex issue, but microfiche, microfilm, and optical disc technology can provide users with graphics (and noncomputerized document information) outside the registry.

Valuation and Accounting: During the registration process, revenue is collected through fees for registration, taxes (or stamp duty), and fees for information and services. Where taxes or and registration fees are based on property values, this information has to be collected and checked. Usually a certified document (e.g., affidavit of consideration) is prepared during the conveyancing process. In some systems the market value of the parcel is public and may become part of the information stored and disseminated. Even where this information is deemed confidential, it is generally forwarded to other government authorities for property taxation.

An important part of the registration information discussed in Section 5.3.1 is for accounting purposes. Frequent users (e.g., registering documents or accessing information) are often billed to avoid cumbersome money transactions. Automated systems in Australia and elsewhere have simplified the record keeping and billing

process. At the same time computerization has required new accounting policies and procedures to capture revenue from automated searching facilities and networks.[30]

5.5 Land Registration Systems

Land registration systems are considered here from three perspectives: individual systems (the system model), the collection of land registration systems within a jurisdiction (the system community model), and the external factors that affect individual systems and the system community (the system environment model). These models are composites of the models described above (e.g., land registration processes) or in previous chapters (e.g., land management and administration functions). Chapter 6 then investigates how these composite models can be applied in system evaluation and design.

5.5.1 The system model

Figure 5.11 represents system components for land registration, based in part on the definition of a land information system given in Section 1.2. Land registration information and processes have been detailed above; this section describes the remaining components. Two examples of information flow and the organization of processes are also given.

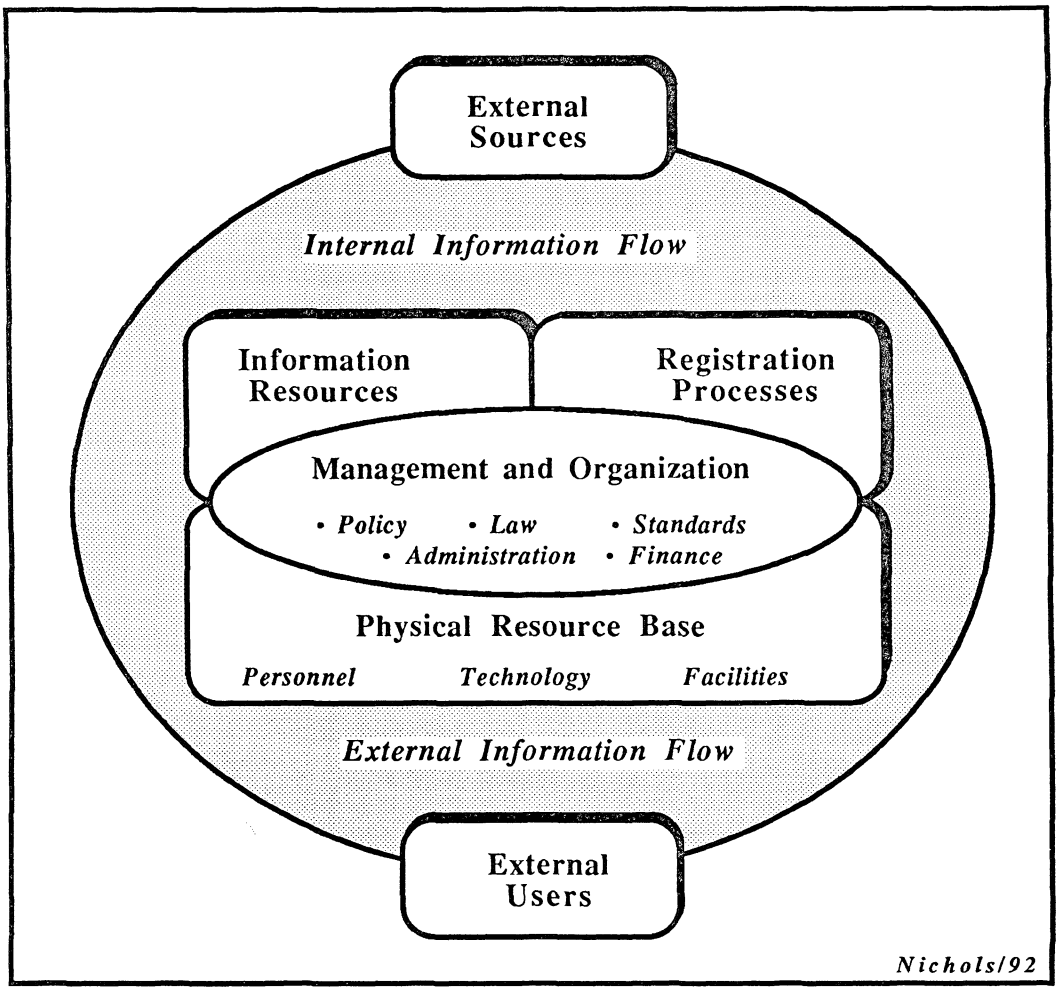

FIGURE 5.11: The system model

Physical Resource Base: The physical resource base comprises the personnel, the technology, and the facilities of the system. Personnel include the people operating the system such as the Registrar, plan and title examiners, and clerks, and the administration staff. Technical resources include everything from basic binding and copying equipment to computer technology. Other facilities are often forgotten, but may be important in system evaluation and implementation of reforms.[31] Of particular importance in manual systems are the vaults or secure storage facilities. The layout of the offices and facilities for searching or closing transfers should be considered, as well as local or regional offices.

Management and Organization: The co-ordination and effectiveness of all of the components depend on how the system is organized and managed. Some of the principal issues from an information management perpective include:

- policies concerning security, access, pricing, and liability, etc.;
- laws and regulations affecting any aspect of land registration;
- standards for parcel definition, referencing and indexing, examination, information content and quality, technology, staff education, etc.;
- common standards among decentralized offices;[32]
- general administration and management, including organizational structure, staff development, co-ordination with unions[33] and other groups, administrative procedures, quality control, and accountability;
- financial concerns, which may be related to policies (e.g., cost-recovery), daily operations, or the development of reforms.

Information Flow, External Sources, and External Users: In this system concept, the processes are seen as extended beyond the walls of a particular registry office. External sources and users are considered part of the system because many of the processes (e.g., notification and dissemination) cannot be effectively described or evaluated without considering these groups. Furthermore, many external users are part of the verification and certification processes.

One objective in management and organization is optimizing the flow of information from external users, internally through the various processes, and then to external users. How the processes, facilities, and information are organized will affect the information flow and therefore the efficiency of the system. Information flow

problems such as poor indexing, difficult information retrieval, ineffective plan examination, or poor office layout can slow the registration processes and thus the land administration activities that depend on the system, especially conveyancing.

Examples: In system analysis, tracking the flow of information can assist in identifying how processes are carried out, by whom, where, and what problems exist. Examples from two primary land registration systems (Prince Edward Island and Sweden) are discussed briefly here.

Prince Edward Island has a noncompulsory deed registry system with most information indexed by grantor and grantee name. In Figure 5.12 the flow of information and registration processes are illustrated. This is a manual system and the examination procedure is primarily to check documents and plans for standards on form and format. Although the main access key to information is the owner's name, products from other offices with parcel referencing are available in the Registry to aid searching. An important feature in Prince Edward Island was the flow of information among the registry, assessment, and property mapping offices (See Appendix II). These offices are now amalgamated in the Real Property Records Division and a project to automate the indices and include parcel referencing is in development.

Sweden has a parcel-based, European land title system. Figure 5.13 shows the flow of information and organization of land registration processes in Sweden. This is a simplified diagram and the registration of parcel data is not shown. Significant features here include the fact that two organizations are involved, the local land registration offices under the National Courts Administration and the Central Board for Real Estate Data (CFD). The CFD is responsible for maintaining a computerized inventory of parcel, title, and ownership data that is the legal record of tenure interests.

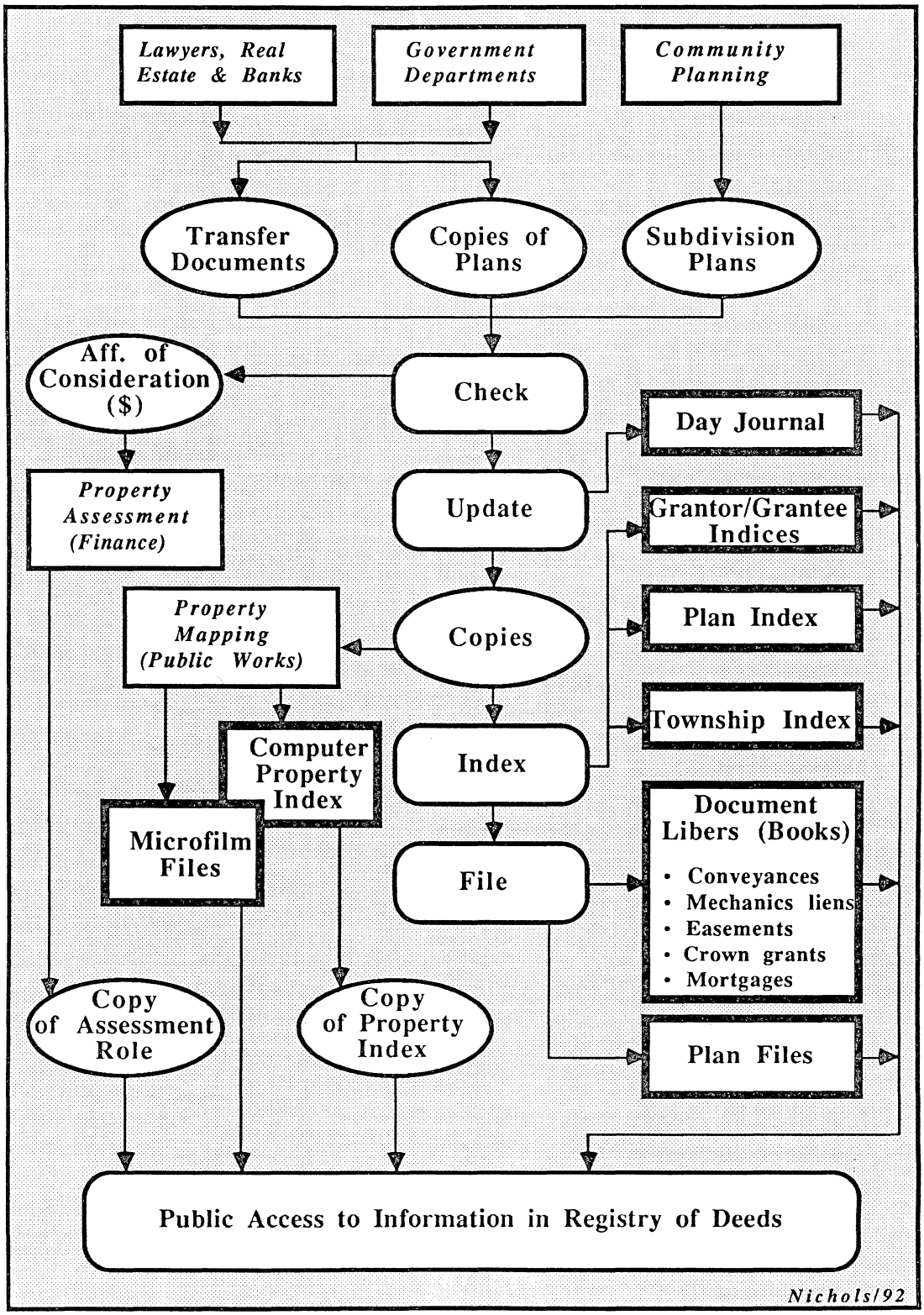

FIGURE 5.12: Flow of information in the PEI Registry of Deeds

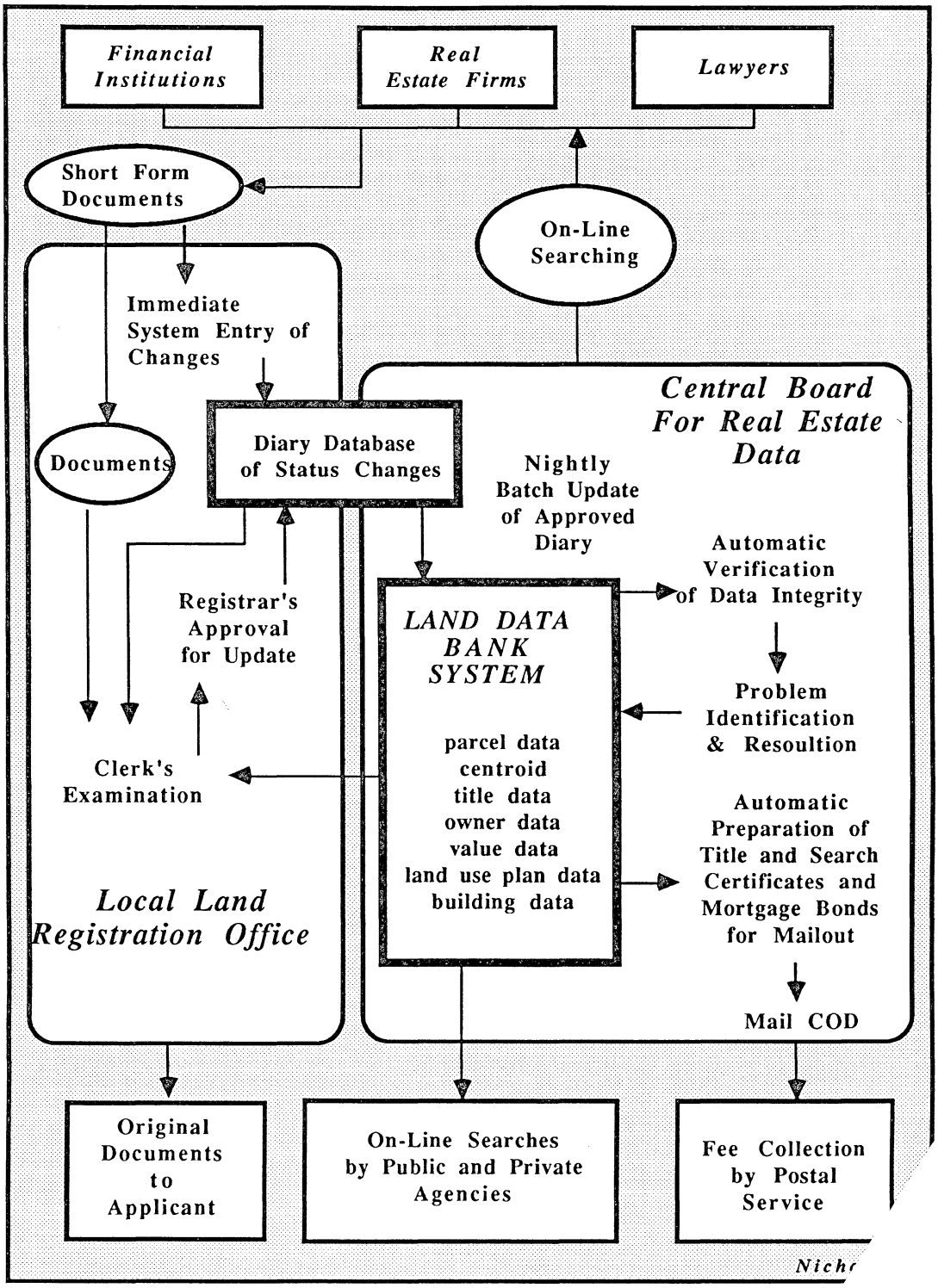

FIGURE 5.13: Registration of real property interests in Swe

But the land registration authority is responsible for creating and validating the data for all new transactions.

When documents are filed at the registry the information is entered in a computerized diary (file of transactions pending). The information is checked by a clerk and validated at the end of each day by the Registrar. Approved entries up-date the Land Data Bank System each night. Other features shown here include a further validation of the data within the system and external collection of fees. One development currently being reviewed is transferring the responsibility for verifying, entering, and up-dating mortgage data from the land registry to financial institutions.[34] Other features of the Swedish system are described in Appendix III.

5.5.2 The community of systems

One objective of this research was to point out that there are many forms of land registration systems in each jurisdiction and all must be considered if land management requirements are to be met effectively. Figure 5.14 illustrates the components of a model for this community of systems. Although the model shown here was not used directly in the evaluation of the system community in Newfoundland (see Appendix I), it describes many of the components that were identified.

Land tenure information is created, managed, and used primarily within the land management and land administration processes. These have been described in Chapters 2 and 3, respectively. Other components in the models include the following:

Primary and Secondary Systems: The major function of primary systems is to manage a subset of land tenure information as evidence of tenure interests. The' systems are characterized by explicit laws and regulations governing the statu' management of the system. Providing information about tenure status is a si' part of the routine activities. Examples of primary systems include: the c'

registries, the registries of state lands and interests, most registries for resource interests, and state cadastral surveying and mapping offices.

Secondary systems include those in which a subset of land tenure information is officially and systematically managed, but primarily to serve other mandates. In some cases the information may be considered primary evidence of specific tenure interests if they are not registered elsewhere. These systems might be found within, for instance, planning authorities (e.g., building and development rights, land use regulations), property taxation systems, municipal organizations (leases of municipal lands), and transportation departments (highway rights-of way).

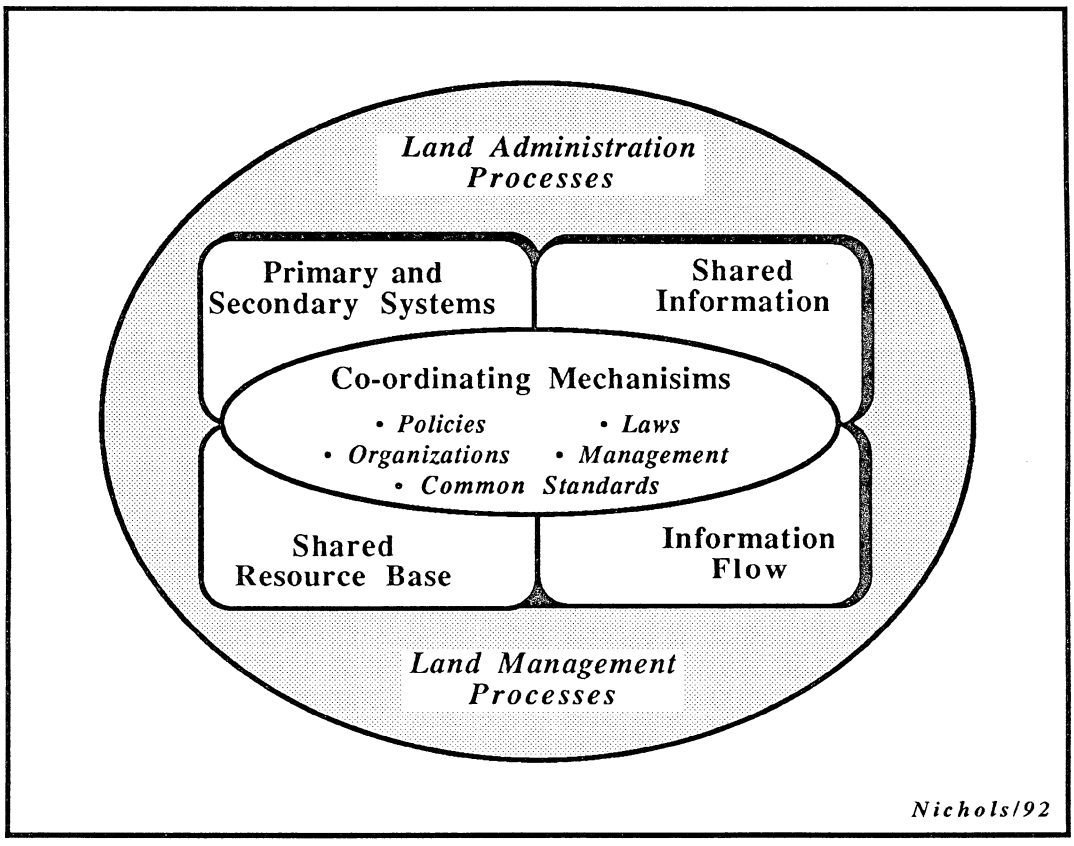

FIGURE 5.14: The system community model

Shared Resource Base: The shared human, technical, and physical resources include any that are used in common by one or more system (e.g., an office, or a computer system). They may also include resources external to all systems, but which assist in the registration processes. Thus, for example, a public communications network used for land registration may be considered part of these shared resources.

Shared Information: Shared information is tenure information that flows freely among systems, sources and users. Most information contained within systems will be included here. But shared information would not include information in a system to which there is limited public access. Until recent reforms in Britain, access to tenure information in the primary Land Registry was restricted, even for other government departments. Market value information which is collected through registration for taxation purposes may or may not be shared information.

Information Flow: As in the internal system model, information flow is an important component of this model. Figures I.A.1 and I.A.2 in Appendix I provide examples of the flow of tenure information in Newfoundland. Tracking the flow can highlight problems and requirements. For example, a description of the flow may point out that land management organizations have been obtaining tenure information of doubtful quality from secondary and tertiary sources and thus there may be a requirement to improve access and distribution of information in land registration systems.

Co-ordinating Mechanisms: How well land tenure information is managed in a jurisdiction will often largely depend on the degree of co-ordination among systems, sources, and users. Among the specific concerns from an information management perspective are the following:

- public policies that encourage data sharing, specify common standards, or delegate responsibilities to organizations and groups;

- laws and regulations affecting access or standards for information quality or indexing which can promote or inhibit information sharing;

- co-ordinating organizational and management arrangements, such as the Land Tenure Advisory Committee in Newfoundland, LIS organizations in many jurisdictions, or informal co-ordination among system management;

- common or at least compatible standards, e.g., for parcel definition, referencing, information quality, data exchange.

The type of co-ordination mechanisms and their effectiveness will be partly determined by the specific system environment.

5.5.3 The system environment

The land registration system environment consists of the social, economic, technological, legal, or institutional arrangements that significantly affect or are influenced by land registration. Figure 5.15 illustrates some of the major elements of the environment. Land management and administration have been included again for completeness. Among the other factors that should be taken into account, especially when land registration reforms are being considered, are:

- *public policies and priorities* – including policies related to the environment, economic development, land use, land tenure, and information;

- *public administration* – e.g., government organization, financing, co-ordinating committees and agencies, and administrative rules and regulations;

- *legal systems* – including land law and administrative law and any legal reforms;

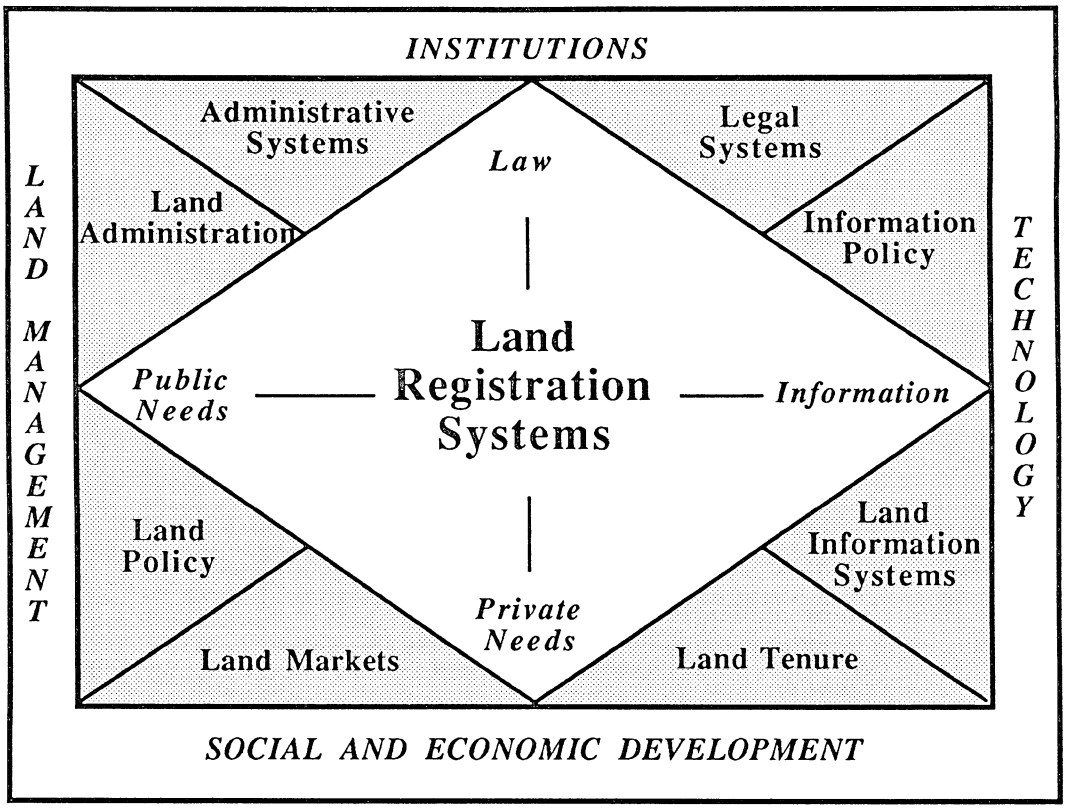

FIGURE 5.15: A model for the land registration system environment

- *social and economic conditions* – including education and any historical, cultural, and religious factors affecting land and land tenure;

- *land markets* – e.g., level of activity, financing and conveyancing arrangements, and geographical distribution;

- *technology* – including data communication networks, surveying and mapping technologies, and systems for archival storage of public records;

- *development of land and geographic information systems* – these may be external to all or part of the land registration system community.

5.6 Assessment and Issues for Further Research

This chapter has systematically developed information management models for land registration. The purpose was to provide a set of tools for describing and evaluating land registration arrangements and for designing reforms to meet the requirements in land management and administration. This application of the models in system reform is discussed in more detail in Chapter 6 and the discussion below focusses on the more theoretical aspects of the models.

Among the benefits of the information management models are the following:

- They include the traditional conveyancing role of land registration but are designed to meet both public and private requirements.

- They are independent of specific legal, administrative, or technical arrangements and therefore can be used to describe land registration in any jurisdiction.

- They are not based on specific forms of registration and therefore can be used in describing various types of systems (e.g., deeds or titles; primary and secondary; interests and boundaries).

- They provide a framework of elements (objectives, functions, information, processes, and systems) that permit complete description of land registration, including legal, procedural, and technical elements, but that emphasize the importance of information management.

The models provide a different way of looking at land registration that is becoming increasingly important as the roles of the private and public sector begin to change and as new organizational arrangements evolve. What was once a "system," contained within an office or a building, is today often a set of subsystems maintained by several groups. By emphasizing processes and information, the models provide the flexibility to include these and other arrangements.

One significant limitation of the models is that they describe a passive role for land registration. For example, boundary delimitation is viewed as being a separate land administration process; the role of land registration is to manage the information collected. This may be limiting in the evaluation and design of land registration systems. It may also further polarize land registration rather than facilitate its integration with land management as was intended. However, this approach has permitted the research to focus specifically on land registration from an information management perspective. Whether the role should be broader is the subject for future study.

There are many areas for further research, including the following:

Case Studies and Further Refinement: The models evolved during the case studies and subsequent research. What has been presented here needs further refinement in other case studies and comparative analyses, particularly for different types of primary and secondary systems. As recommended in previous chapters, these studies should include countries with significantly different legal and administrative structures.

Refining and Developing the Information Models: The information models are just one element of the framework here and they need further refinement. One problem is to determine what type of information is essential in land registration (including all primary and secondary systems) and what new information should be included. For example, this research has been limited to land tenure information, but perhaps information about buildings and land use should be an essential part of a land registration system (i.e., putting more emphasis on "land" not only tenure). The models here could accommodate such an expansion.

Further investigation of the relational model presented in Section 5.3.2 is required. There are systems currently in development that have taken a similar perspective on relating sets of information or data elements, but there is a need for more

general models specifically for land registration. These general models could have a potential impact on how land registration reforms are designed, particularly in putting the focus on optimizing information management, rather than simply introducing a legal or conveyancing system. This research should also investigate the use of object-oriented data models that may help to describe the required relations more effectively.

The Role of Land Registration: Although the information management role has been investigated here, most land registration systems are an integral part of other processes. This is especially true in first registration or land titling projects. This adjudication role has not been explicitly included here, although it could be viewed as a special application of the examination and verification processes. One area of research is to take a similar information management approach in these and other activities to see whether the boundaries for the role of land registration drawn here should be expanded.

1 Hennsen, J. [1983]. "Land registration systems." Theme paper submitted to the United Nations Seminar of Experts on Land for Housing for the Poor, Tallberg, Sweden.

2 For example, S.R. Simpson [1976], *Land Law and Registration,* vol. I, New York: Cambridge University Press, at pp. 3-4; P.F. Dale and J.D. McLaughlin [1988], *Land Information Management: An Introduction with Special Reference to Cadastral Problems in Third World Countries,* Oxford: Claredon Press, at pp. 170-172.

3 After a model by J.D. McLaughlin [1981], *Lecture Notes for Land Information Management.* Department of Surveying Engineering, University of New Brunswick, Fredericton, N.B.

4 As for example, outlined by Simpson [1975], *supra,* note 2; E. Dowson and V.L.O. Sheppard [1952], *Land Registration,* London: Her Majesty's Stationery Office.

5 E.g., Dale and McLaughlin [1988], *supra,* note 3, at pp. 25-27; G. Larsson [1971], "Land registration in developing countries." *World Cartography,* XI, pp. 33-67, at pp. 34-35.

6 G. Wunderlich (1975), "Juridical or fiscal cadastre: economics of land information systems." In *Proceedings of the North American Conference on Modernization of Land Data Systems,* Washington, DC, pp. 47-67, notes for example at p. 50 that if land records are viewed from communication theory, "the effectiveness of the system can be measured by its capacity to enter, transmit (including storing and retrieving), and receive a volume of messages in the shortest possible time."

7 Simpson [1976], *supra,* note 2, at pp. 17-18, after Dowson and Sheppard [1952], *supra,* note 3, at p. 72; and Fortescue-Brickdale [see note 2, p. 17 in Simpson].

8 E.g., *supra,* note 5.

9 But security of tenure does not necessarily depend on the existence of any land registration system. In the outport communities in Newfoundland, for example, customary or unregistered interests in land through possession were well recognized and respected for generations. It was primarily the shift to obtaining mortgages for housing and new legislation limiting adverse possession of Crown Lands in the last few decades that have led to the need for public notice of interests through registration of deeds. Simpson [1976], *supra,* note 2, also notes [at pp. 8-10] that security of tenure does not depend on land registration alone.

10 Simpson [1976], *supra,* note 2, at pp. 3-4.

11 In common law jurisdictions, the traditional hierarchy of evidence in cases of boundary disputes gives greater priority to physical monumentation and possession than to measurements in deeds or titles or shown on plans of survey.

12 Note, however, that most field adjudication is considered part of land administration in this thesis as described in Section 3.1. This is also discussed in Section 5.6.

13 A. Ouellet [1986], *Professional Liability in Conveyancing in New Brunswick,* Toronto: Carswell, for example, discusses certification by lawyers and the liability issues of title insurance companies, at pp. 40-42 and 83-85.

14 In Sweden, a pilot project in which financial institutions take responsibility for validating the priority of mortgage bonds and for officially managing the registration of these interests is now under review, B. Kjellson [1991] Personal communication, CFD, Gävle, Sweden. Also the recent partial privatization of certain land registration functions in Ontario, including conversion of the registry of deeds to registry of title, may result in a greater private sector validation role.

15 Even in a deeds registration system operating under a notice statute, the time of registration may be a factor in establishing priority. See Simpson [1976], *supra*, note 2, at p. 96 on notice, race, and race-notice statutes.

16 Revenue data for several countries is presented by G. A. Jeffress [1991]. *Land Ownership Information Use in Real Property Transactions*, Ph.D. Dissertation in Surveying Engineering, Orono: University of Maine. Care must be taken, however, in making comparisons simply on total revenue, because of differences in tax schedules and in accounting procedures.

17 J. McLaughlin and S. Nichols [1987]., "Parcel-based land information systems." *Surveying and Mapping*, 47(1), pp. 11-29; also see Dale and McLaughlin, [1988], *supra*, note 2, at pp. 39-42.

18 In Sweden, for example, the parcel identifier became a national issue when it was proposed to use a simple code and abandon the traditional parish names. The current identifier is prefaced by the parish and is relatively easy to remember; efficiency is preserved in the computer system by translation to a simple code.

19 Dale and McLaughlin [1988], *supra*, note 2.

20 This became an issue when automating the Indian Land Registry maintained by the Canadian federal Department of Indian and Northern Affairs, where interests were poorly defined and did not well reflect the nature of the tenure. Different classifications of interests also became a problem in attempts to develop a shared data base between the Registry of Deeds, the Land Titles Office, and the Property Mapping Office in Albert County, New Brunswick, where all three offices used a different scheme for the same interests (or types of documents).

21 Examples include abolishing copyhold tenure in England in 1925 and more recently dower rights in Canada. But the complexity is likely to increase rather than decrease as new types of interests such as time-sharing, aboriginal title, and environmental interests receive legal recognition.

22 The name of the interest holder is an important access key to the data in the system, although the parcel identifier is more effective for most types of searches. In the Northwest Territories, the Lands Branch of the Department of Indian and Northern Affairs implemented a computerized system to manage information on leases and other interests on federal Crown lands. The name of the leasee was of course included in the system but the files had to be accessed by an account number. Most public enquiries were made by name and therefore the old rolodex of printed cards relating name to account number had to be retained as part of the system. This also illustrates the need for continuous development of new systems on-site where such problems can be identified before a system is "final". In this case most of the system development took place in Ottawa, over 2000 miles from the eventual users.

23 For example, in New Brunswick "Crown" is often insufficient in identifying federal and provincial authorities, yet department names and mandates often change. Linkages between former and current authorities should be kept to facilitate searching in the deeds registries.

24 Note for example, that until 1991, England's Land Titles Registry was virtually closed to the public because of the tradition of protecting privacy. This secrecy policy was an obstacle in the development of public and private geographical information systems.

25 I. Ezigbalike [1988], *Land Information Systems Development: Software and Hardware Considerations*, Ph.D. Dissertation, Dept. of Surveying Engineering, University of New Brunswick, Fredericton, N.B. [at e.g., pp. 101-104] discusses some of the issues raised in this section and also provides a similar model for relating specific parcel-based information in New Brunswick.

[26] A management decision has been made in Sweden to retain the current DBMS (AROS ROSAM - Swedish), despite some awkwardness in handling specialized searches, until conversion of all properties has been completed in approximately 1995. At that time it is hoped to implement a DBMS that will have the flexibility of a relational database, but have other features such as better data integrity checks which are essential to the Land Data Bank System. [E. Fahlen, CFD, 1989].

[27] For example, Swedish legislation required that every plan affecting land tenure (e.g., environmental, zoning, etc.) be referenced to the parcels affected. By comparing co-ordinates of the plan limits with the centroid co-ordinates previously captured for each parcel, the parcels in each plan could be identified (within certain limits since the centroid does not define the boundaries of the parcel). The system now allows a user to access information about every plan affecting a particular parcel and every parcel affected by a specific plan.

[28] Note, for example the use of bar coding in Australia and Britain for automatically identifying and tracking documents. In England, for example, a systematic check of each document is made every week by scanning the bar codes and identifying the location (e.g. room) where it is located. This means of course that after 4-5 days the location has to be deduced from the location given for the last check, but in registries with a large document flow, this is a great improvement.

[29] Ouellet [1986], *supra*, note 12, mentions the physical layout of the books in the New Brunswick registry as a major problem, including the fact that the organization of books and the manner of indexing varies from county to county. In Newfoundland title searchers, lawyers, and other users were also competing for the index books within a crowded space. With computerization of the indices, the issue has become the number of terminals available for users.

[30] The availability of on-line information in Sweden and the confidence users place on the reliability of the data has meant that banks and real estate agents are not requesting many certificates of search.

[31] See, for example Chapter 10 in Dale and McLaughlin [1988], *supra*, note 2. In the Registry of Deeds in Zimbabwe, shelving and the supply of appropriate cards and paper is a concern. One issue in introducing computers is the need for reliable power sources, new office layouts, and backup facilities.

[32] In New Brunswick, the incompatibilities among the 15 county deed registries did not really become apparent until automation and integration was proposed. At this point the different ways in which Mac and Mc names were indexed in each registry, as well as churches and government agencies, suddenly became an obstacle.

[33] Developing co-operation with unions can be critical in large reform projects if, for example, reforms lead to staff reductions or changes in job descriptions. In Sweden where conversion to the automated system has extended over two decades, on-going liaison with the unions has been an important factor in maintaining public and political support for the system.

[34] See, *supra*, note 14; also S. Andersson and B. Kjellson [1990], "Designing LIS for real estate financiers and lenders." In *Proceedings of the XIX Congress of the FIG*, v. 3, Helsinki, pp. 227-235.

6. SYSTEM MANAGEMENT: STRATEGIES FOR REFORM

... change will occur in all areas of professional activity, even if it is not wanted by participants; indeed even if it is opposed. Reform is another matter. Reform will not occur unless there is a rational design and an organisational capacity for change.

Wallace, 1990[1]

System management is concerned with organizing, directing, and controlling resources and activities to achieve specific objectives and broader policy goals. It also involves evaluating how well the system achieves these objectives, then identifying problem areas, and implementing appropriate reforms. As illustrated in the framework in Figure 6.1, it is this subset of system management – managing change – that is the focus here.

Land registration reforms are frequently multi-organizational projects and long term programmes. Many have been successful, but others have had limited results; some never get beyond the planning or pilot-project stage. Among the reasons for problems are an inadequate assessment of constraints and requirements and a focus on a limited range of options. Other difficulties are related to inappropriate reform strategies, including the lack of support programmes. While it is beyond the scope of this research to discuss all of the issues involved, this chapter highlights the need to address these problems more systematically.

The objective is to show how the information management models presented in Chapter 5 can assist in system evaluation and development of reforms. Selected management concerns in land registration projects are reviewed and more specific issues related to the case studies are discussed in the appendices. A methodology for evaluating

land registration arrangements and information management requirements is presented. But the focus is on the initial development of models to assist in the identification of reform options and support programs. Appendix I presents an early application of this approach in Newfoundland.

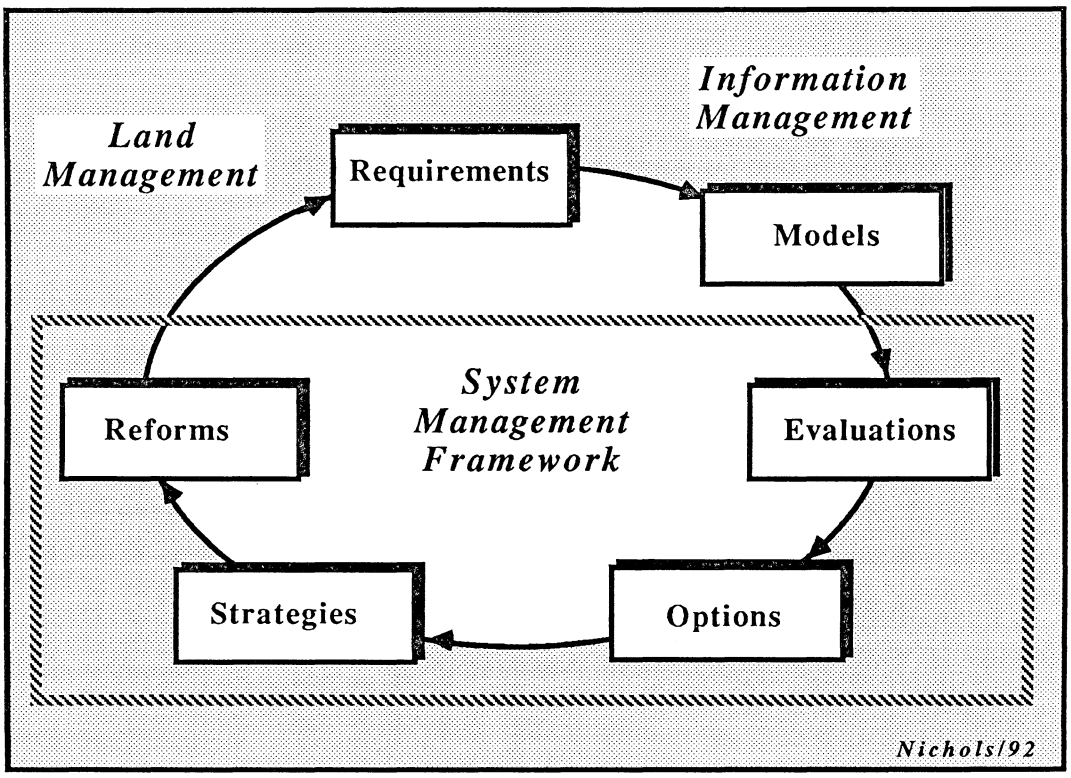

FIGURE 6.1: A system management framework for reforms

6.1 Special Issues in Managing Land Registration Reform

The purpose of this section is to briefly outline why land registration reform can involve special concerns for system management. To set the stage, various types of reforms are reviewed to point out the range and complexity of activities involved in improving land registration. Special management issues are then considered.

6.1.1 Types of reforms

In Chapter 1 reforms were classified as first registration, system conversion, and system improvement. While it is recognized that this is in reality an artificial distinction (because they are all system improvements and most projects involve elements of each type), it is useful in illustrating the range of land registration reforms.

First Registration: This involves the identification, adjudication, and recording of tenure interests and boundaries that are customary (undocumented) or for which there are poor or unsystematic public records. It may be systematic (for a complete area or type of interest) or sporadic (registration occurs when there is a new transaction). New cadastral surveying and/or mapping programmes are often involved, in addition to compilation of a register of documents or interests. Major systematic land titling projects have been undertaken in, for example, Africa,[2] Asia,[3] and Latin America.[4] Sporadic first registration has been a long term programme in Britain.[5] In Newfoundland, occupational interests have been formalized through individual quieting of titles actions and applications for Crown grants (see Appendix I).[6]

Conversion to a New System: This has been of special concern in eastern and central Canada, where there are major projects to convert deed registration systems to title registration systems.[7] Australia and New Zealand have had an on-going process of converting remnants of "old system" registered deeds to land titles. Another example is moving from the traditional common law hierarchy of evidence in boundary delimitation to give more legal status to co-ordinates and provide state guarantee of boundary location.[8] Figure 6.2 presents a model of options in this type of reform.

Some automation projects result in a new system. For example, the development of the Swedish Land Data Bank System integrated two systems – land registration

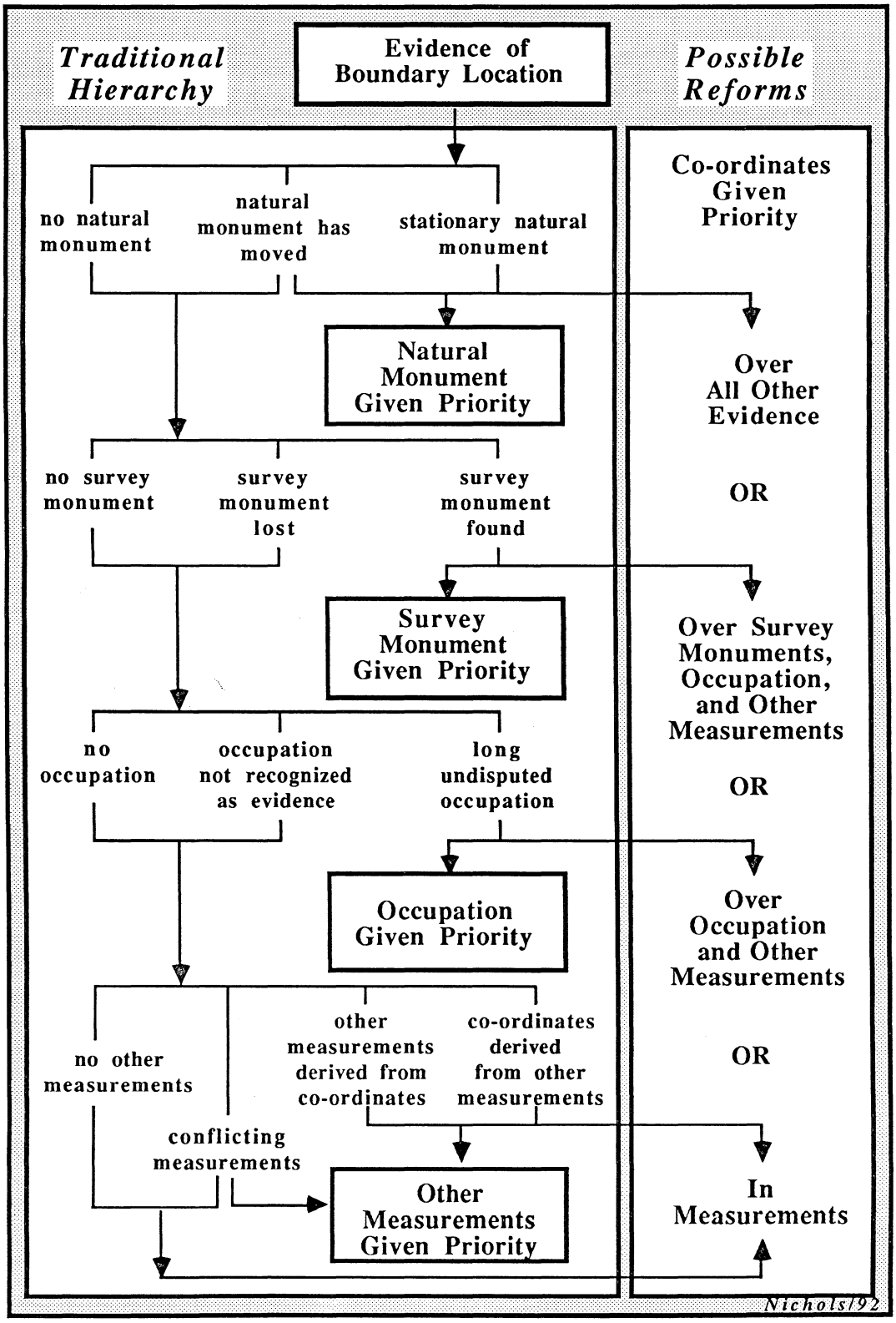

FIGURE 6.2: Co-ordinates as evidence of boundary location: options for reform

(interests) and real property (parcels).[9] The primary feature of conversion is the need for significant legal and administrative reforms to support system implementation.

System Improvement: The distinction between system conversion and system improvement is largely artificial. The purpose here is to point out that there may be many smaller projects that make incremental system improvements, as well as large-scale programmes. System improvements can range from changes in survey information and parcel indexing to complete automation of records and subsequent development of distributed, computerized networks. Chapter 4 has described some of the reforms currently in development or planning stages.

6.1.2 Special concerns in land registration reform

Although the management of land registration systems and system reforms is in many ways no different than managing other administrative systems or computerization projects, there are some special concerns. These include the following:

Legal Reforms and Land Policy Issues: Most land registration projects depend on changing or implementing laws and regulations. Even simply microfilming documents or computerizing indices may require legislative changes concerning evidence and prescribed procedures. Legal reform can cause long delays in implementation and can even require modification of the system design. Where significant legal reforms are required and where land tenure or land policy issues are involved, political support becomes crucial. Support is also required from the professional groups involved such as the legal and surveying communities, other groups that are impacted by the reforms (e.g., title searchers, property assessors), and those most greatly affected by the changes – the landholders. Whether a project or

programme gets started or reaches completion will often depends on leadership and communication in the early stages.[10]

Long Term Projects and Programmes: Reforms often span decades before they are "complete" and even the planning process can take years. They can also involve large annual budgets. Therefore maintaining continuing political and financial support over the programme life is essential. Management must be able to respond to changing political and economic conditions and produce results that will justify continuation and/or attract new sources of funding. There must also be flexibility to revise projects and programmes as new technologies, laws, requirements, or other conditions occur.

A related issue in these large projects is the need for incremental reforms. This may be the introduction of a new system region by region (e.g., in district offices or by county). Or it may involve dividing a reform project into parts that can be implemented sequentially. In other cases, reforms could consist of gradual improvements over time, each improvement building on the strength of the previous one.[11]

Continued Service: Land registration systems are an essential part of land markets and conveyancing, as well as other administrative processes. Users must be able to rely on the system, its information, and its services during any system transition. Implementation must also be planned to meet special conditions such as avoiding periods when land transactions are at their peak (usually summer).

Uniqueness: Land registration systems reflect the unique characteristics of the system environment in each jurisdiction. While some improvements can be "purchased off the shelf," major reforms must be tailored to fit specific and complex institutional conditions. What works well in one jurisdiction may be a failure in another. Even if a title registry or digital mapping system is implemented, it can only be effectively

maintained if it suits the local environment. Managing reforms requires an understanding of the history of the existing system and tenure arrangements and the current and future jurisdictional constraints.

Organizational Considerations: Land registration reforms often involve changes in organizational structure – both internally and within the broader land administration context. This may include formation of new agencies, restructuring of departments, and/or changes in administrative structure within the organization.[12] Land registration reforms can also involve new relationships between the private and public sector and usually require extensive co-ordination with many organizations.

6.2 Evaluating Requirements

Evaluation of information requirements is the term used here (and in the case studies) to include evaluation of one or more systems in a jurisdiction, the system environment, and the requirements for improvement. Although the emphasis is on information management, any related problems or requirements are also considered. Evaluating requirements helps to identify strengths and weaknesses in existing system arrangements and provides criteria for assessing options and designing specifications.

This section reviews a model methodology for evaluating requirements that was developed during the case studies. It is based on standard methodologies for developing information systems but has been modified for several reasons. In the first place, the emphasis in the case studies was on the initial development stage and did not include detailed system specifications; it is therefore more general than most system analyses. Secondly, as described in Chapter 3, the case studies were concerned with the need for land tenure information in many organizations, not one system. Therefore, the focus of

this section is on evaluating general requirements in a jurisdiction, demonstrating the application of the information management models.

6.2.1 Methodology

Figure 6.3 represents the methodology that developed in the Canadian case studies to evaluate land tenure information requirements. These stages include the following:

Preliminary Planning: In the preliminary planning stage, background information about the jurisdiction is collected and the initial criteria for the evaluation are developed. These criteria may be defined, for example, by the organizations involved (e.g., a Steering Committee determines what and how the evaluation will take place) or by the evaluator. In the latter case, criteria may involve a checklist to be used during interviews to ensure that complete and consistent information is collected.[13] The land policy and general public service objectives in the jurisdiction also serve as initial criteria.

In Newfoundland and in the NWT, this involved a preliminary assessment of requirements based on interviews with organizations over approximately two weeks. In PEI the initial information was contained in a Request for Proposal and the planning stage came in submitting the proposal and in subsequent meetings with the Steering Committee. Information should also be obtained from the literature (history, government reports, etc.).

Examining and Evaluating the Existing Arrangements: Appendix I provides an example of a description and evaluation of existing arrangements. Figure 6.4 illustrates the system community model (from Figure 5.14), with the components of the model expanded, as a framework for identifying what should be examined and evaluated for this section of the methodology (Figure 6.3) What is shown in Figure 6.4

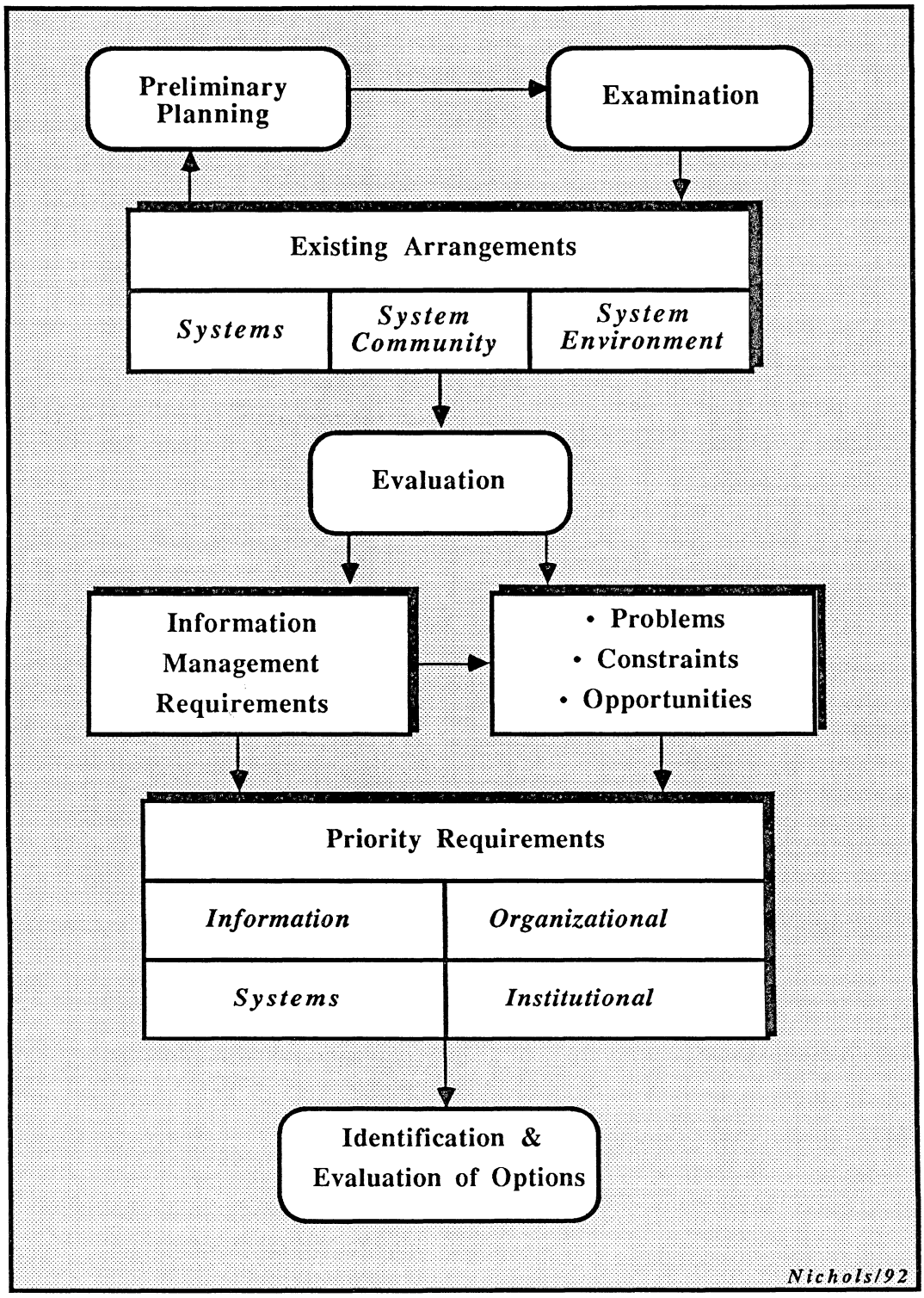

FIGURE 6.3: A model methodology for evaluating requirements

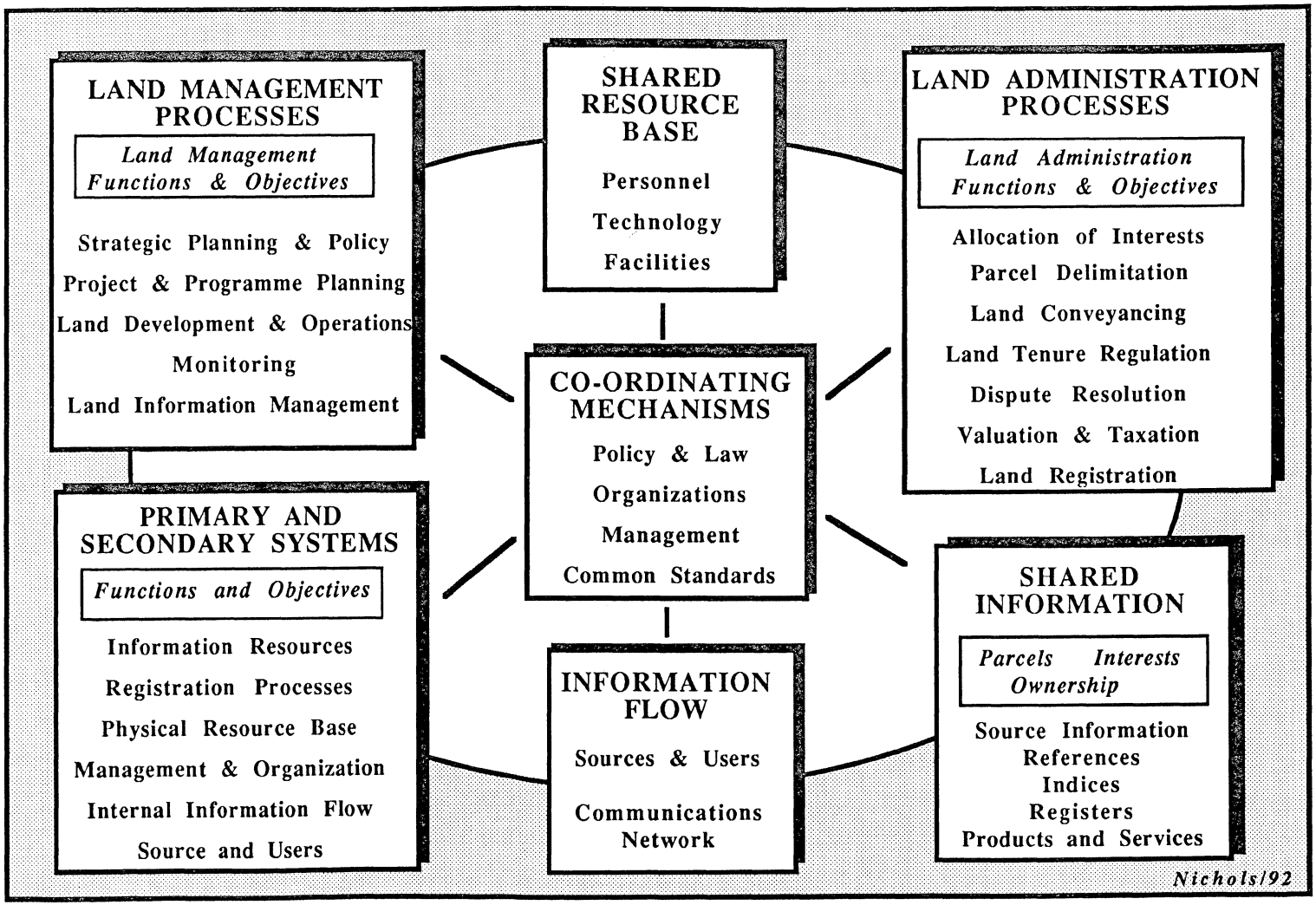

FIGURE 6.4: Model framework for evaluating the system community and its requirements

is a framework because it presents guidelines; the particulars to be evaluated would have to be included for each jurisdiction. Each part (e.g., information flow or land administration processes) should be examined in the study.

The system, system community, and system environment models from Chapter 5 also provide a framework for developing evaluation criteria. Some examples of criteria include:

- *information* – accuracy, precision, coverage, completeness, presentation and format, reliability;
- *information flow* – frequency, expediency, reliability, complexity;
- *primary system registration processes* (e.g., examination) – complexity, expediency, completeness;
- *systems* – accessibility, indexing, security, use and type of technology
- *standards* – for information, referencing, technology, products.[14]

Inputs for the Evaluation: Sources of information for the examination and evaluation stages can include:

- *literature, legislation, and reports;*
- *questionnaires* – e.g., distributed to organizations in place of an interview, used during interviews as a guide, or distributed after an interview;[15]
- *interviews* – these may be very structured or relatively informal and some of the issues are discussed in the following section;
- *focus groups* – these are small groups of special interest groups (e.g., registry information users; system administrators) with a facilitator and the purpose is to come to a collective determination of problems, requirements, and priorities;

- *general user forums* – these may be organized during or after the evaluation to discuss needs and problems, present initial study findings, and obtain feedback;[16]

- *demonstrations, pilot projects and prototyping* – if a system or product is available or being designed, then these methods can provide direct user input to aid the evaluation of options and provide design specifications.[17]

Evaluation Outputs: In the methodology in Figure 6.3, two forms of outputs are shown: requirements and a set of problems, constraints, and opportunities. The evaluation is an iterative process and all of these are connected. In the case studies, emphasis was placed on determining information requirements in land management and land administration processes. The existing arrangements were evaluated against these ideal requirements to determine problems. Constraints and opportunities can come from the system environment (funding or educational constraints), the system community (good co-ordination), or the systems (lack of base information). Constraints and opportunities are as important as requirements and problems in determining priorities.

Priority Requirements: Determining priorities is the next level of the evaluation stage. At this point, direct input from the system community and possibly other government and private organizations should be obtained if possible. What type of priorities will be identified will partially depend upon the initial evaluation mandate. Thus, for example, if the mandate involves selection of a computer system, then the emphasis in priorities will be more technical. But the evaluator should always have the option of recommending no automation on the basis of the constraints and requirements.

It is important in this stage to identify a range of priority issues, since these can be used to help identify support programs for implementing reforms. Thus, for example, if the priority is related to a cadastral mapping programme and one of the

options is computerized mapping, then integrated surveys and personnel training and education may be additional priorities.

Identification and Evaluation of Options for Reform: This was the final stage of evaluation in this research. Various options were considered and evaluated, although not rigorously. A strategy for reform was also designed in each study. At this stage in most projects, evaluation might involve cost-benefit analysis, development of detailed specifications for system benchmark tests, implementation of pilot projects, or perhaps prototyping. Section 6.3 discusses the design of options in more detail.

6.2.2 Issues in evaluation

There are many special considerations in system evaluation that are beyond the scope of this chapter. But some of the issues include the following:

Defining the Study Objectives: The objectives must be clear in order to determine, for example, the timing of the study, the level of detail, the organizations which should be involved, the evaluation criteria, and how the results are to be presented. For instance, if the studies are at the beginning of a large multi-organizational reform, then what should be evaluated may be much different than a study conducted to solve storage problems in a land registration office. One advantage of the models is that they can accommodate a range of possible evaluation conditions.

Reducing Bias and Subjectivity: The primary problem in evaluation is the fact that it has a large degree of subjectivity. The goal should be to eliminate as much bias as possible by designing specifications, criteria, and feedback mechanisms for the study that will guide the evaluation. Another important consideration is the selection of

evaluators. System vendors, for example, are very knowledgeable and can usually assess potential technical problems and requirements well, but they have a vested interest that must be recognized. But any evaluator is biased to some degree by disciplinary background or by familiarity with specific types of systems or institutional arrangements. One solution is a mixed evaluation team.

Identifying the Participants: This is often an iterative process, because new participants will be identified as the situation becomes better understood. Both current and potential users and sources of information should be identified. Users, sources, and regional offices in other communities should also be contacted. One experience from the case studies is the fact that in collecting information, it is important to talk to many different people in the organization and community. For example, a manager will often cite what should be done (i.e., company policy), while the drafting technician may be a better source of what actually occurs. Similarly relying on information from only one type of users can cloud the real issues.[18]

Identifying Real Requirements: Studies such as those discussed above are often referred to as user need studies. This was avoided here because the implication is that the major means of obtaining information is by asking users what they need. Sometimes the answer is a "wish list" of new technology or new products, not what is required to carry out the activity. More frequently users define problems and requirements in terms of existing products or arrangements. In the NWT, for example, map users commonly said they needed map scales of 1:31,680 (the metric conversion of 2 inches = 1 mile) since this was the product they were currently using. If digital mapping is an option then real requirements (i.e., more ideal scales) based on objectives, processes, and activities need to be determined.

6.3 A Model Framework for Identifying Options and Designing Strategies

One reason why system reforms sometimes achieve only limited results is the fact that only a limited range of optional reforms have been considered. The solution to the problems in deed registration systems may be seen as title registration and computers may be viewed as solving nearly everything. But usually the real benefits of such reforms can only be realized if there are appropriate supporting arrangements. In this section a framework for identifying options and designing incremental reform strategies is presented. For the most part the discussion is limited to the internal system model for land registration (see Figure 5.11), although a similar approach could be taken for the system community (Figure 5.14).

6.3.1 Identifying options

Once the priority requirements are known, the options for meeting those requirements must be identified. This is often a rather random process in practice – options may be identified from the available technology or from experience in other jurisdictions. In many cases this may be the best route, especially when conditions are similar and the systems have been successful. But even introducing a well-tested reform, such as cadastral mapping, in another jurisdiction will involve special circumstances (e.g., different survey standards or mapping organization structures). Modifications will be required and there will be a need to identify what these should be.

The model framework presented in Figure 6.5 shows the internal system model (Figure 5.11) with its various components expanded. The purpose of this model in the identification of options is to provide a more systematic approach. For example, if the requirement is to provide improved public access to information, then the diagram can help to identify various system components that can be used to meet this objective. Changes might involve how information is indexed (process and standards), how office

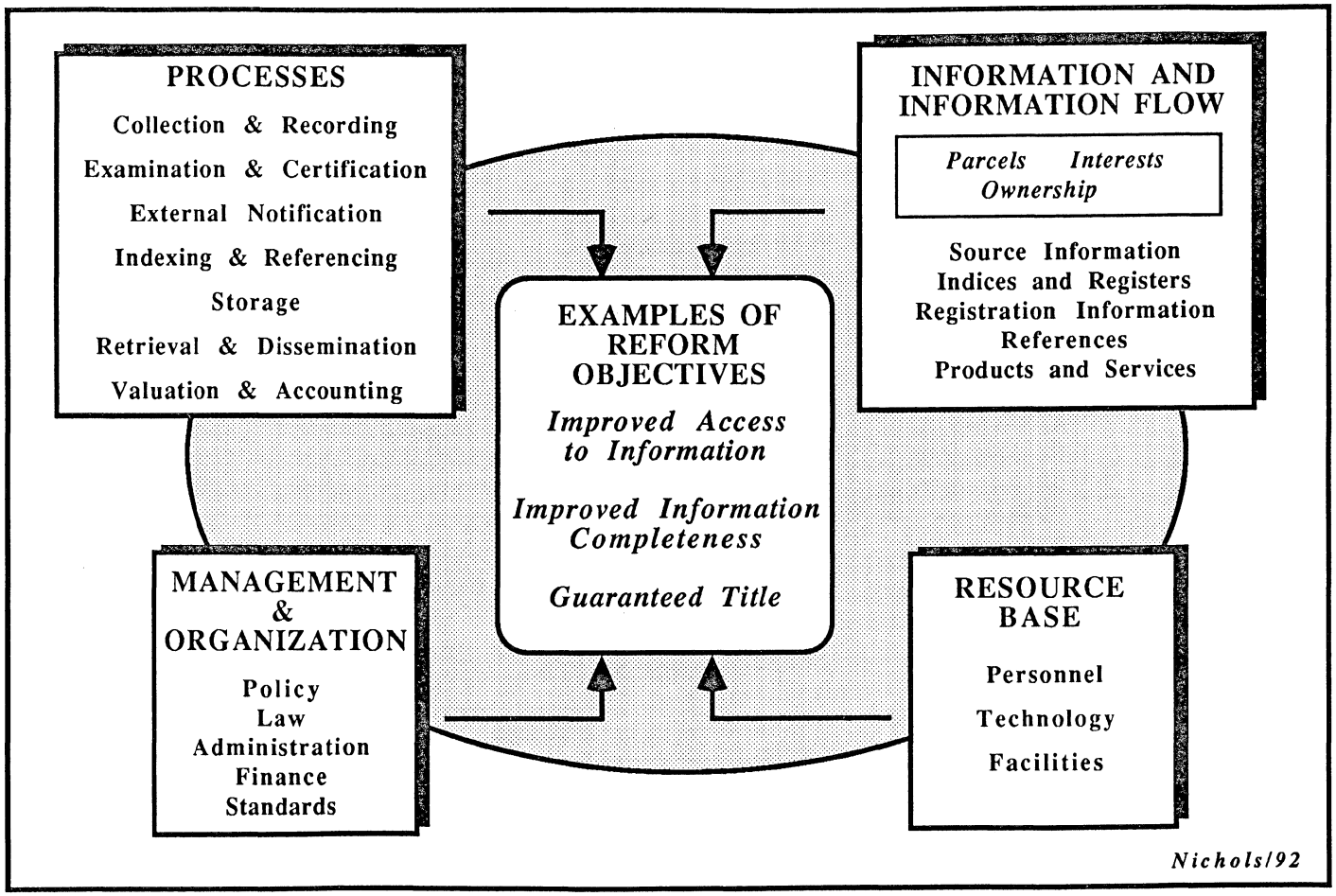

FIGURE 6.5: A model framework for identifying system reform options

facilities are organized (resource base), provision of automatic notice to users when tenure status changes (processes), development of information networks (flow and technology); or changes in law and public policy (management and organization).

How these options might be organized within a strategy is discussed in the following section. Similar models for the system community and system environment can be used to identify a wider range of options.

6.3.2 Designing reform strategies

A strategy is a plan or carefully designed method to reach a goal. In land registration reform, it means putting all of the selected options together in an organized sequence of events. It also involves organizing various component options together in a logical arrangement, such as adjudication, mapping, and compilation of a title register in first registration. In this section examples are given of how strategies for the three reform objectives identified in Figure 6.5 can be developed using the framework. These examples include information completeness, improved access, and development of active systems that may provide a public guarantee of boundaries or title.

In Figure 6.6 a model strategy for developing a range of options to provide more complete land tenure information is shown. To develop an appropriate strategy, the items in each box might be considered, and each will have an additional set of options. For instance, the last box (linkages to other systems) could be developed into separate options that consider what land registration systems are involved in a network, what common standards for parcel definition and indexing have to be developed, and the technical resources required. This example illustrates the fact that there are layers of additional options for each reform.

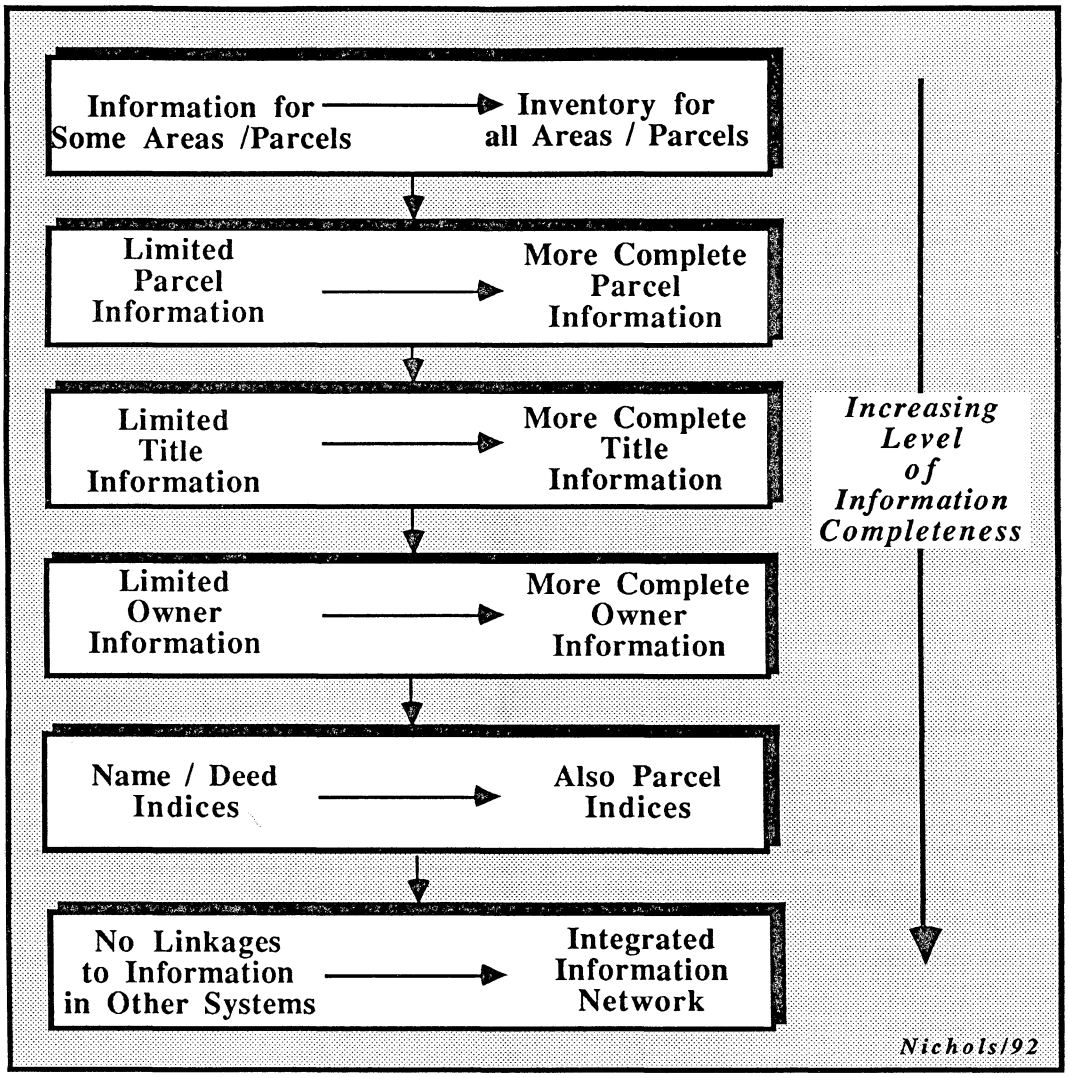

FIGURE 6.6: A model strategy of selected options for improving information completeness

Figure 6.7 is a selection of options for improving public access to information. As described in Section 6.3.1, this example shows how the model frameworks (e.g., Figure 6.5) can be used to identify a wide range of options – from policy to technology – to achieve the desired reform.

The options are shown in Figure 6.7 as a progressive sequence that has a logical order. But it would not be necessary, for example, to have full compulsory registration

for plans and documents in order to develop access to information policies. A reform strategy would probably consist of a jagged path through these items (e.g., compulsory registration of some documents, manual parcel indices, passive notification, new access policies but restrictions on value information, regional services, and linkages of several registries through a computerized network).

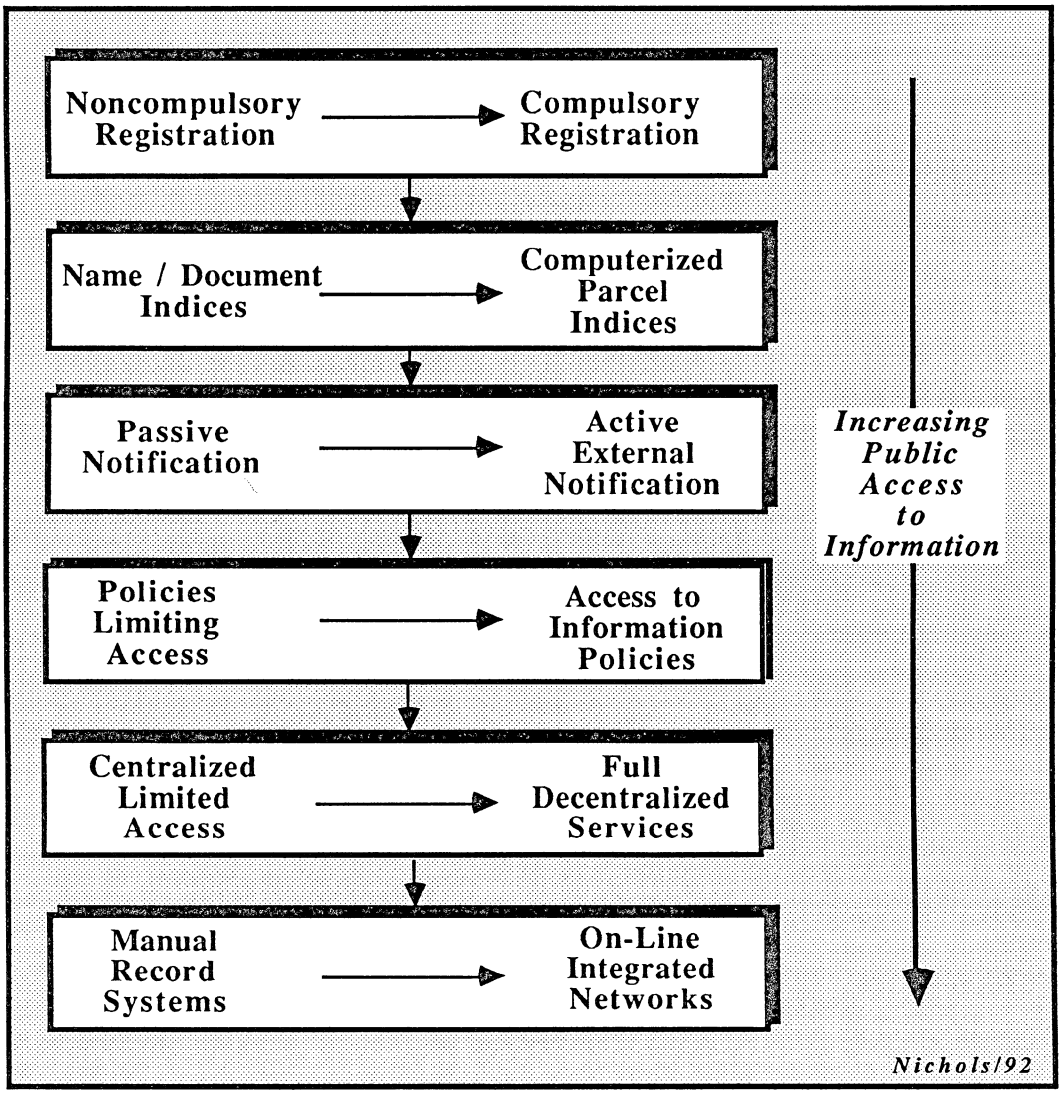

FIGURE 6.7: A model strategy of selected options for improving public access to information

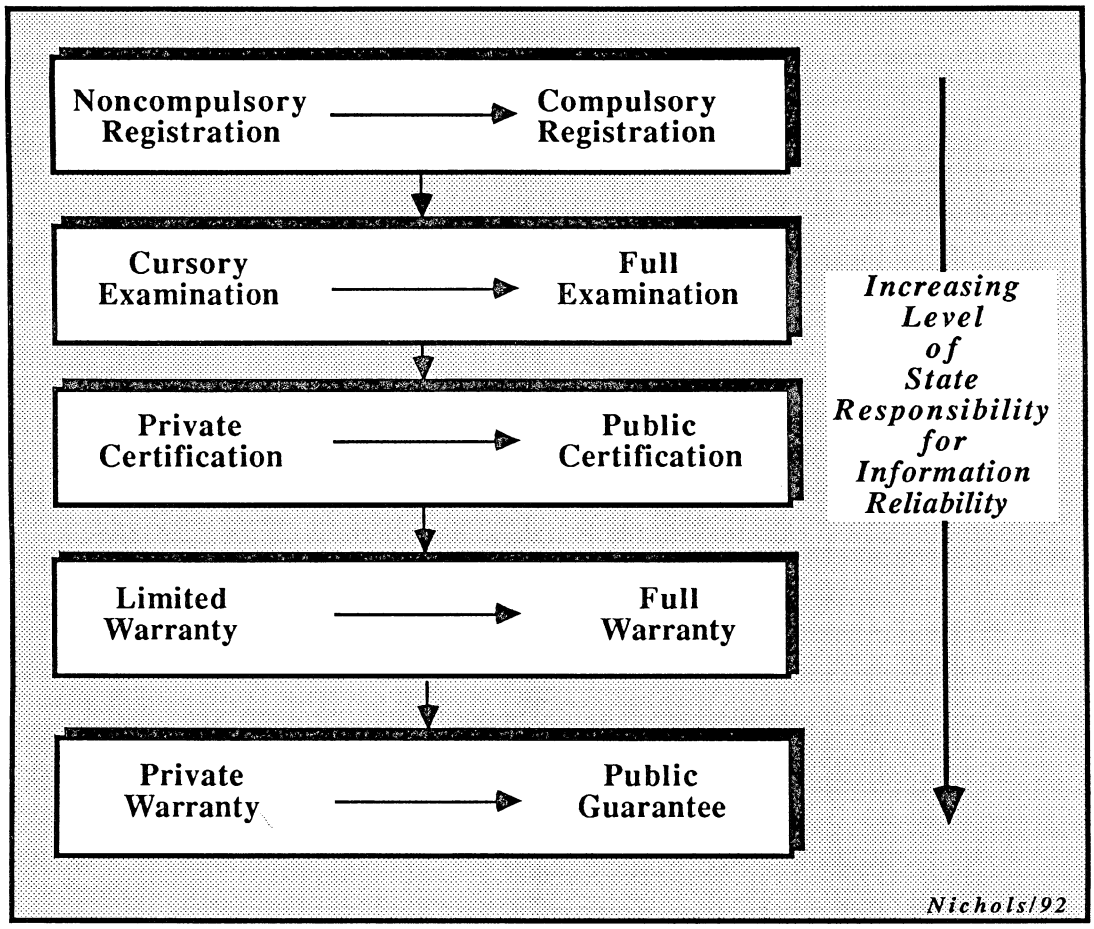

FIGURE 6.8: A model strategy of selected options for developing active land registration systems

The third example given in Figure 6.8 is for developing active systems where the state has an increasing degree of responsibility for the reliability of land tenure information. This is based on taxonomies for boundary and interest registration by McLaughlin.[19]

In this strategy there is more inter-dependence among various options than for the strategy in Figure 6.7. For example, public certification and guarantee would probably not be an option without some examination, but what should be examined, how, and by whom would still have to be determined and there would be a wide spectrum of possibilities. This strategy would also require a range of support

programmes, as are discussed for Newfoundland in Appendix I (See for example Figure I.3.3).

The models presented above demonstrate how a systematic approach can be developed for designing land registration reform strategies. They incorporate four principles for appropriate strategies:

- A wide range of options should be identified - within the system, the system community, and system environment.

- Strategies should include development of appropriate support programme options – e.g., training, law reforms, integrated surveys.

- Strategies for major reform should be designed to achieve short term improvements, in addition to meeting long term objectives – e.g., to maintain political and community support.

- Strategies for major reforms should be incremental, each improvement contributing to a logical progression of objectives.

These principles are essential to the successful implementation of land registration reforms.

6.4 Assessment and Issues for Further Research

This chapter has demonstrated the application of the information management models that were developed in Chapter 5 in evaluating systems and requirements and in designing appropriate improvements. Some of the advantages of using the information management models include the following:

- They provide a systematic approach in evaluation and design in which most of the elements in systems, the system community, and system environment can be easily identified.

- They enable frameworks for evaluation and design to be developed that are general and flexible (i.e., not dependent on any specific system, level of technology, or land tenure arrangements).

- The frameworks can be used to evaluate and improve both the parcel and interest components of land tenure and facilitate identification of a wide range of options and strategies for reform.

The major disadvantage of the information management models in evaluation and design is that in order to incorporate all of the components, the frameworks (e.g., Figure 6.4 and 6.5) are complex. A second disadvantage is that they do not provide a general set of evaluation criteria directly. This limitation is mitigated by the fact that most criteria for evaluation and design of land registration arrangements need to reflect the purpose of the evaluation and the particular jurisdictional priorities (e.g., land policy objectives).

What has been presented in this chapter is the intial development of methodologies, frameworks, and strategies for the management of land registration reforms. Among the issues for further research are the following:

Refinement of the Model Frameworks: The frameworks presented here for evaluation and design represent work in progress. There is a need to refine these further in other case studies to ensure that the components and relationships of the frameworks are truly jurisdiction independent. Particular emphasis should be given to case studies involving different forms of registration arrangements, including jurisdictions with other legal and tenure systems.

Further Development of Strategies: Section 6.3 presented examples of how strategies for reform can be designed using the information management models. These were only partial strategies and there is a need for further research in a number of areas. The first issue is to find a more appropriate way of presenting the strategies and options. Secondly, the various levels of strategies for each example should be developed. There is also a need to develop similar model strategies for other requirements and objectives.

Application in Evaluating Options for Boundary Delimitation: A specific area for research is a more systematic development of options for improving parcel boundary delimitation. One recent issue is guaranteed boundaries to complement guaranteed title systems. A second and related issue is the legal effect of co-ordinates, as illustrated in Figure 6.2. Although these problems have been reviewed from legal, economic, and technical perspectives, there is a need for further research with an information management approach.

6.5 Endnotes

1 J. Wallace [1990]. "Barriers to cadastral reform," In *Papers and Proceedings from the National Conference on Cadastral Reform '90*, D. Jeyanandan and G.J. Hunter, eds., Dept. of Surveying and Land Information, University of Melbourne, Victoria, Australia, pp. 192-200, at p. 193.

2 See, for example, S.R. Simpson [1976], *Land Law and Registration*, Cambridge: Cambridge University Press; G. Larsson [1971], "Land registration in developing countries," *World Cartography*, XI, pp. 33-67.

3 See for example, I.P. Williamson [1990], "Considerations in assessing the potential success of a cadastral project in a developing country – a case study of the Thailand land titling project," *Australian Surveyor*, 35(4), pp. 313-325.

4 See, for example, G. Barnes [1988], *A Comparative Evaluation Framework for Cadastre-Based Land Information Systems (CLIS) in Developing Countries*, Ph.D. Dissertation in Civil and Environmental Engineering, Wisconsin: University of Wisconsin.

5 See, for example, Simpson, *supra* note 2

6 The development of customary arrangements is described by A.C. McEwen [1978], *Newfoundland Law of Real Property: The Origin and Development of Land Ownership*, Ph.D. Dissertation in the Faculty of Laws, London: University of London. McEwen, the former Director of Surveys in Newfoundland also discusses ways in which land registration could be improved.

7 M. Olgilvie [1988], "Property registry and conveyance: the Maritime experience," In *A Primer on Multipurpose Land Information Systems*. Wisconsin Land Information Report 4; Madison: University of Wisconsin, pp. 98-108; I.P. Williamson and J.D. McLaughlin [1985], "A review of the recent New Brunswick Land Titles Act," *Canadian Surveyor*, 39(2), pp. 109-122.

8 See, for example, [1991] "Legal coordinated cadastre: progress report." Report in *Tieline*, vol. 7, pp. 21-23. [South Australian Division of the Institution of Surveyors, Australia] which describes the establishment of a system giving priority to co-ordinates in South Australia. Note that guaranteed boundaries do not necessarily imply the use of co-ordinates and a general boundary [e.g., a hedge] could be guaranteed. What is important in this issue is what is actually being guaranteed [e.g., location of boundary in the field or as shown in a plan or on a map, co-ordinate values], what tolerances are allowed, and what the guarantee actually means in terms of legal effect [e.g., monetary compensation, removal of encroachments].

9 For example, S. Andersson [1987], "The Swedish Land Data Bank," *International Journal of Geographic Information*, 1(3), pp. 253-263; I.P. Williamson [1987], "Lessons from the Swedish Land Data Bank System," *Australian Surveyor*, 33(8), pp. 740-750.

10 See, for example, D. Gordon [1991], *Parcel-Based Land Information Systems: A Comparative Study*, Research Report 91-1, Christchurch: University of Canterbury, Civil Engineering Dept.

11 In Australia automation projects in the centralized registries have been divided into subsystems such as a document tracking system and strata plan system for implementation. In British Columbia, a complete computerized system was introduced office by office. In Sweden conversion is also by region, the large metropolitan areas with frequent land transactions being converted in the early stages. Problem areas have been left until last. Also see Appendix I which recommends an incremental reform strategy in Newfoundland.

[12] For example, M.C. Ircha and J.M. Tolliver [1989], "Restructuring organizations: alternatives and costs," *Journal of Management in Engineering*, 5(2), pp. 164-175.

[13] See, for example, Appendix B in P.F. Dale and J.D. McLaughlin [1988], *Land Information Management: An Introduction with Special Reference to Cadastral Problems in Third World Countries*, Oxford: Claredon Press.

[14] See, for example, Y.C. Lee and D.J. Coleman [1990], "A framework for evaluating interchange standards." *Canadian Surveyor*, 44(4), pp. 391-402.

[15] A detailed questionnaire was distributed during the NWT study, and although most items could be answered with a checkmark in a box, the majority of questionnaires were uncompleted. This was partly due to the wide mandate of the study and the fact that so many different types of organizations, activities, and information were concerned. The questionnaire was then used as a guide in interviews. In Newfoundland and PEI, a checklist was used during interviews to ensure that information was consistent and complete. A short post interview questionnaire was distributed in Newfoundland to confirm the findings of the study and provide an opportunity for further input. This was found to be helpful.

[16] This approach was used in both the Newfoundland and PEI studies and was found especially useful in obtaining information, in communicating the purpose and findings of the study, and in obtaining important feedback for the final report in PEI.

[17] In Sweden, for example, the initial Land Data Bank System was introduced as a pilot project in one county. However, it could be considered to be a form of prototyping because users were directly involved in modifying and developing the system.

[18] Interviewing a number of people from the same group is also important. For example, in the NWT study three lawyers were interviewed and asked about services and any problems in the NWT Land Titles Office which has parcel-based indices. The first lawyer was from Yellowknife (across the street from the LTO)and he had a number of complaints about delays and forms. The second was from Hay River, a community approximately 200 kilometres to the south. He thought the system worked well despite the fact that inquiries had to be made by phone and applications and certificates depended on mail service. A third lawyer in Fort Smith, further to the south, thought the system was absolutely wonderful. It turned out that the Yellowknife lawyer was originally from England and more familiar with the Land Registry there; the Hay River lawyer was from Ontario and familiar with both deeds and title systems. The Fort Smith lawyer was originally from Cape Breton, Nova Scotia where there is a rudimentary deed registry system with only grantor/grantee name indices. Finding the correct "J.MacDonald" in Cape Breton when there are probably hundreds listed in the registry, is a major problem.

[19] J.D. McLaughlin [1975], *The Nature, Function, and Design Concepts of Multipurpose Cadastres*, Ph.D. Dissertation in Civil and Environmental Engineering, Madison: University of Wisconsin.

7. CONCLUSIONS AND RECOMMENDATIONS

> *Each generation has its own rendezvous with the land, for despite our fee titles and claims of ownership, we are all brief tenants on this planet. By choice, or by default, we will carve out a land legacy for our heirs. We can misuse the land and diminish the usefulness of resources, or we can create a world in which physical affluence and affluence of spirit go hand in hand.*
> *Udall, 1963*[1]

Information alone will not necessarily lead to better land use decisions. Nor is information a substitute for legal, economic, and political measures that must be taken to ensure appropriate development of land resources. But if the information resource is well-managed, it can provide three important advantages: decisions can be made with better knowledge of the consequences and options; a basis for more equitable decisions can be established through informed participation; and the consequences of the decisions can be monitored and enforced.

This research has been concerned with a small, but essential, subset of the information required for land management – land tenure information. The purpose has been to show that by viewing land registration from an information management perspective, not only can traditional objectives be accomplished more effectively, but broader land management requirements can also be accommodated. This chapter summarizes the conclusions, recommendations, and contributions of this research.

7.1 The Role of Land Registration in Land Management

One basic premise in this research was that land registration systems exist to serve a wider purpose than efficient conveyancing. As Henssen, for example, has said:

...it must be kept in mind that land registration is not an end in itself, but a necessary prerequisite for social and economic development.[2]

Increasingly the important role of land registration in land management is also referred to, but there has been no systematic examination of that role. This research analyzed the land management and administration processes in the Canadian case studies to identify requirements for land registration. These requirements include:

- a complete, up-to-date inventory of all land tenure information comprising sets of graphical and textual information that can be readily accessed without specialized knowledge, and can be easily related and integrated with other information for various land management activities;

- effective procedures, e.g., for indexing and referencing, for improving the quality of the information over time, and for providing a broader range of products and services to a more diverse user community;

- effective and flexible systems that can be improved incrementally to meet new requirements and constraints, including new types of tenure interests, new land policies, and new technologies;

- effective management and organizational arrangements to co-ordinate various registration authorities, to develop common standards, and to provide decentralized access to information;

- information management policies concerning issues such as access, co-ordination, standards, and objectives within a land policy context.

The analysis required a better framework for land administration than currently exists in the literature. Therefore one contribution of this research has been the development of functional models for land administration and land management that show their interrelationship and demonstrate that land registration has a direct information management role in land management. But the models and the analysis of requirements

are limited primarily to the experience gained in the case studies. Therefore, it is recommended that further research be undertaken to:

- refine the models for land management and land administration by testing them in studies of other jurisdictions where land tenure, land policy, and administrative structures are different;

- relate the work that has been presented here to environmental management;

- develop more detailed requirements for land registration in the policy, planning, and monitoring processes of land management and in the land use regulation and dispute resolution processes of land administration;

- develop a general framework for land reform and its relationships to land management and land administration;

- investigate the impact that the expanding international and interprovincial real estate markets will have on land registration.

7.2 Land Registration from an Information Management Perspective

From the case studies, the site visits, and the literature the existing land registration arrangements were evaluated against the requirements. It was found that, in general, land registration suffers from the following problems:

- specialization that has led to a multiplicity of systems in each jurisdiction with specific standards and procedures designed to serve a relatively narrow user community;

- complexity, including awkward and inadequate parcel descriptions, complex and outdated legal terminology, and complex procedures that can be costly yet not necessarily effective;

- inflexibility, derived from the emphasis on law and traditional procedures, that has inhibited innovation and has made responding to new requirements and conditions difficult;

- partially completed systems and incomplete land tenure information, especially information about public rights and lesser interests, and related attributes about land holders and the parcel itself that are required for many land management activities.

For the most part these problems result from poor information management practices and systems designed primarily to serve the legal profession in conveyancing and land administration organizations responsible for specialized land tenure activities.

Some of the trends in land registration were then briefly reviewed. These include:

- increasing efforts to integrate land registration within larger land information systems and to develop the necessary common standards and automated parcel-based indices;

- greater emphasis on risk management, development of new products and services, improved security, and shifting of responsibility for data accuracy and maintenance to data sources;

- development of automated systems for tracking document flow, for improving information storage and retrieval, and for optimizing procedures;

- development of digital cadastral databases, complete automation of the supporting survey process, simplification of parcel descriptions, and a greater role for co-ordinate information in parcel delimitation and land registration;

- development of simple, standardized forms for land transfers, simplification of legal terminology, and a reassessment of how overriding interests are registered;

- greater emphasis on cost-recovery, on integration of land administration functions, on the role of the private sector in land registration, and on developing policies related to standards, access, privacy, and copyright.

These trends illustrated that progressive land registration authorities have been developing better ways to manage land tenure information to solve some of the problems outlined above. But even where reforms have been implemented, especially automation, it has often been found that more fundamental problems need to be addressed, for example:

> *Today, most organizations realize that their investments in computer systems have not produced enough benefits. They now see that they must improve their procedures before automating them; otherwise, they won't get the full benefits of automation.*[3]

There has been little general theory directly related to land registration to guide reform and to provide models for describing processes, information (including textual information), and systems from this information management perspective. This challenge was therefore undertaken in the research.

Based on the requirements for land registration and other criteria, a set of information management models was progressively designed to describe registration objectives and functions, information (with special attention to relating different sets of information), processes, and systems. The system models include the internal system model, the system community to describe the many land registration systems in a jurisdiction, and the system environment. Unlike most models for land registration, they are not based on specific legal, administrative, nor technical arrangements. They can therefore be used to understand land registration arrangements that range from being rudimentary (e.g., Newfoundland) to highly sophisticated (e.g., Sweden). And they are as applicable to secondary registration systems (e.g., mining rights, cadastral mapping, etc.) as they are to primary systems such as a Registry of Deeds or Land Titles Registry.

The models developed bring a different perspective to land registration that is essential if systems are to respond more effectively to requirements in land management and to the opportunities afforded by information technology. This perspective is not new; the contribution of this research is a more systematic and generalized description of what is occurring sporadically in practice.

One major disadvantage of the models is that they describe a passive role for land registration, i.e., to manage land tenure information. Other processes such as adjudication are considered separate, although closely related, land administration activities. Whether this role should be broader is the subject for further research. In the context of land registration and information management, it is therefore recommended that research be carried out in the following areas:

- reassessment of how land registration has been defined in this research to determine whether the boundaries of this passive role are too limiting and whether an even greater emphasis should be put on land (e.g., buildings and land use) than what has been implied by tenure here;

- further development of the models for information, especially determining essential and optional data sets, development of the relational models, and more consideration of object-oriented data modelling in land registration;

- case studies and comparative analyses in other jurisdictions to test and refine the information management models;

- case studies and comparative analyses to update the standard works on land registration practice by describing recent reforms using a common framework for description and analysis.

In this research, greater emphasis should be given to land registration arrangements in Eastern Europe and developing countries, to registration of interests other than fee simple title or equivalent, and to textual as well as graphical information.

7.3 System Management for Land Registration Reform

Part of system management is concerned with evaluating existing systems, identifying problems and new requirements, and implementing appropriate solutions. In his description of technological and organizational change, Eason points out that:

> *The danger of large, comprehensive and detailed procedures is that people may slavishly follow them without understanding and may use them inappropriately...[a better approach] is a statement of the issues and a general procedure for tackling them so that people can tailor it to their own situation.*[4]

This approach was used here.

Chapter 6 reviewed some of the issues related to land registration reform. A model methodology was presented for evaluating land registration arrangements and information management requirements. Using the models derived in previous chapters, a framework for identifying critical elements in the community of land registration systems was developed. How this framework might be used to develop specific evaluation criteria was demonstrated. Some of the conclusions about evaluation from the case study experiences included the importance of the following:

- defining the study objectives clearly because this will determine what should be examined, at what level of detail, what criteria are important, and at what point in the design and development process the evaluation should take place;

- reducing bias and subjectivity by designing clear specifications for the evaluation, by using feedback mechanisms such as committee reviews, user forums, or post-interview questionnaires, and by using evaluation teams which represent several different perspectives on the problem;

- identifying and contacting a broad range of participants to ensure that many views are represented;

- identifying real requirements related to the fundamental problems and not simply describing what currently exists or what users would like to have;

- using questionnaires as a guide and feedback mechanism, but not as the basis for the entire evaluation.

The system model that was developed in Chapter 5 was then applied in developing a systematic framework for identifying options for reform, including support programs. How this framework might be used in designing reform strategies was also presented with examples.

It was found that the information management models and resulting model frameworks provide a more systematic approach to identifying significant elements in current arrangements for evaluation and a wide range of options for reform. Since they are general models, they can be used in any jurisdictional setting for both the parcel and interest components of land registration. The major disadvantage is that the frameworks are complex; they are also far from being complete. It is therefore recommended that further research be undertaken to:

- test and refine the model frameworks in jurisdictions with different land registration arrangements;

- further develop the strategies for reform presented here, including developing the many levels of options that may be involved and investigating strategies to meet other reform objectives;

- specifically address the issue of developing options for parcel description, including cadastral mapping, plan examination, and the role of co-ordinates in land registration.

7.4 Summary of Contributions

The contributions of this research are both practical and theoretical. The case studies represented a living laboratory approach to cadastral studies research. By direct involvement in the community, the research contributed to the development of multi-organizational co-ordination for system improvement in Newfoundland and in the NWT. Recommendations in the reports prepared became a focal point for discussion in public forums and by special committees. In PEI the recommendations in the final report contributed to changes in government policy and departmental reorganization to improve the management of land tenure information. The integration of property mapping, property assessment, and land registration functions recommended for PEI was also adopted in New Brunswick.

At the same time, the experience in the case studies assisted in the development of general models that have advanced academic research. This research has provided a synthesis of land registration from an information management perspective. The synthesis has analyzed the requirements for land registration in land management, shown why a new approach to land registration is needed, and demonstrated how an information management perspective can assist in developing systems to meet the requirements. More specifically, the academic contributions can be summarized as follows:

- The potential role of land registration in land management has been demonstrated through a systematic examination of the functions and processes in land management and land administration. Of particular significance is the development of a more comprehensive conceptual framework for land administration than has existed in the literature to date.

- A set of conceptual models has been systematically developed to describe land registration arrangements from an information management perspective. This perspective allows elements that are critical to the effectiveness and efficiency of land registration to be identified more readily than the traditional conveyancing perspective.

- A methodology for evaluating systems and requirements was developed and tested during the research and the information models provide a framework for evaluation that is independent of specific legal, technical, or administrative arrangements.

- The information management models for land registration were also used to develop an initial model framework for identifying options for system reform.

- Preliminary work was undertaken on the systematic development of model strategies for improving land registration.

By viewing land registration from an information management perspective, land registration systems can be more effectively designed to meet land management requirements. Land registration provides an essential part of the information required for land management – information about who has the power of control and use, who reaps the benefits, and who bears the costs. Effective management of this land tenure information can create important bridges between:

- people and the land;
- private and public interests;
- economic development and environmental protection.

And it is precisely these kinds of linkages that are needed in the search for better solutions to land policy issues. That we need to find these solutions is evident; whether we will is not. As Leopold said many years ago:

> *We shall never achieve harmony with the land, any more than we shall achieve justice or liberty for people. In these higher aspirations, the important thing is not to achieve, but to strive.*[5]

7.5 Endnotes

1 S.L. Udall [1963], *The Quiet Crisis*, New York: Holt, Rinehart and Winston, at p. vii.

2 J.L.G. Henssen [1983], "Land registration systems," Theme paper to the United Nations Seminar of Experts on Land and Housing for the Poor, Tallberg, Sweden, March, 7 pp.

3 Gellman, H. [1992], " New paradigms for information systems," *Inside Guide*, v.6, April-May, pp. 14, 37, and 42, at p. 37.

4 K. Eason [1988]. *Information Technology and Organizational Change*. New York: Taylor & Francis, at p. 7.

5 A. Leopold [1949], *A Sand County Almanac*, New York: Oxford University Press.

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APPENDIX I

REQUIREMENTS FOR LAND TENURE INFORMATION IN NEWFOUNDLAND

PREFACE

In this appendix, the final report on the Newfoundland case study is presented. The study demonstrates the application of the methodology and many of the models that have been described in this thesis. At the same time, the study should be recognized as one step in the evolution of the models; many refinements have been made. The report provides:

- an example of a model for describing existing arrangements including sources, users, information flow, systems, and institutional factors (Appendix I.A);
- an evaluation of requirements in land administration and land management processes (section I.2);
- a description of problems in existing arrangements, many of which are common to most jurisdictions (section I.3.1 and Appendix I.A);
- development of a range of options for making improvements (section I.3.2).

EXECUTIVE SUMMARY

In 1985, two workshops were sponsored by the Department of Forest Resources and Lands to identify user problems and requirements with regard to land tenure information in the province. One result of these workshops was the formation of an Ad Hoc Committee on Land Ownership Information to address the issues raised. This committee (now called the Land Tenure Advisory Committee) was given an formal mandate in 1986 by the provincial government to formulate a plan for the management of land tenure information.

Study Objectives

Although the study reported here came under the direction of the Advisory Committee, it is a further development of work begun in 1984. It is based on interviews with public and private organizations, as well as information gathered from participants at the workshops. The primary objective of the report is to provide the Advisory Committee and user community with background information for formulating a management plan or strategy. More specifically, the report:

1. evaluates requirements for land tenure information (section I.2);
2. reviews and evaluates the current arrangements for managing this information, including recent system and program developments (Appendix I.A; summarized in section I.3.1);
3. identifies some of options available to the province for making improvements (section I.3.2);
4. identifies priority issues that should be addressed by the community of information users/providers and the Advisory Committee (section I.4).

Findings

The study is based on the premise that in order to make appropriate improvements in any information system, the requirements of those using and managing the information must first be identified. Requirements were evaluated in four primary activities: land transfer and development, property valuation (e.g., for taxation), Crown Land administration, and land use and resource management. From the assessment, the following priority requirements were identified:

1. Users require complete and reliable identification of all land tenure (interests in and restrictions on real property). Specific requirements for most users include maps of current tenure, a related record or inventory from which current ownership and title status can be determined directly (i.e., without searching documents), and a registry of survey plans that identify precise parcel location and boundaries;
2. Users require efficient access to the above information and to information contained in various provincial data bases. In particular, users require access to all information by parcel (e.g., unique parcel identifier) and/or geographical location;
3. Systems require mechanisms (e.g., standards and standard procedures):
    a. to provide property assessment and land use management agencies with timely notification of any change in parcel status (ownership and boundaries);
    b. to ensure that information is reliable, complete, and up-to-date;
    c. to ensure that information is in a standardized format to permit integration with other land information and to facilitate information exchange among agencies using computer technology.

These requirements are currently not being met efficiently, if at all, by existing land tenure information systems. The major problems identified include:

1. lack of required information in an appropriate format, in particular, the lack of cadastral maps;
2. inefficient access to information, e.g., the multiplicity of sources that need to be contacted, the lack of access outside St. John's, and the lack of parcel indices for searching in registries;
3. absence of an interdepartmental strategy that provides a co-ordinated approach to implementing new systems and programs or reforming existing ones.

These problems have resulted in uncertainty, and sometimes errors, in decision making. They frequently cause delays in projects and duplication in, for example, data collection and retrieval. To date, the costs of these inefficiencies have been considered a normal part of the land administration process and/or have been borne by property owners.

The problems are not new; they have been identified by users, by government, and in previous studies. Some problems have been addressed by individual agencies and groups, but for the most part the solutions have been designed to meet specific agency objectives. Therefore, despite recent initiatives in system development, progress in the overall management of land tenure information has been sporadic.

In some cases, significant opportunities have been lost. For example, in a 1978 report on land registration, consultants recommended that a cadastral mapping program be initiated [Decision Dynamics, 1978]. It is estimated that during property assessment in Conception Bay Area South in the early 1980s, the lack of cadastral maps (and the resulting increase in time and effort for assessors to identify current ownership) added approximately $100,000.00 to the cost of program [Mullet, 1985]. Property assessors are not responsible for producing standardized maps showing the information collected and therefore much of the information collected has been lost to other potential users. A substantial investment was made with no significant improvement to the general information arrangements.

Recommendations

At the root of these problems is the fact no overall plan for the management of land tenure information exists. Yet this information is an essential resource for land management, investment, and development. This report therefore recommends:

1. that a comprehensive provincial strategy or plan be developed for the management of land tenure information in the province (e.g., see section I.4.3, Figures I.4.1 and I.3.4);
2. that appropriate support be provided on an on-going basis to ensure the implementation of the strategy and the completion of related programs and projects (e.g., see section I.A.4.4);
3. that a cadastral mapping program be a priority objective of the strategy (e.g., see section I.4.1, section I.2, Table I.2.1, and options in section I.3.2.1);
4. that improvements within the land registration system continue and that consideration be given in future developments to the issues and options identified (e.g., see sections I.4.2, I.A.1.2, I.A.3, I.3.1.2, and options in I.3.2.2);
5. that the strategy emphasize the development of common standards and procedures to improve the quality of information over time and to ensure that information is compatible for integration, use, and exchange in a computer environment (e.g., see sections I.4.1, I.3.1.3, I.A.4.2, I.A.4.4, I.2.4, and I.2.5);
6. that the strategy emphasize co-ordination of existing facilities as well as new system development (e.g., see section I.4.3, Tables I.A.2, I.A.3, and I.A.4);
7. that the Government of Newfoundland and Labrador, in conjunction with other users and providers of land tenure information, continue to build on the communication and co-operation within the community so that reforms appropriate for the Province will be designed and realized.

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I.1 INTRODUCTION

I.1.1 The Need For Land Tenure Information

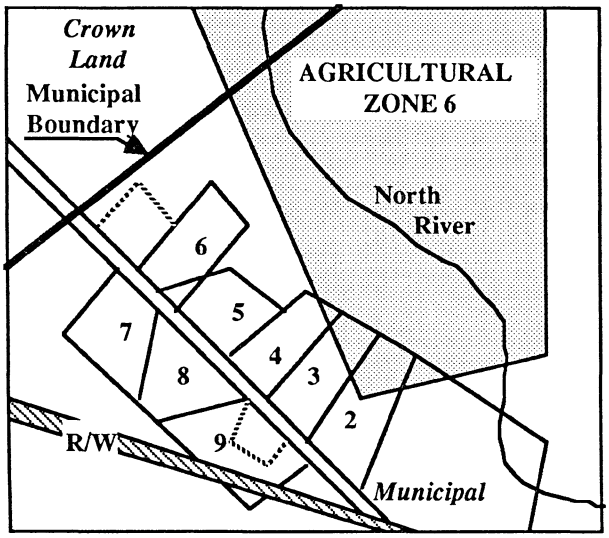
Information about land tenure is an essential resource for both government administrators and the private sector. It provides answers to the following fundamental questions:

a. What property rights and restrictions exist in a particular area?
b. Who owns those rights and who is responsible for administering those restrictions?
c. To what areas of land, or land parcels, do those rights and restrictions apply?
d. Where are the parcels located and what are the boundaries of these parcels?
e. Who are the adjoining property owners and where are the adjacent property boundaries?
f. What are the land uses, improvements, and land use regulations pertaining to a particular parcel?

When combined with other information, land tenure information can also be used to determine spatial relationships between units of ownership and resources, resource capability, and infrastructure (See Figure I.1.1).

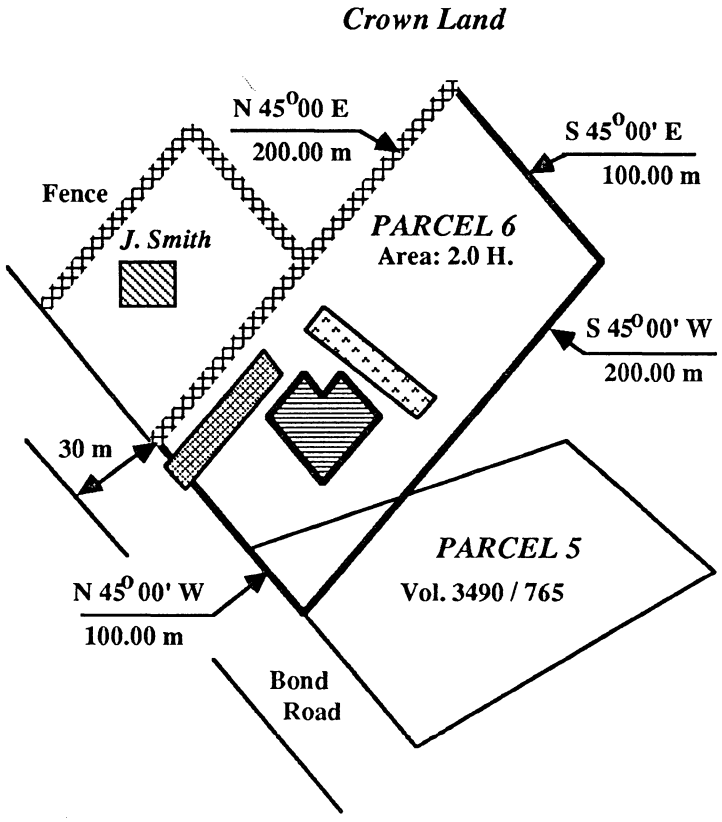
Answers to these questions are routinely required by government administrators, resource managers, land use planners, private developers, and property owners. The answers, when information is difficult to find or of poor quality, can lack the required degree of certainty. This has direct economic consequences, for example, in administrative costs, land investment, and effective resource development decisions.

Among the benefits of improving the access, availability, and quality of land tenure information are :



AREA 24

Municipality:
Bakerfield
Agriculture Zone 6
Land Use:
Residential = 12 H
Agriculture = 14 H
9 Registered Parcels
2 Occupied Parcels
Marked By Fence
Lines
Population: 26
Bond Road 30 m
R/W: N & L Light&
Power:
(Vol. 4198 / 65)
15 m Right Of Way



PARCEL 6

Registered Owner:
P. K. & D. L. Power
P.O. Box 53
Corner Brook
Deed: Vol. 3578 / 79
Type: Joint Tenants
Plan: H. Mann, N.L.S.
(Unregistered)
Crown Grant:
Vol 35 / 64
Leasee: K. Graham
Mun. Address:
30 Bond Road
Municipal
Services: None
Municipal Zone:
Residential
Other Restrictions:
None
Land Use:
Residential
Wood Lot
Assessment Number:
02-1650-420-0-
0120 -000-1-r
Assessed Land Value:
$3000.00
Total Assessed Value:
$25,000.00

FIGURE I.1.1: Examples of land tenure information

a. greater security of tenure and investment, particularly important as land values and the scale of land development increase;
b. more efficient property assessment and more equitable distribution of the tax burden among land holders;
c. prevention and more effective resolution of land ownership disputes with the accompanying decrease in litigation and administration costs;
d. availability of standardized, complete information for land use planning and resource management which assists the development of policies and plans, enhances the effectiveness of regulation processes, and helps to identify and resolve potential and existing land use conflicts;
e. more effective use of new technologies that, over the long term, can help to reduce costs to government while maximizing benefits.

Experience in other common law jurisdictions has shown that government agencies have tended to introduce ad hoc improvements, especially the implementation of computer systems, without recognizing that land tenure information is a shared resource, involving a complex set of relationships among public and private agencies. This, in turn, has led to costly duplication of facilities and services without necessarily meeting the general requirements of information users. As government budgets undergo restraint and the need for better land tenure information increases, an overall management strategy for the information resource is no longer a luxury.

These problems are present in Newfoundland today. The need to develop a management strategy for land tenure information has been a concern for nearly two decades. Yet despite efforts to initiate programs to solve the problems enumerated in several studies (see, for example, Government of Newfoundland and Labrador [1973]; McEwen [1978]; Decision Dynamics [1978]), progress in the management of the resource has been sporadic.

This report will not attempt to duplicate the details provided in these studies, although Section I.A summarizes and updates the systems and other arrangements for information management. The purpose here is to focus attention on the needs for land tenure information in the province, the problems in meeting those needs, and the options for making improvements (Sections I.2 and I.3). Recommendations for developing an initial strategy are presented (Section I.4).

I.1.2 The Need for This Study

In 1985, the Lands Branch of the Department of Forest Resources and Lands organized two workshops in St. John's (May and November) to discuss problems related to land ownership information in Newfoundland. The response to these workshops, from both the private and public sectors, attests to the need for improved arrangements for the collection, storage, and dissemination of this information. Among the problems identified were the following:

a. lack of a complete, up-to-date inventory (graphical and/or textual) of land tenure in the province and the consequent difficulties in ascertaining ownership;
b. lack of a central registry from which all ownership information could be obtained;
c. uncertainty in decisions made by land administrators due to the lack of appropriate information;
d. excessive expropriation of lands acquired for public projects necessary to ensure that the title acquired is free of any unidentified interests.

In general, the workshop participants called for an improved Registry system and a property mapping program, similar to recommendations made in a previous study commissioned by the provincial government [Decision Dynamics, 1978].

Since that study, several changes have taken place, including the development of automated systems for the deeds and Crown lands registries, for an expanded

provincial property assessment program, and for forest management. However, the lack of a comprehensive strategy to manage the information resource has led each organization to view its system development and problems in isolation.

No overall strategy has been developed to meet the needs of users outside these agencies or to solve many of the underlying land ownership information problems identified in previous studies. Without such a strategy, the province will continue to lose opportunities for maximizing the benefits of its investments – human, technical, and financial – in information-related activities.

To cite just one example, it is estimated that during property assessment in Conception Bay Area South the lack of property maps (and the resulting increase in time and effort to identify ownership) cost the provincial government an additional $100,000.00 approximately [Mullet, 1985]. Property assessors are not responsible for producing standardized maps showing information collected. Thus a substantial investment was made with no significant improvement to the general information arrangements.

To prevent such problems, the overall requirements for land tenure information, as well as the many relationships among users, sources, and systems must be better understood. There is a need, therefore, to examine the existing information arrangements and to identify priority requirements that should be met in a management strategy.

I.1.3 Study Background

This study was sponsored by the Department of Forest Resources and Lands in 1985. The Ad Hoc Steering Committee on Land Ownership Information, formed at the workshop in May, 1985 and consisting of five provincial and municipal government representatives, has also acted as a steering committee for the report. In July, 1986,

this group was superseded by a Task Force on Land Tenure (now called the Land Tenure Advisory Committee) reporting to the Minister of Forest Resources and Lands.

The findings of this study are based primarily on interviews within the province conducted in June and July 1985. The majority of interviews took place with representatives of provincial, municipal, and private agencies in the St. John's area. Other interviews in Marystown, Gander, Grand Falls, Corner Brook, and Port Aux Basques gave an indication of regional requirements and issues.

Additional input for the current study was obtained through the workshops conducted in 1985 and a questionnaire circulated in September of that year to confirm and/or supplement information gathered. Twenty-one responses were received from 45 questionnaires mailed. Other sources of information for the study include the previous studies indicated above.

In 1984 a preliminary assessment of land information requirements was made in Newfoundland [Nichols, 1984]. Although some of the material from that study is presented here, other background information (for example, on land administration and resource information) is not duplicated and the reader is referred to the earlier report.

I.1.4 Land Information Management: Concepts and Terminology

Information is data that has been processed and conveys a meaning or significance to the user with respect to his particular activity. It should be noted that 'one man's data is another man's information.' A set of measurements of property boundaries in a field book may be considered data to a land manager who is concerned with the relative location of the parcel to a stream. Yet the surveyor may consider this same set of measurements the information he requires to retrace a boundary. Since the terms are user dependent, the term information is used almost exclusively in this report.

One exception is the use of the term data base to refer to an organized set of records (e.g., lists, files, maps, documents). Although data base is generally used in the context of computer systems, the same principles apply in nonautomated record systems. In both cases there is a predetermined order for storing the records (e.g., by community) and an access key or identifier, i.e., a means by which the records or the information contained in the records can be obtained by the user. As long as the identifier is unique, the information can be readily accessed.

An index or set of indices relates the identifier to the record location and to other identifiers and descriptors. An example is the grantor-grantee index in Registry of Deeds, Companies, and Securities [hereafter referred to as the Registry of Deeds] in which the identifier (grantor's name) for the record (copy of the title document) is referenced to the location of the record (microfilm roll and frame numbers). Additional information is also cross-referenced to the identifier in the index (date, document #, location, etc.) to facilitate searching.

Data bases are only one component of a land information system (LIS). An LIS may be broadly defined as:

> *a combination of human and technical resources, together with a set of organizing procedures, which results in the collection, storage, retrieval, dissemination and use of [land] data in a systematic fashion.* [McLaughlin, 1985]

An LIS does not necessarily imply computerization, nor do computer facilities alone comprise an LIS. Until recently, for example, the most important technical facility in the Registry of Deeds was the photocopier, yet the registry is the primary LIS in the province.

Essential to an LIS is the set of organizing procedures. These include standards for the content, quality, referencing, and format of information, as well as standard procedures for its collection, storage, and dissemination. Organization ranges from technical procedures for accessing information (e.g., indices and identifiers discussed above) to administrative procedures in assigning staff responsibilities and activities.

The information contained in an LIS will of course depend on the purpose of the system. For this report, land tenure information encompasses not only information about property owners, property rights, and zoning restrictions, but also information concerning the land parcel to which rights apply, including the use, value, geographical location and extent of the parcel. It concerns the set of rights, responsibilities, and restraints affecting the use and enjoyment of the land and its produce.

An LIS containing primarily land tenure information can be referred to as a parcel-based LIS or cadastre, where a cadastre may be defined as a record of interests in land encompassing both the nature and extent of those interests. It should be noted that these interests may be legal interests, recorded in documents, or customary interests with no documentation but recognized as binding upon others (see, for example, McLaughlin and Nichols [1987]).

Examples of parcel-based LIS in Newfoundland are the Crown Lands Registry, the Mineral Lands Registry, and the property assessment information system. The distinctive characteristic in this type of LIS is that the information stored in the system is referenced to a cadastral parcel, defined as the area (or volume) of land to which a unique set of property rights apply. (See Figure I.1.2.) In a parcel-based system the parcel identifier (PID) serves as an access key to information in the system and can also provide a direct geographic reference. An assessment account, Crown grant number, claim number, or the geographic co-ordinates are examples of PIDs. While the grantor or grantee's name may be a key to parcel information, it is not a unique identifier (there is not a one-to-one correspondence between last names and parcels).

The implementation or reform of an LIS is one example of a management strategy. Management may be defined as the effective use of resources to achieve an objective or set of objectives. Examples of land information management objectives are to increase the efficiency of land transactions, to reduce storage space or costs, or to

improve the quality or use of information. Computerization is not in itself an objective, it is a strategy, or part of a strategy, to meet some other objective.

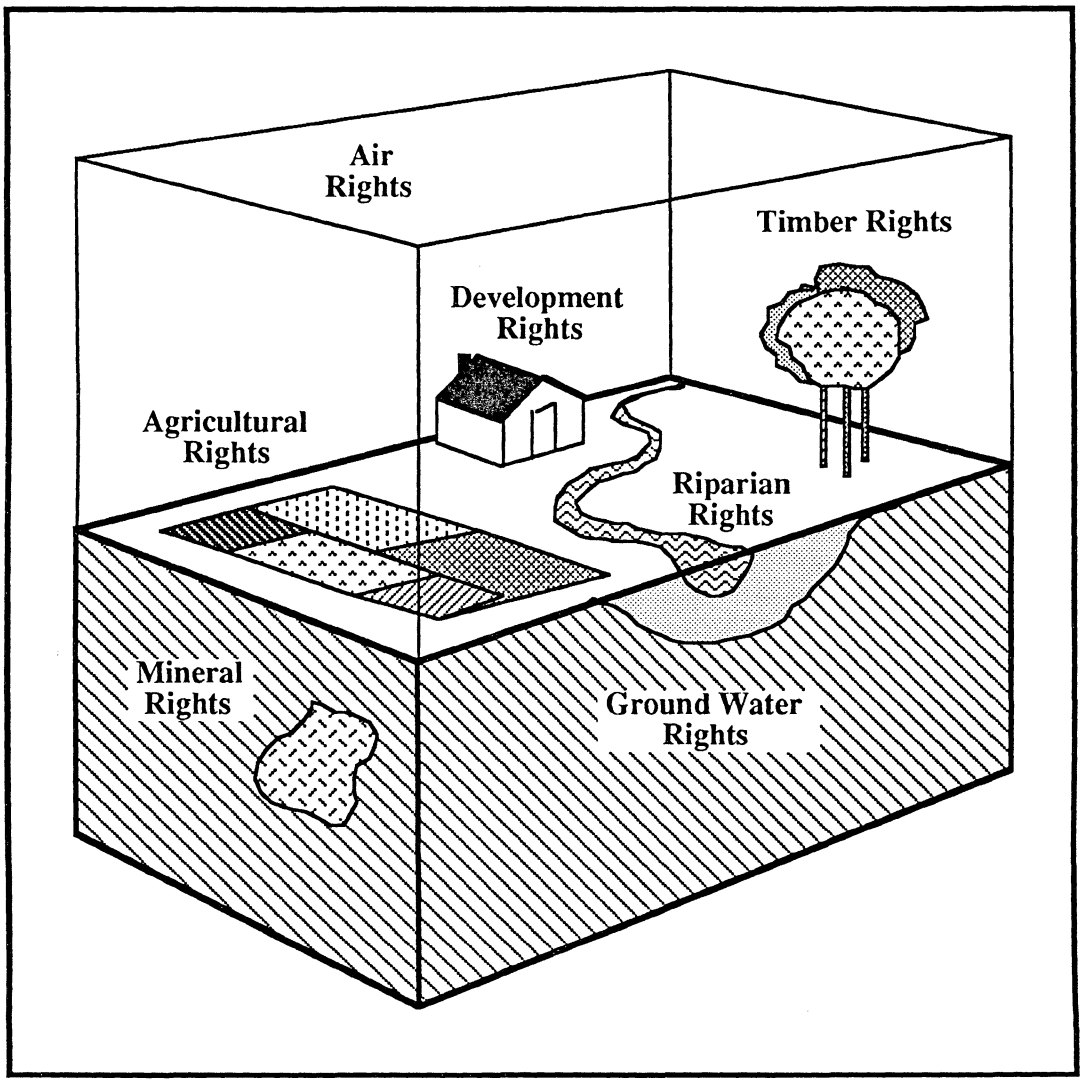


FIGURE I.1.2: The cadastral parcel [after Platt, 1976]

Land information management (LIM) concerns not only the information resource and the organization of technical facilities and staff, but also the relationships of an LIS within an environment of users, sources, and other systems. When the information arrangements among several systems and/or organizations are being considered, the management objective may be to improve the flow of information among systems and to users. One LIM strategy now being implemented in several jurisdictions is the development of a land information network (LIN), where information is exchanged through communication networks linking systems and system users (see, for example, Palmer [1984]). Such a network often replaces or enhances the informal networks or ad hoc arrangements for information dissemination that generally exist among organizations.

The success of a management strategy is measured by how effectively and efficiently it meets the predefined objectives. Since an LIM strategy directly affects and is affected by the institutional environment, a strategy (e.g., LIS) developed for one jurisdiction may not be appropriate in another, at least without major modification. For this reason, it is essential to understand the information requirements within the LIM environment, as well as the specific needs of users, in designing an appropriate strategy. That is the purpose of this report.

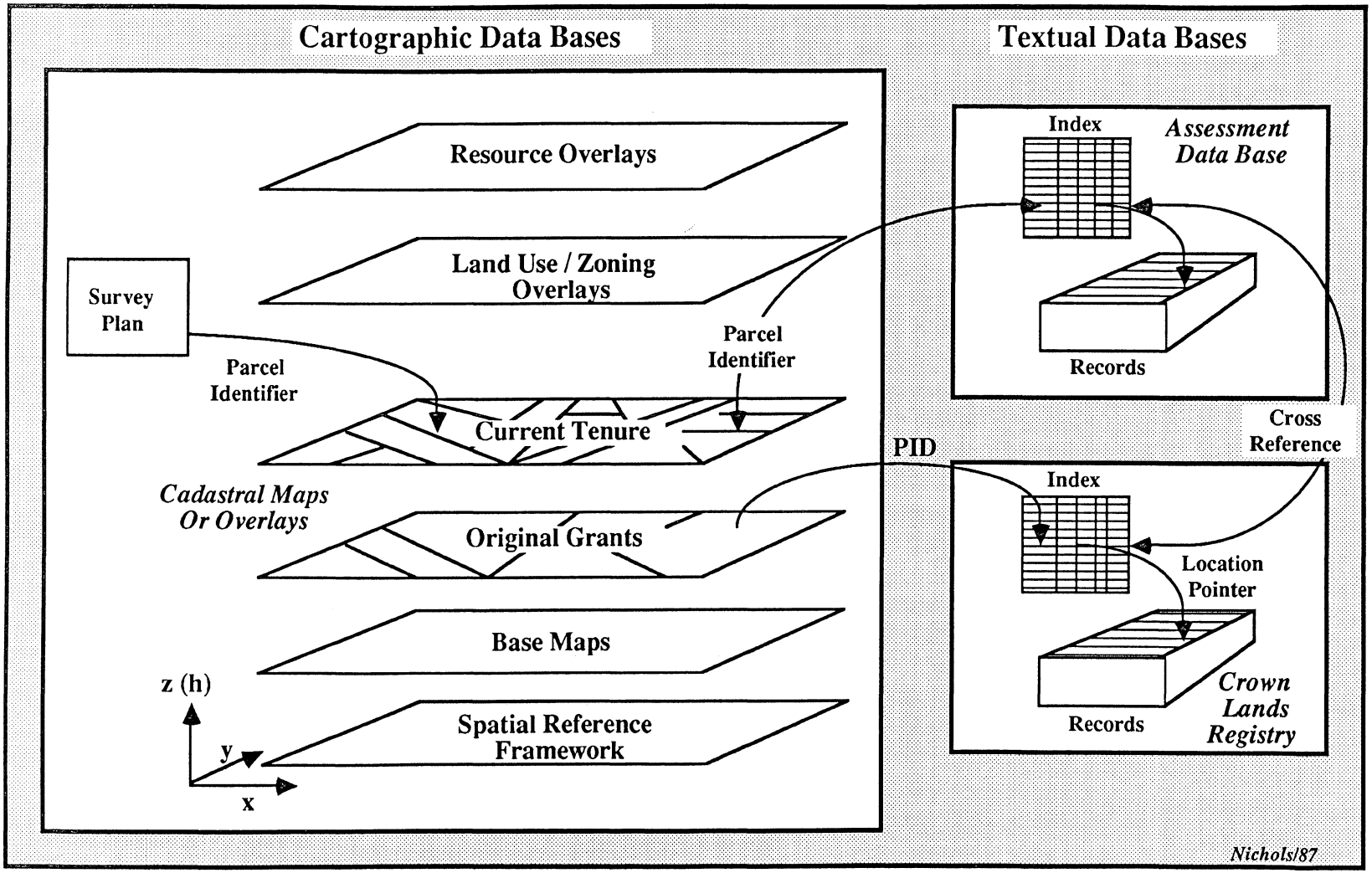


FIGURE I-1.3: Examples parcel-based LIS components

I.2 EVALUATION OF INFORMATION REQUIREMENTS

Figure I.2.1 depicts the activities in which land ownership information is collected, used, and provided in Newfoundland. In this section, the user requirements for information are evaluated based on a consideration of the tasks within four of these activities. (Requirements for information management are discussed in section I.3.) It is recognized that the tasks and the flow of information illustrated in the diagrams that follow are generalizations. Table I.2.1 in Section I.2.5 summarizes these requirements.

It should be emphasized that the requirements given here reflect but do not necessarily correspond to the information the user currently obtains to carry out a task. Instead they represent what the user should have, whether or not that information is now available to him. For the status of current information available see Appendix I.A.

I.2.1 Requirements in Land Transfer and Development

The major tasks that depend on land ownership information within land transfer and development, as well as the flow of information in those tasks, are illustrated in Figure I.2.2. The requirements for information can be summarized under the following general headings.

a. **Identification of appropriate sites and ownership of selected parcels for land acquisition:**
   i. a graphical depiction of *parcel structure (i.e., cadastral maps)* capable of being used as an overlay with other land related information to identify parcel location with respect to other parcels (e.g., rights-of way or Crown land), natural features, infrastructure, administrative boundaries, etc. (For an example of the use of maps as overlays, see Figure I.1.3.);

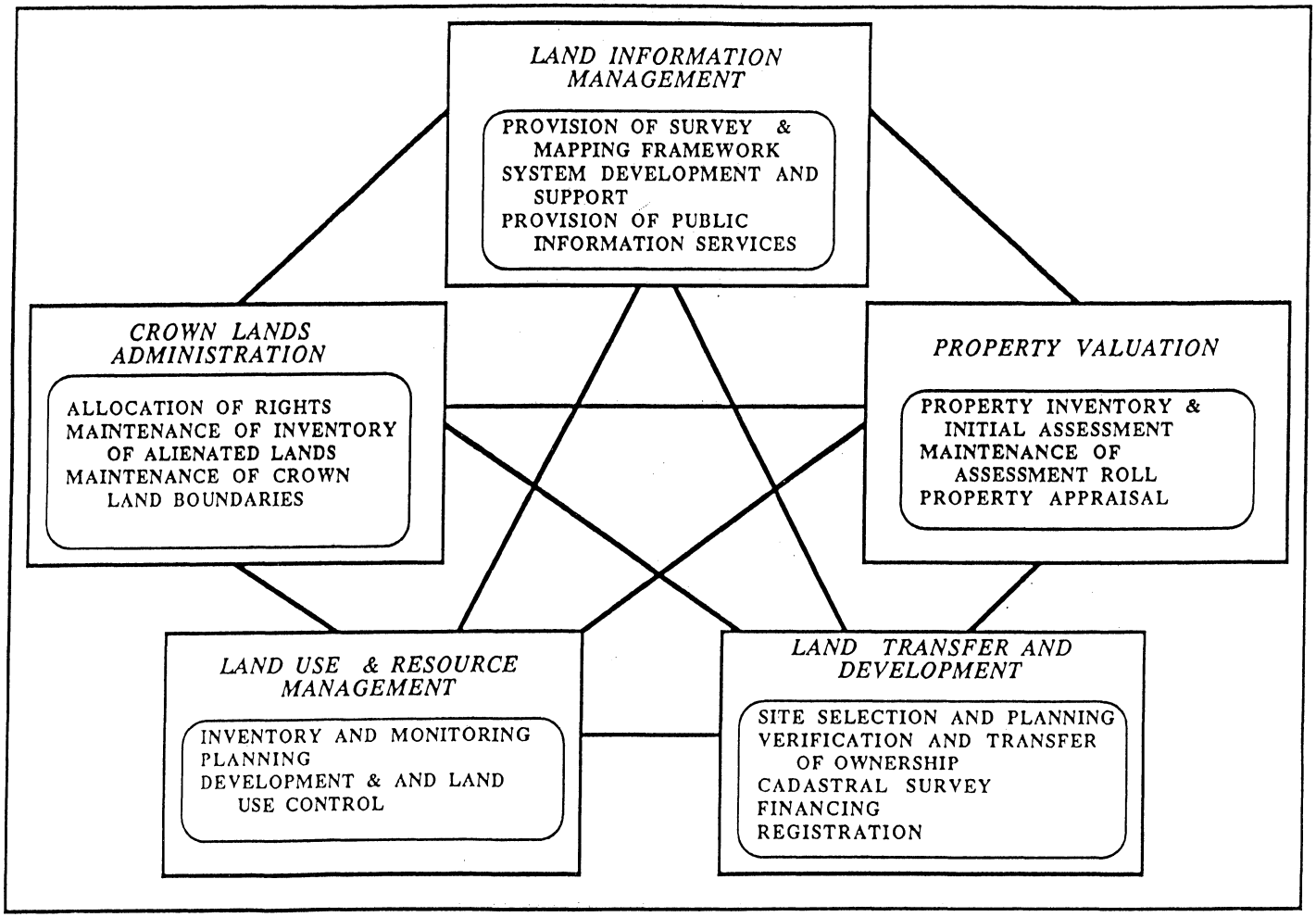


FIGURE I.2.1: Main Activities in which Land Tenure Information is Used and Provided

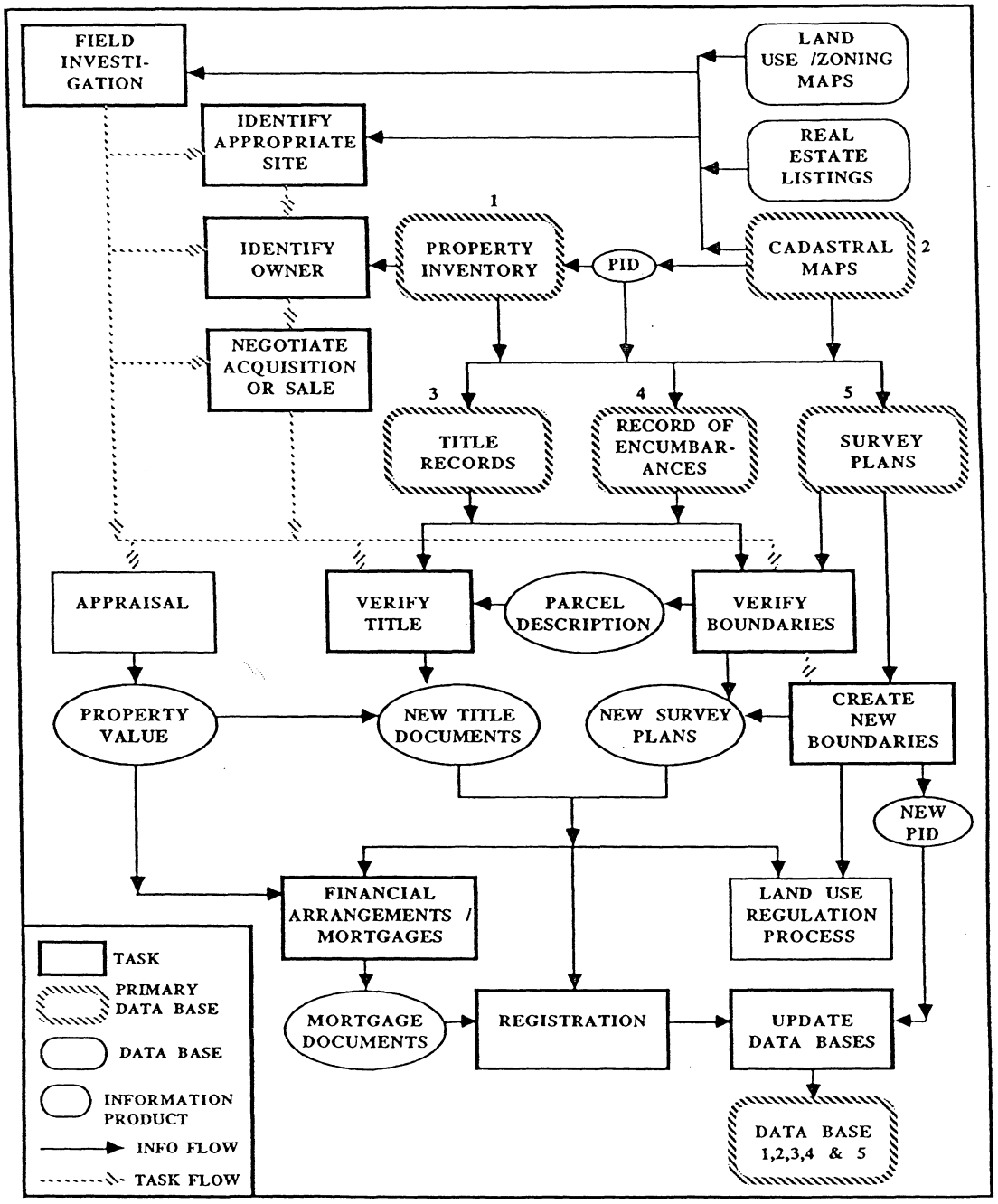


FIGURE I.2.2: Information Requirements - Land Transfer and Development

ii. a *property inventory* for the province providing information for each parcel, such as current owner, type of tenure, encumbrances, geographical location, area, and cross references to other data bases containing detailed parcel related information;

iii. *access to information by parcel* and geographic location (e.g., by a unique parcel identifier -- PID).

b. **Verification of ownership** for selected parcels, for conveyancing or expropriation (Note that under the current system of registration of deeds this entails searching historical documents affecting title.)

i. a data base consisting of a *complete, up-to-date set of title documents*;

ii. one or more data bases consisting of *complete, up-to-date records of encumbrances* (e.g. mortgages, liens, rights-of way) affecting the parcel;

iii. *access to these data bases by PID* and/or parcel location, as well as owner name (grantee/grantor or mortgagee/mortgagor).

c. **Identification and verification of the specific parcel location and boundaries,** including location relative to adjacent parcels, rights-of-way or easements, and physical features;

i. *cadastral maps* depicting the general location and relationship of parcels;

ii. *cadastral survey plans* that adequately describe the specific location of parcel boundaries and that reference boundaries to survey control monuments (co-ordinates) ;

iii. a complete *inventory of all survey plans,* indexed and accessible by PID, to provide information on parcel descriptions.

d. **Creation of new survey plans and title documents;**

i. reference in each document and on each plan to *a unique PID for indexing;*

ii. *description of each parcel* in new documents, whenever possible, by reference to a registered survey plan to provide clear identification of parcel boundaries and to simplify title documents.

e. **Registration of documents and plans;**

i. *registration of all title documents* to provide security for documents, legal notice of transactions, and complete public information for making decisions concerning property;

ii. *registration* at appropriate offices *of all encumbrances* affecting properties, including notification when these restrictions have lapsed or been extinguished;

iii. *registration of all cadastral survey plans,* including mortgage certificate survey diagrams when no other plan has been registered for the parcel, to provide public information on parcel descriptions;

f. **Maintenance of data bases to keep inventories current for subsequent use;**

i. *indexing of all of the above information by parcel,* as well as other criteria (e.g., document number, owner name) necessary for internal use, in order to provide an efficient means of updating related data bases and cross references;

ii. *mechanisms to keep property inventories and cadastral maps current* with respect to all information registered at various agencies;

iii. *procedures for assigning new PIDs* and retiring current PIDs when parcel boundaries change (e.g., on subdivision or consolidation of existing parcels).

These tasks represent the primary use of land tenure information in Newfoundland, based on the number of users and the frequency with which information is used. Of priority importance in conveyancing is that land ownership information be complete, up-to-date, reliable, and directly accessible to users throughout the Province.

I.2.2 Requirements in Land Valuation

Land valuation can be considered as two separate but related activities: the assessment of real property for taxation and the site specific appraisal of real property for land acquisition and conveyancing. The information requirements for property assessment are depicted in Figure I.2.3 and the information requirements for specific tasks are summarized below.

a. **Identification of all parcels** subject to taxation in a given area to ensure that the tax burden is distributed equitably (property assessment)
   i. *cadastral maps* depicting the parcel structure for surface interests for the taxation area;
   ii. other *cadastral maps of subsurface or limited interests* (e.g. mineral leases) if these interests become subject to taxation in the future.

b. **Identification of the owner** (or tax payer) of all parcels (property assessment)
   i. an i*nventory of property ownership, accessible by parcel (PID)* and by owner, giving the ownership and type of tenure (e.g., fee simple, leasehold, Crown ownership) for all parcels, as well as cross-references to information stored in other data bases (e.g., registered title documents).

c. **Identification and quantification of the parcel characteristics affecting property value** (property assessment and appraisal)
   i. *cadastral maps* that can be used as overlays with other graphical information to identify improvements and to determine parcel location relative to municipal services, zoning, land use, and other cultural and environmental features that affect value;
   ii. *title documents and survey plans* from which the dimensions and area of each parcel can be determined;

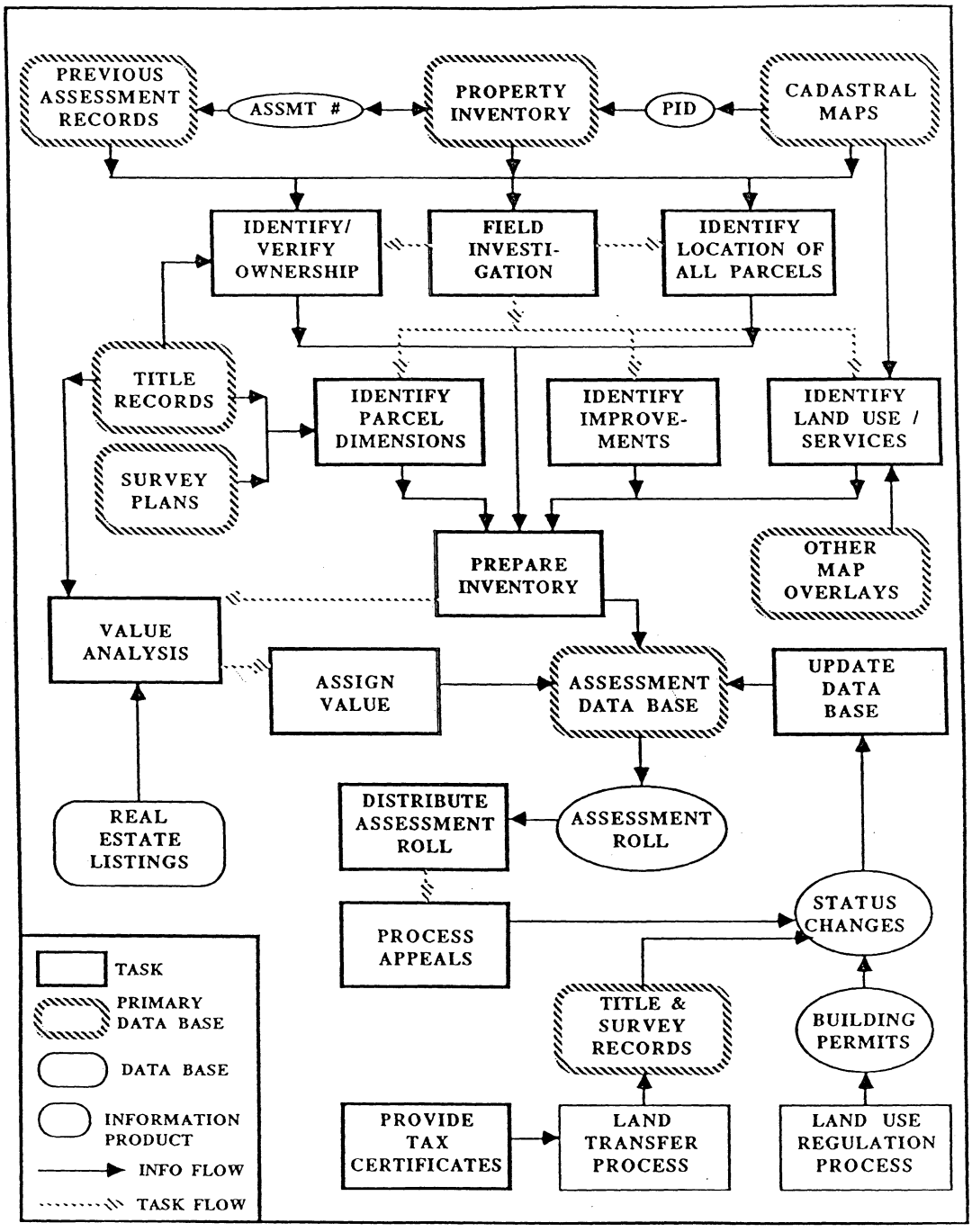


FIGURE I.2.3: Information Requirements - Property Assessment

iii. *access for specific parcels to all building permits* and other documents recording improvement characteristics that are stored by municipal and provincial agencies.

d. **Determination of the property value** (property assessment and appraisal)

i. *access by parcel and geographic area to market values* for all conveyances in order to correlate value with types of improvements and site characteristics;

ii. *capability of performing statistical analysis* on market values for geographical areas;

iii. *information regarding historical transaction values* for specific parcels being appraised;

e. **Preparation and maintenance of the assessment roll** (property assessment)

i. *notification of all changes in land ownership* and land use affecting property taxation to update property assessment data base;

ii. *cross-reference between every assessment account number and PID used in other data bases* and documents in order to efficiently access and update information for assessment (Note that there would not be a one-to-one correspondence between account numbers and PIDs because parcels described in legal documents are not always the same as assessed parcels. E.g., in a trailer park, there may be one legal parcel but several parcels assessed to individual trailer owners.)

iii. *capability of updating assessed value* when changes affecting value (e.g., improvements) occur in order to assess property owners for improvements made between scheduled field checks.

f. **Provision of tax certificates**

i. *identification of parcel for which tax certificate is requested* by assessment account number and by PID cross-referenced to account number.

In appraisal, the ability to readily access detailed information from various sources for specific parcels is the primary concern. The priority requirement for property assessment is complete and consistent information so that property taxation is equitable.

I.2.3 Requirements in Crown Lands Administration

For the purposes of this study, the activities in Crown Lands administration have been limited to the initial allocation of rights (including mineral leases, timber permits, etc.), the maintenance of inventories of these rights, and the monitoring of Crown Land boundaries to identify and resolve potential adverse claims. In Figure I.2.4, the requirements for information in land allocation are illustrated.

a. **Identify the tenure status of the parcel described in a land application,** conduct a preliminary examination;
   i. *adequate identification of proposed parcel location and boundaries*;
   ii. *cadastral maps depicting Crown Land boundaries and previous Crown land dispositions,* as well as maps of current land tenure in order to determine whether the proposed application conflicts with existing tenure.

b. **Administer the land management review process;**
   i. *description of proposed parcel location, boundaries, and land use* to forward to review agencies;

c. **Process approved application, including examination of survey plan;**
   i. *cadastral survey plans,* with boundaries referenced to survey control, to identify and plot precise location of parcel;
   ii. *cadastral maps depicting Crown Land boundaries* (and current tenure) in order to identify any conflict with existing tenure (e.g., boundary overlap);

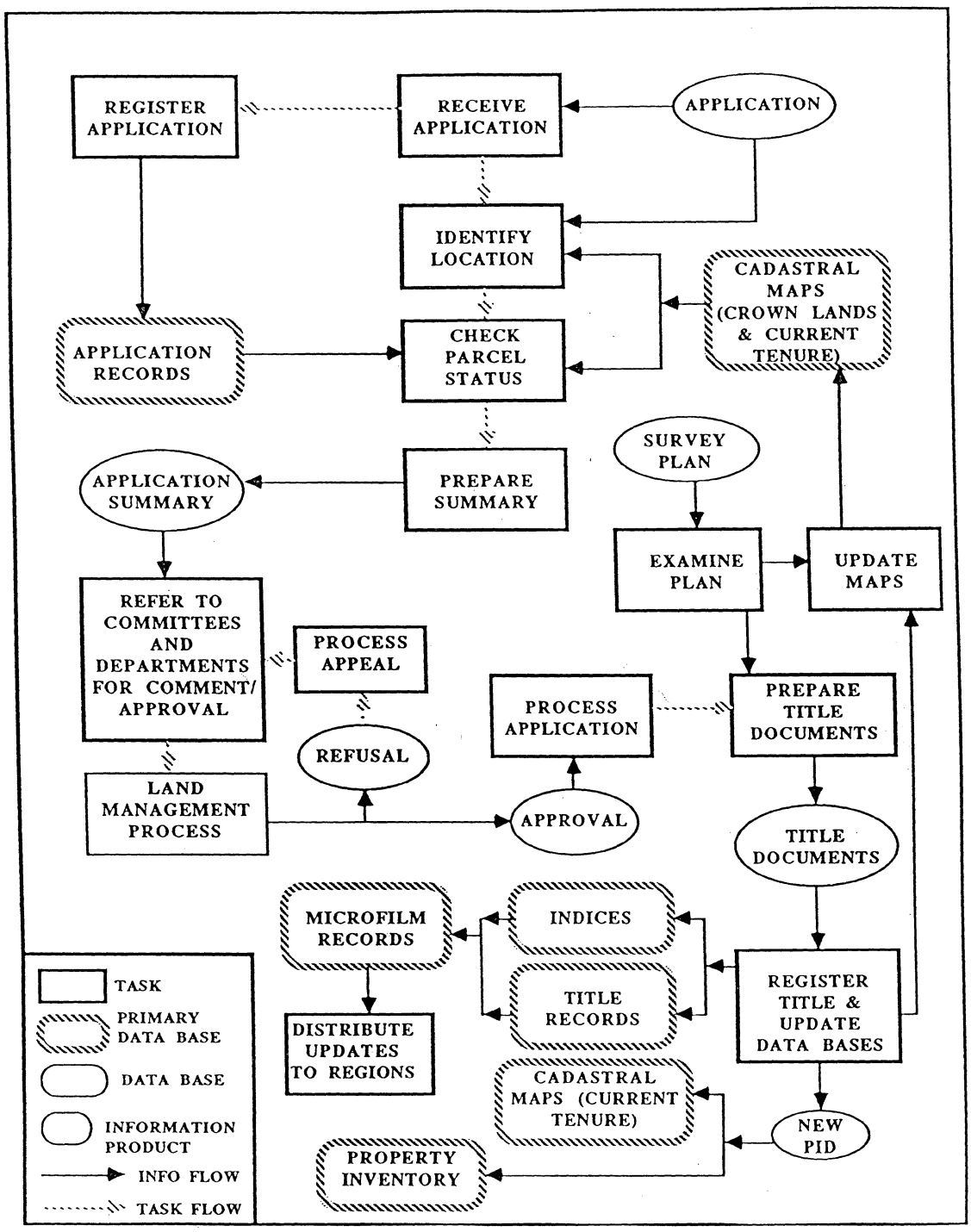


FIGURE I.2.4: Information Requirements - Allocation of Crown Lands (Titles)

iii. *field notes in plan or book format* to identify any errors in survey procedure or calculations;

iv. *capability of efficiently preparing title documents,* including parcel diagram/plan.

d. **Register title (fee simple or limited interest) and update related data bases;**

i. *procedure for assigning PID* for new parcel created;

ii. *capability of updating Crown Land cadastral maps and maps of current tenure,* as well as other indices and data bases;

iii. *provide notice of disposition to appropriate provincial and municipal agencies,* including Regional Crown Lands offices, for updating other data bases (e.g., property inventory, other cadastral maps, assessment data base)

e. **Monitor Crown Land boundaries;**

i. *cadastral maps* depicting legally recognized private tenure and Crown Lands boundaries.

The primary requirement in Crown Lands administration is an accurate depiction in graphical format of the boundary between Crown land and private property. Since historical Crown Land records do not adequately identify the extent of private tenure alone in the case of surface title, cadastral maps depicting current land tenure are required in order to identify this boundary.

I.2.4 Requirements in Land Use and Resource Management

While land ownership information is often regarded as a minor requirement by users in these activities, the effect of land use regulation on land tenure should be an important consideration in the development of resource and land use policies and plans. Land use planning and resource management agencies are also increasingly becoming involved in decisions regarding property rights (including development rights) through

the review of applications for Crown Land dispositions and land development. The requirements for land tenure information are illustrated in Figure I.2.5 and are summarized below.

a. **Identification of existing and potential conflicts between land tenure and land use/resource plans and policies;**
   i. *cadastral maps* of both current surface tenure and limited interests (such as mining exploration permits) capable of being used as overlays with other graphical information to identify relationships between tenure and environmental and cultural features;
   ii. *capability of reformatting (i.e., changing the scale and generalizing graphical information) cadastral maps* to be compatible with other resource and land use maps for comparison and graphical analysis;
   iii. *capability of performing geographic and statistical analysis* with information contained on cadastral maps and in other land tenure data bases, including access by geographical area;
   iv. *capability of producing specialized reports* using land tenure information in either graphical or textual format, with the capability to reformat graphical information.

b. **Monitor changes in land tenure** and enforce land use/ownership regulations;
   i. *notification of changes when ownership and/or land use occur* (as applicable to the agency), identifying location of parcels affected and type of change;
   ii. *notification of proposed changes in land use* as applicable (e.g., building permit application to municipal planning authority), identifying parcels affected by the proposed change, location of improvement, and type of improvement, etc.;
   iii. *cadastral maps and/or survey plans* to determine the location of proposed or completed change relative to property and administrative boundaries and relative to environmental and cultural features;

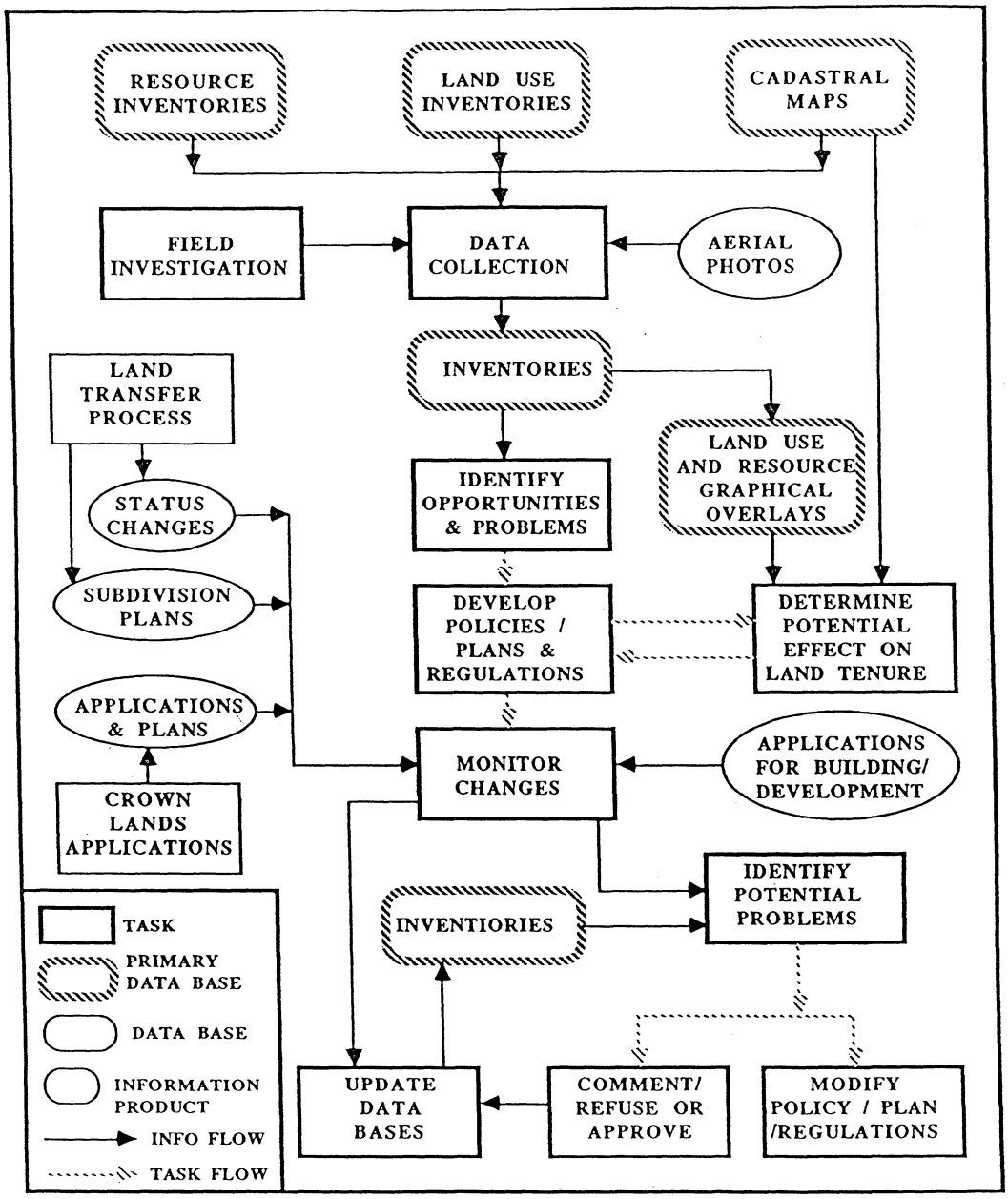


FIGURE I.2.5: Information Requirements - Land Use and Resource Management

iv. *access to property data bases* to verify ownership and parcel status before approving application for permit.

The priority requirement is to have cadastral maps that can be used to relate land tenure to other information used in resource management and land use planning.

I.2.5 Summary of Priority User Requirements

Table I.2.1 is a summary of requirements in the activities discussed above. Priority requirements for land tenure information are listed below. These priorities are based on both the frequency with which information is now or would be used and on how essential the information is to users in carrying out their activities.

a. **complete identification of all land tenure interests in the Province,** including encumbrances and land use restrictions, more specifically:
   i. *complete, up-to-date cadastral maps* that graphically represent current land tenure and that are capable of being used as an overlay with other graphical information;
   ii. *an inventory of land tenure* providing direct access to information on current ownership and property status without searching historical documents and that provides cross-references to information, such as plan # or registered document, contained in other data bases;
   iii. *a complete data base (or bases) of title documents* and other records affecting land tenure status;
   iv. *a complete data base of survey plans* to determine the precise location of boundaries and parcel dimensions;
b. **efficient access to the above information (data bases),** in particular:
   i. *access to all information by parcel (PID)* and/or geographic location;

TABLE I.2.1: Summary of User Requirements for Land Tenure Information

F=FREQUENT REQUIREMENT *R=REQUIREMENT* *O=OCCASIONAL REQUIREMENT* ACTIVITY / INFORMATION REQUIREMENT	LAND TRANSFER AND DEVELOPMENT	PROPERTY VALUATION	CROWN LANDS ADMINISTRATION	LAND USE AND RESOURCE MANAGEMENT
INFORMATION TYPE				
CURRENT OWNER	F	F	F*	O
TYPE OF TENURE	F	R	F	O
RIGHTS / TITLE DOCUMENTS (DEEDS)	F	O	F*	O
EASEMENTS / RIGHTS-OF-WAY	F	R	F	R
MORTGAGE INFORMATION	F			
OTHER ENCUMBRANCES (LIENS)	F			
HISTORICAL TITLE DOCUMENTS	F		F*	
DEVELOPMENT PERMIT INFORMATION	F	F		F
PARCEL LOCATION	F	F	F	R
ADMINISTRATIVE BOUNDARY LOCATION	O	R	F	R
PROPERTY VALUE - MARKET VALUE	F	F	O	
PARCEL BOUNDARY DESCRIPTION / SURVEY PLAN	F	F	F*	O
PARCEL STRUCTURE - CADASTRAL MAP OF CURRENT LAND TENURE	F	F	F	F
INFORMATION ON SUBSURFACE AND OTHER RESOURCE RIGHTS	O		F	F
LOCATION / TYPE OF LAND USE RESTRICTIONS	R	R	O	F
CAPABILITY / SERVICE				
NOTIFICATION OF CHANGE IN REGISTERED OWNERSHIP STATUS	F	F		R
ACCESS TO AN INVENTORY OF CURRENT LAND TENURE	F	F	R	O
ACCESS TO INFORMATION BY PARCEL / PARCEL LOCATION	F	F	F	R
ACCESS TO INFORMATION BY OWNER NAME	F	R	R	O
ABILITY TO OVERLAY CADASTRAL MAP WITH OTHER GRAPHICAL INFORMATION	R	R	O	F
ABILITY TO PERFORM STATISTICAL / SPATIAL (GEOGRAPHIC) ANALYSIS	O	F	O	F

* Note that in Crown Lands Administration, these requirements are generally restricted to information on original Crown Land dispositions

ii. *access to information in various provincial agencies from one or more key locations* (e.g., the Registry of Deeds, Crown Lands Registry);

c. **mechanisms for:**

i. *providing efficient notification of changes in parcel ownership or land use* to concerned agencies in order to keep other data bases current and to assist in enforcing land use/resource policies;

ii. *ensuring that information is reliable, complete, and up-to-date;*

iii. *ensuring that information is standardized* where possible to support integration with information from other sources (e.g., common standards for cadastral maps that can be used as overlays with other land use and resource information in graphical format) and to support efficient exchange and analysis of information among agencies using computer technology.

I.3 CURRENT ARRANGEMENTS AND OPTIONS FOR REFORM

I.3.1 Evaluation of Current Arrangements

The current arrangements for managing land tenure information and specific problems in those arrangements are presented in Appendix I.A. This section summarizes that evaluation in the context of the requirements of users presented in section I.2. Some of the options for improving current arrangements are also identified in section I.3.2.

I.3.1.1 Availability of appropriate information

Most problems concerning the availability of information required by users are directly related to land settlement patterns and land registration systems. With a large number of parcels under possessory claims and voluntary registration of title documents, there are still many parcels for which title records are unavailable or are difficult (time consuming, thus expensive) to find. Unsurveyed parcels, unregistered survey plans, and the poor quality of descriptions in title documents further hinder precise identification of parcel location and extent even when documents are registered.

Recent legislation and the registration requirements for mortgages have contributed to greater registration of title documents. Two other programs in particular have greatly increased the availability of information on land tenure: 1) a mapping program for Crown land grants and leases from historical documents, and 2) property assessment, through which it is estimated that approximately 80% of current tenure will be identified. But since this information is being collected to meet immediate departmental requirements, it does not fulfill the general requirements of users for complete and accurate identification of current land tenure.

Problems related to the availability of appropriate information include the following:

a. **lack of a complete inventory of land tenure** that permits efficient identification, for example, of current ownership, type of tenure, and all restrictions on title for each parcel;
b. **lack of up-to-date cadastral maps** identifying all current tenure and depicting parcel structure;
c. **incomplete data bases of documents describing property interests** from which current title can be derived;
d. **no systematic means of collecting or registering all survey plans** prepared for conveyancing and development, thus reducing the information available on parcel boundaries and rights-of way, for example;
e. **inconsistent / incompatible information,** often of uncertain reliability, because most information is collected to meet the immediate needs of one agency, group, or project (also see I.3.1.3 c).

I.3.1.2 Access to information

In many cases, information on land tenure may exist but it can only be located and collected by the user with difficulty, if at all. Implementation of computerized indices in the Registry of Deeds and, more recently, similar developments in the Crown Lands Registry have improved and will expand searching capabilities. The use of microfilm / microfiche in both registries also provides an opportunity to increase decentralized or remote access (i.e., access from other locations).

For most users, however, the collection of information is performed on a project basis and often repeats the time consuming, labour intensive searches and collection

procedures that have been carried out by themselves or others for the same information at another time. Problems include the following:

a. **difficulty determining what information is available** and what agencies are potential sources of information, particularly when documents and plans are not available in the major registries;
b. **the multiplicity of registries and information sources** that must be contacted to obtain all of the information they require;
c. **centralization of most information sources in St. John's** (although in different locations within the city), which severely limits access to users throughout the province;
d. **inability to access information directly by specific geographic location or by parcel** because most land tenure information is indexed only by name or community (also see I.3.1.3 b).

I.3.1.3 Program and system development

Sections I.A.3 and I.A.4 in Appendix I.A discuss some of the major initiatives in system development, programs, and projects to improve the management of land tenure information. These include 1) the introduction of computer systems in the major registries; 2) special projects for cadastral mapping; and 3) the formation of the provincial Land Tenure Advisory Committee following two user forums. The creation of the official Committee is an opportunity to take a co-ordinated approach to system and program development.

Some of the problems that need to be addressed by the Committee include the following:

a. **lack of provisions for data entry and access on-line from regional offices** when computer systems have been implemented in head offices;

b. **unco-ordinated development of manual and computer systems.** For example, the lack of standardized cadastral maps hinders the property assessment program and the efficient development of land use and resource information systems with graphical data bases. It has also delayed development of parcel-based indices for registry information that would permit efficient cross-referencing of information among registries and other sources;

c. in general, **a lack of emphasis on the development and/or enforcement of appropriate standards** (e.g., format, recording of sources, accuracy) for textual and graphical information. Without common standards, the information contained in different systems and data bases may be incompatible, thus creating a major obstacle to exchanging and integrating information in the future;

d. **no comprehensive strategy for the management of land tenure information** at the provincial government level and appropriate mechanisms for implementing such a strategy. Ad hoc improvements, programs, and unco-ordinated system development by agencies have done little to solve the underlying information problems.

I.3.1.4 Summary of priority problems

Figure I.3.1 highlights problems identified above and in Appendix I.A. The figure also illustrates some of the effects of those problems on users and information service agencies. Priority problems are summarized below:

a. **lack of a graphical index of current land tenure** required not only by users to carry out specific projects, but also for effective system development in registries and in land/resource management;

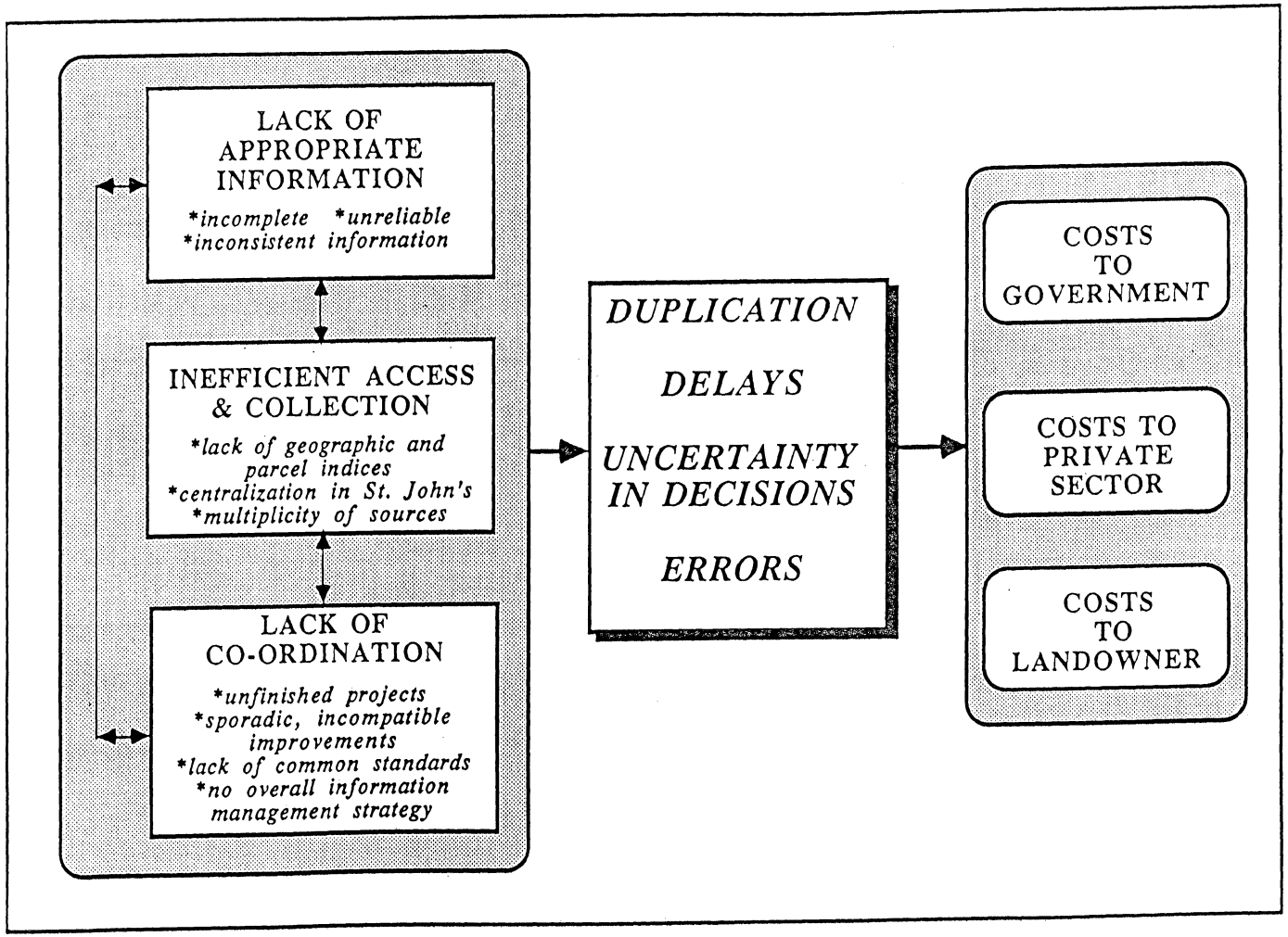


FIGURE I.3.1: Summary of Information Management Problems

b. **the multiplicity and incompleteness of tenure data bases** under the present arrangements for land registration making information collection difficult, time-consuming, repetitive, and therefore expensive for government and private users;

c. **absence of a long term, co-ordinated provincial strategy.** Therefore, there has been extensive investment of human, technical, and financial resources in system development without attaining significant benefits, in terms of access to and availability of information required by government and private users.

I.3.2 Options for Improving the Current Arrangements

Some of the options for more effectively and efficiently meeting the requirements identified in section I.2 are presented in this section. The objective is to provide a framework for the user community to identify and evaluate their own course of action.

I.3.2.1 Options for a cadastral mapping program

Figure I.3.2 illustrates some of the options for designing and implementing a cadastral mapping program for the province. Such maps would provide a graphical index of land tenure to support title searching, parcel referencing, and land use and resource management systems.

Under the heading "mandate", an option for developing a property inventory in conjunction with mapping is given. This recognizes two facts:

a. A cadastral mapping program involves extensive collection of title and boundary information that, if systematically stored and/or indexed, could provide a reference system to registry and other information. Loss of the information collected would represent an inefficient use of program resources;

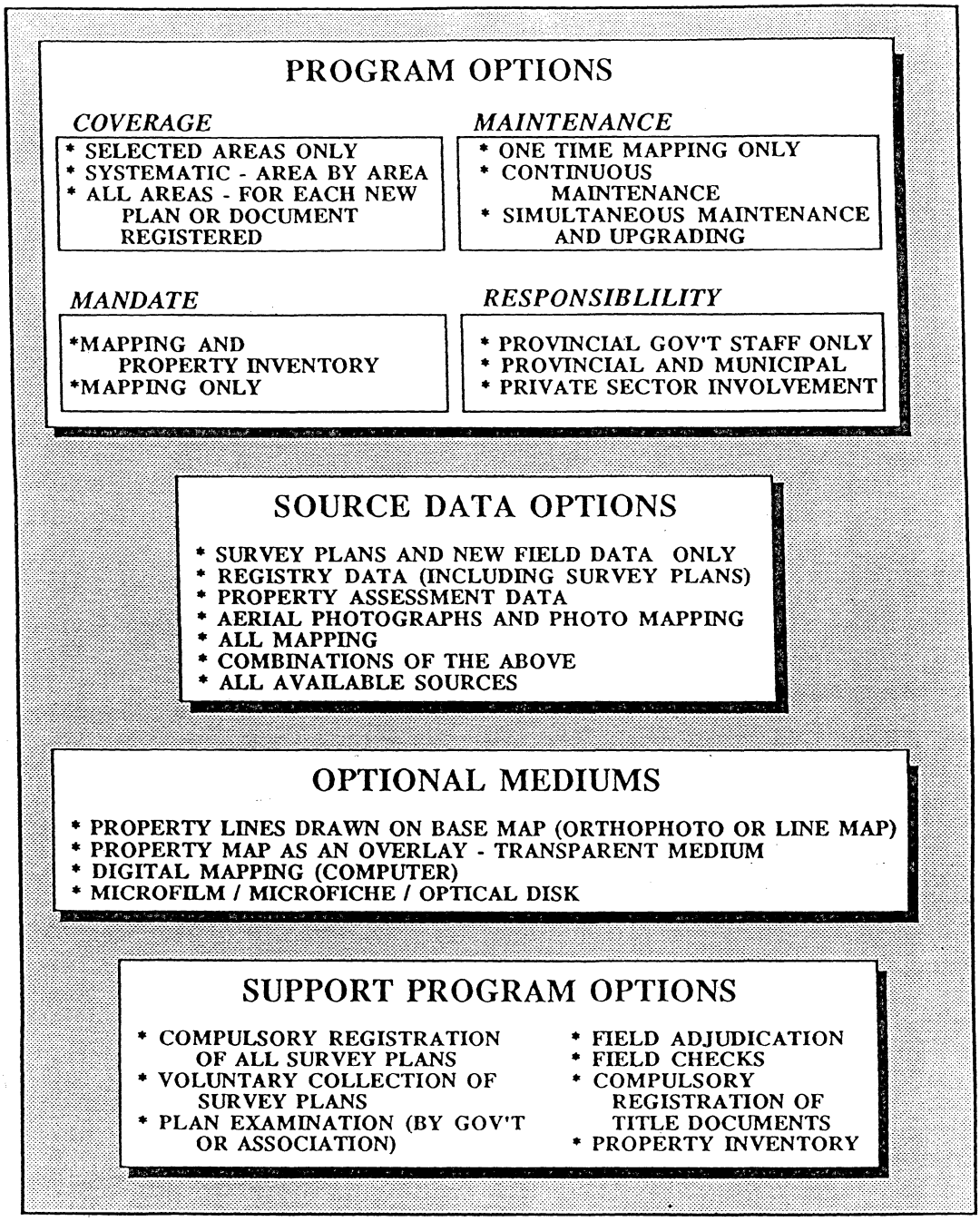


FIGURE I.3.2: Examples of Options within a Cadastral Mapping Program

b. Such an inventory also acts as a support system for updating and improving cadastral mapping over time and for resolving inconsistencies when new information is added.

Field adjudication, under the heading "support program options", was an alternative discussed at workshops [also in Tobin, 1985]. It may involve a number of sub options, among these:

a. Systematic adjudication could be established for the province or for designated areas to resolve all title and boundary uncertainties. This option is sometimes used in the conversion of customary land tenure to registration of title [Simpson, 1976] but requires extensive institutional (e.g., legal and financial) support;
b. Sporadic (selective) adjudication by an official tribunal could be used to resolve specific boundary or title problems;
c. A further option might be a less formal arrangement involving a compulsory survey (by either government or private surveyors) to resolve a boundary uncertainty. Such a procedure might result in a registered quit claim deed or boundary agreement supported by a registered survey plan.
d. Although identified as a separate option, a field check by the property mapping staff or a surveyor could help to resolve difficulties in determining boundary or parcel location from documents.

I.3.2.2 Options for improvements within land registration

Improvements within land registration and may be viewed from two perspectives: 1) improved information services; 2) improved security of tenure. Options representing these two perspectives are illustrated in Figures I.3.3a and I.3.3b, respectively. As can be seen from the figures, the options for achieving these objectives are directly related.

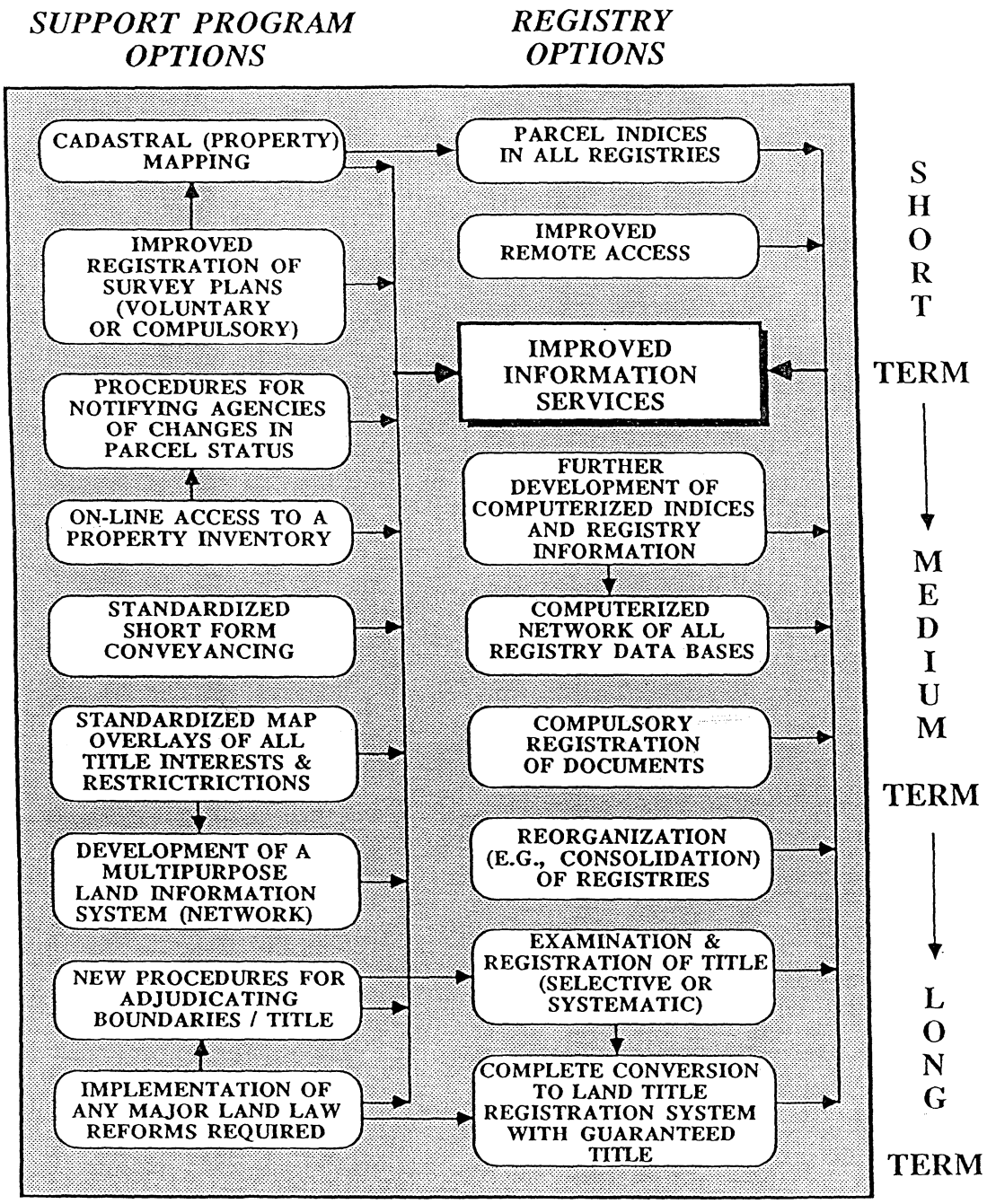


FIGURE I.3.3a: Examples of Options to Improve Land Tenure Information Services Through Land Registration

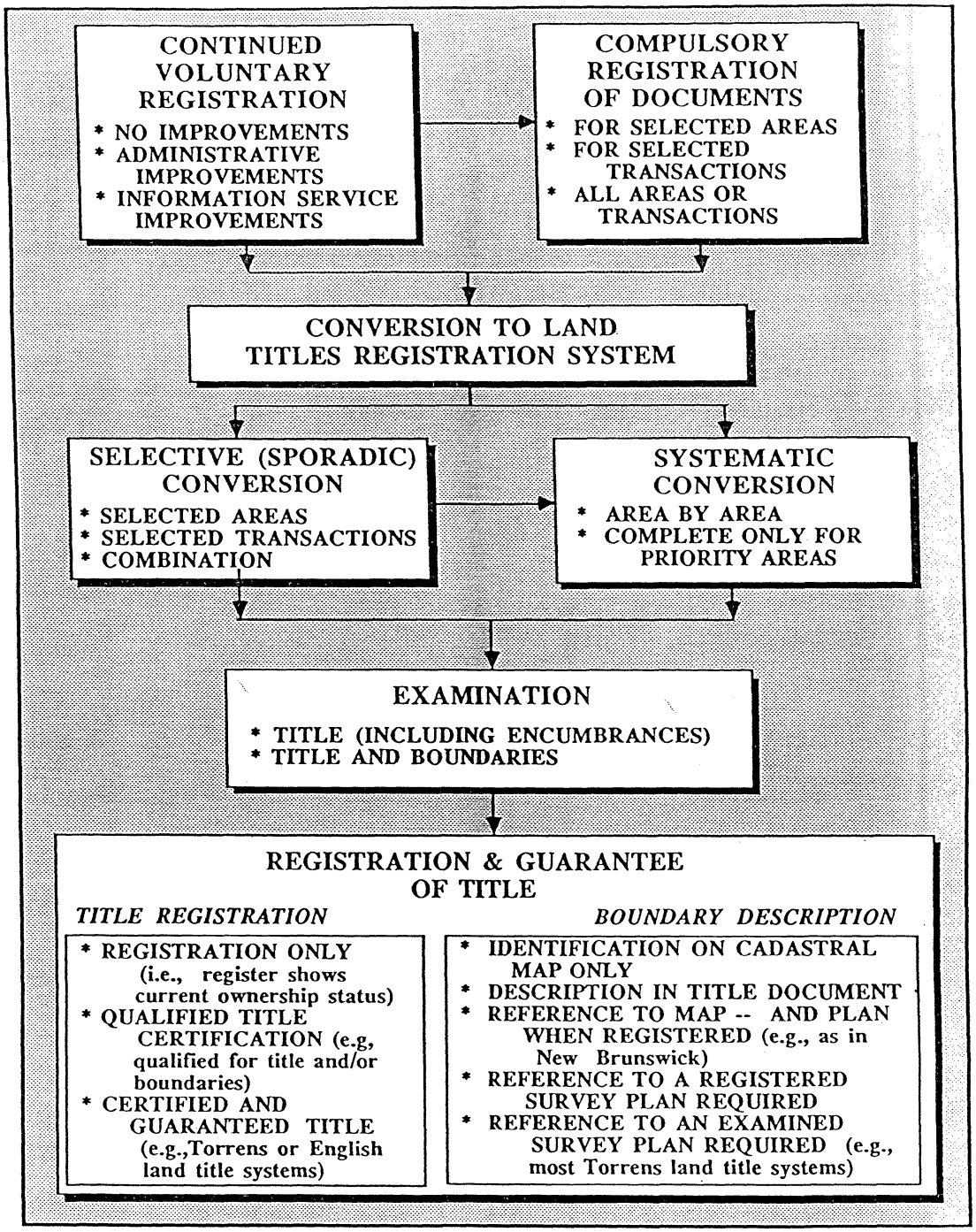


FIGURE I.3.3b: Examples of Options to Improve Land Registration and Security of Title

In the interviews and surveys conducted, users identified conversion of the present land registration system to registration (and guarantee) of land titles as one priority improvement. The mechanisms for such a conversion, the eventual legal basis for such a system (e.g., what is registered), the information required, and the technologies used present an almost limitless number of options, examples of which are shown in the figures.

Conversion to either an improved deeds registration system or to a land titles system can be considered progressive, each change providing the platform for future reforms. For this reason, short, medium, and long term options have been identified in Figure I.3.3a. Those options requiring major organizational and/or legal reforms are generally considered long term options; short term improvements do not depend on such reforms.

Finally, the author would like to clarify a point that arose during several interviews and may arise in future discussions on land registration. In land title registration systems, such as variations of the Torrens system used in western Canada, title is guaranteed by the state or province, but this does not imply guarantee of boundary location. In fact, no common law jurisdiction currently guarantees the precise location of boundaries. However, through physical monumentation, cadastral mapping, and/or the provisions for registered and examined survey plans, there are generally few boundary disputes in land titles jurisdictions.

I.3.2.3 Options for developing a strategy

In Figure I.3.4, some of the options within a comprehensive strategy for managing land tenure information are identified. They are classified to represent the effect one level of options will have on another. For example, the objectives chosen will affect the fundamental system or program design and this, in turn, will help

determine the required organization and implementation options. Figure I.4.1 in section 4 provides one example of a plan for choosing among strategy options.

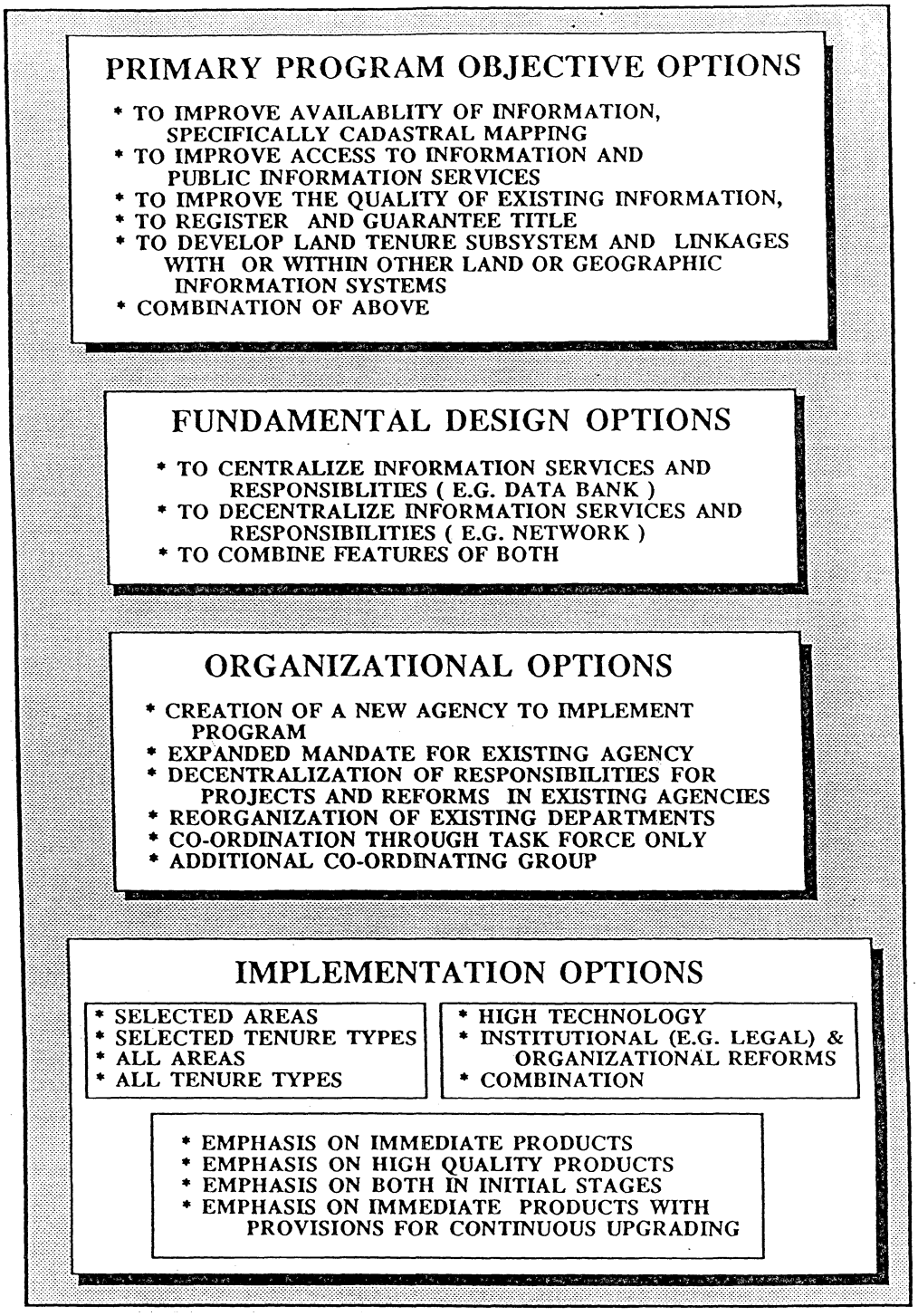


FIGURE I.3.4: Examples of Options within an Information Management Strategy

I.4 RECOMMENDATIONS

The following recommendations are based on the requirements identified in section I.2 and the problems discussed in Appendix I.A, summarized in section I.3.1. Since the objective of Section I.3.2 was to identify some of the options for the Newfoundland community to consider, the following are not specific recommendations on those options. It is recognized that other efforts are planned to address special projects and issues.

The purpose here is to recommend development of a strategy for choosing among those or other options. A balance was sought between achieving immediate benefits (to encourage user and government support) and ensuring that a comprehensive, long term program for meeting user requirements is in place.

I.4.1 Cadastral Mapping Program

I.4.1.1 It is recommended that a **cadastral mapping program be designed** and implemented by the Lands Branch of the Department of Forest Resources and Lands as a priority initiative.

I.4.1.2 It is recommended that in designing such a program special consideration be given to developing **standards and procedures**, in particular the following:

a. standards for defining the *type of parcel* (or tenure) to be shown on the cadastral maps, including long term provisions for adding easements and rights-of-way;
b. standards and procedures for assigning *a unique identifier* to each mapped parcel for use in parcel referencing in all registries and procedures for cross-referencing this identifier with other identifiers, such as assessment codes;

c. standards and procedures for *assigning priorities (weights) to the data* used for plotting parcel boundaries based on the legal priority of the data as evidence of boundary location;

d. procedures for *maintaining records documenting the evidence* used in plotting the boundaries of each parcel for future reference in resolving problems arising from conflicting information;

e. procedures for *systematically storing the information collected* to produce the property maps or for recording its location in other registries for future reference by users.

I.4.1.3 It is further recommended that **standards and procedures** be developed and implemented for:

a. *continual maintenance of the cadastral maps* to ensure they are kept up-to-date;

b. *upgrading the quality* (i.e., accuracy, reliability) of the map data over time.

I.4.2 Improved Land Registration and Information Services

I.4.2.1 It is recommended that the Department of Justice, together with the legal community continue their initiatives in system development and that **special consideration in current and future studies** be given to the following:

a. *use of the unique parcel identifier* assigned in cadastral mapping for parcel referencing and indexing in all registries and in all documents affecting title;

b. provision of *registry services in major centres outside St. John's;*

c. improved provisions for *a registry or inventory of all government interests in land;*

d. implementation of *compulsory registration of title documents* for all or selected areas or types of tenure;

e. development of *standardized short forms* for land transfer documents;

f. *computerization of all registry indices* to improve access to information;

g. investigation of a *long-term strategy for conversion to a land title registration system.*

I.4.2.2 It is recommended that the surveying and legal communities, in conjunction with the Department of Forest Resources and Lands, the Department of Justice, and other departments as appropriate investigate the feasibility of and mechanisms for implementing **reforms in the cadastral survey system,** in particular:

a. *compulsory surveys* for specific land transactions, including all land transactions by government agencies;

b. voluntary or compulsory *registration of survey plans,* including location certificates;

c. *reference to survey plans for parcel descriptions.*

I.4.2.3 It is further recommended that land registration and information service reforms be developed within the framework of a **comprehensive strategy for managing land tenure information.**

I.4.3 Development of a Long-Term, Interdepartmental Strategy

I.4.3.1 It is recommended that the Government of Newfoundland and Labrador develop and implement a **comprehensive, long-term strategy for managing land tenure information,** and more specifically

a. that the *Land Tenure Advisory Committee be responsible for co-ordinating* the development of such a strategy;

b. that further *input to such a strategy be gathered from user forums,* from direct contacts with associations and groups that would be affected, and from municipal and provincial government agencies;

c. that appropriate *government support be given to the Advisory Committee* to design the strategy and to ensure its implementation;

d. that the *strategy emphasize co-ordination of existing facilities,* as well as future system development;

e. that the *strategy emphasize the role of land tenure information systems within a broader land information system or network for the province;*

f. that the strategy *build upon the existing co-operation and communication* among organizations and individuals in the province.

I.4.3.2 It is further recommended that such a strategy be developed within **a policy recognizing land tenure information both as a shared resource** within government and as an essential resource for effective land management in the province.

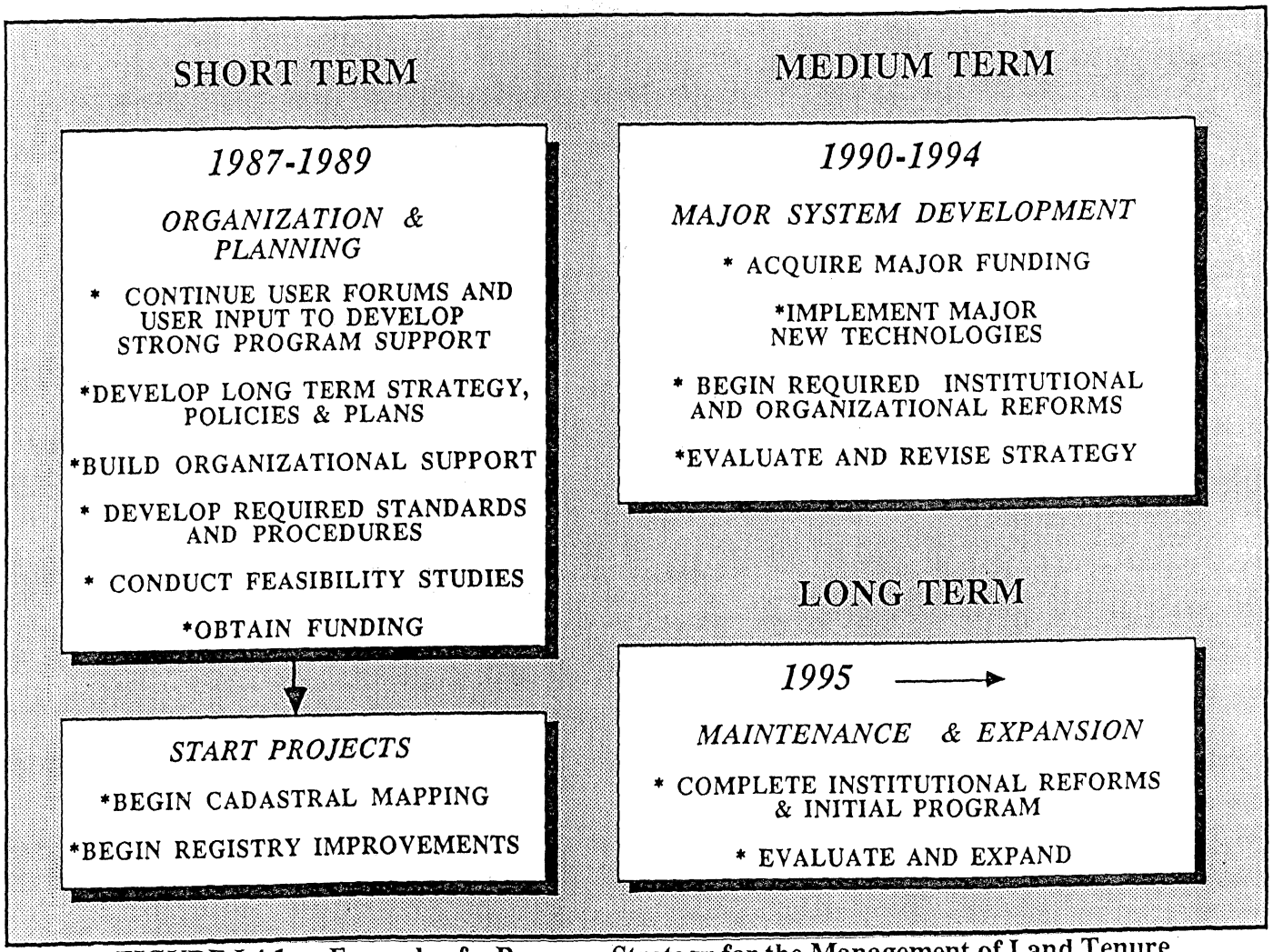


FIGURE I.4.1: Example of a Program Strategy for the Management of Land Tenure Information

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APPENDIX I.A

THE LAND TENURE INFORMATION ENVIRONMENT

APPENDIX I.A: THE LAND TENURE INFORMATION ENVIRONMENT

I.A.1 The Land Tenure Environment

Many of the land tenure information problems discussed in this chapter are directly related to the history of settlement and development of land transfer arrangements in Newfoundland. This section briefly summarizes some of the issues that directly affect the current information environment.

I.A.1.1 Land settlement and customary tenure

In many areas of the province, land was and continues to be occupied without benefit of documented title. Approximately 80% of parcels are based on occupation [Tobin, 1985]. While similar patterns of customary tenure may be found in other parts of the Atlantic provinces, several factors contributed to its extent and persistency in Newfoundland, in particular, early colonial policies that discouraged systematic granting of Crown lands, the remoteness of communities, and the subsequent difficulties in monitoring land occupation. Customary rights have also been well accepted by neighbours and fences have been used extensively to mark claimed boundaries. Until recently, the landholder has had little concern for legal documentation.

Within the last decade, many occupational rights have been converted to legally recognized interests through Quieting of Title procedures, applications for Crown grants, and the acquisition of land for public services. Among the factors that have led to the conversion of customary interests, or at least to their identification, are the following:

a. **Limits on Adverse Possession:** Adverse claims to Crown lands have been limited by legislation [Crown Lands Act, 1970, R.S.N., c. 71, s. 134b as amended 1976]. Applications for Crown lands increased from less than 1500 in 1968 to nearly 6500 in 1978. With monitoring and enforcement, this legislation should help to discourage future unauthorized occupation.

b. **Property Values and Mortgaging:** The development of municipal services and the impact of the offshore petroleum industry have contributed to rising property values (approximately 8% increase in market values from 1984 to 1985 in St. John's area for residential properties sold). As land and development values increase throughout the province, land owners and investors have become more concerned with security of title. Mortgaging has become more common and lending agencies require documented proof of title.

c. **Land Use and Resource Management:** Some municipal and provincial government agencies have recognized the need for improved land tenure information to support land management and development control. As policy or as regulation, the registration of title documents has been made mandatory when ownership is transferred in, for example, the St. John's Urban Region (Agriculture) Development Area [Regulation 198/83, s. 28 under The Development Areas (Lands) Act, R.S.N. (1970), as amended] and in the City of St. John's [St. John's Municipal Plan, s. 3.2.3.1].

d. **Property Assessment:** Recent changes in provincial policy regarding municipal grants have required municipalities to implement property taxation. Since 1979, this has expanded property assessment to smaller communities and by 1985 properties in approximately 130 municipalities had been assessed. If identified, customary interests are assessed. It is expected that approximately 80% of the parcels in the province will eventually be included in the property assessment system.

No attempt has been made, however, to convert customary land interests to legally recognized interests on a systematic basis. Even though some indication of customary interests and boundaries of occupied parcels can be obtained from property assessment and other data collection programs, this information is approximate and does not confer any legal status.

I.A.1.2 Land transfer arrangements

After several attempts to enforce compulsory registration in the early 1800s, a race-notice statute for a rudimentary deeds registration system was introduced in 1862. Since 1883, the Registry of Deeds, Companies, and Securities has been centralized in St. John's [McEwen, 1978]. The legal profession, not the registrar, is responsible for certifying title, based on a complete search of the chain of title. In most cases, title abstract firms are employed to conduct the title search. The survey profession is responsible for the location of boundaries as identified in the field and as delineated on a plan of survey.

Since conveyancing and registration are the main sources for land tenure information there are many issues that are addressed throughout this report. To set the background for further discussions, the main features of the land registration system are highlighted here.

a. **Registration Provides Evidence of Title:** The Registrar of Deeds is not responsible for examining the validity of interests described in the documents registered. The lawyer certifies title for conveyancing. Documents are stored in the registry to provide security and to provide priority and notice of property interests. To determine the current property owner and property rights, historical documents must be searched to establish a chain of title from the original Crown

Grant or other root of title. Furthermore, to determine all interests affecting the property, other registries such as the Sheriff's Office must be searched.

b. **Noncompulsory Registration:** In general, registration is voluntary, hence, the Registry of Deeds does not always contain a complete set of documents affecting title for a specific parcel and in many cases, no registered document for the parcel exists.

c. **Indexing:** Until recently, the primary index for the Registry of Deeds has been based on the names of the grantee/grantor (mortgagor/mortgagee). The recent implementation of a computerized data base has expanded the indexing, and thus search capabilities, by adding cross-references to Town (e.g., St. John's) and Situation (e.g., Water Street). (See Figure I.A.4).

d. **Parcel Description:** Surveyors are responsible for certifying the location and boundaries of a parcel (Lawyers certify title, but not boundaries). Surveys are not compulsory for most transactions and parcel descriptions are often given only by metes and bounds in documents. Many parcel descriptions are inadequate for identifying the precise location of the parcel. Descriptions referring to monuments, bounds, and/or adjoiners that no longer exist or referring to plans and diagrams that have not been registered are often repeated in subsequent transaction documents. The poor quality of many older descriptions and survey plans contribute to uncertainty in identifying parcel boundaries for transactions or for cadastral mapping .

e. **Noncompulsory Registration of Survey Plans:** Cadastral survey plans (other than survey plans for Crown land grants and leases) are not examined and registration of plans with title documents is noncompulsory. Location certificates (survey plan showing location of improvements and some boundary information) prepared for mortgage transactions and for development permits are also generally

not registered but are in some cases stored by building development and planning agencies.

f. **Inherited Interests:** In addition to conveyancing, inheritance forms a large part of the land transfer process in Newfoundland. Estates of intestates are divided among family members, including all children. [The Intestate Succession Act, R.N.S. (1970), c. 183] Where there are many heirs, interests in land parcels may be small. If heirs do not occupy their portion of a land parcel, legal interests are often difficult to identify.

I.A.2 Provision of Land Tenure Information

Agencies at all levels of government, as well as private organizations, are users and sources of land tenure information. The main federal government agencies concerned with land tenure information are the Real Estate Services Division of Public Works Canada (land acquisition and disposal), the Surveys and Mapping Branch of Energy, Mines and Resources Canada (examination and registration of survey plans for federal Crown lands), Canada Mortgage and Housing Corporation (mortgaging and development), and Revenue Canada (income tax monitoring). Others, such as Transportation Canada, Parks Canada, and Fisheries and Oceans Canada are responsible for the administration of lands under their jurisdiction. In this study, primary emphasis has been given to the arrangements for information management within the provincial government and to a lesser extent those among communities and the private sector.

I.A.2.1 Information sources

Tables I.A.1a, b, and c summarize the various organizations identified in this study as sources of land tenure information, classified by their predominate roles in information activities (See Figure I.2.1). The primary public sources are the Registry of Deeds, the Crown Lands Registry in the Crown Lands Administration Division, and the Assessment Division. (See section I.A.3 for a further description of these systems.)

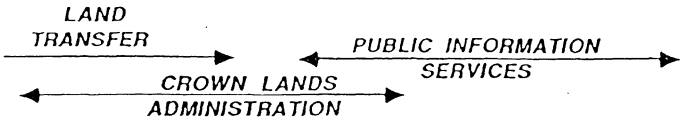


TABLE I.A.1a: Sources of Land Tenure and Related Information

	TYPE OF INFORMATION / SOURCE	PROVINCIAL ARCHIVES *CULTURE, RECREATION*	SURVEYS & MAPPING *FOREST RES. & LANDS*	REGISTRY OF DEEDS *JUSTICE*	SHERIFF'S OFFICE *JUSTICE*	COURT REGISTRY *JUSTICE*	CROWN LANDS ADMIN *FOREST RES. & LANDS*	MINERAL LANDS & MINES *MINES & ENERGY*	PETROLEUM RIGHTS ADM *PETROLEUM DIR.*	REALITY SERVICES DIV. *PUBLIC WORKS & SER.*	REAL ESTATE SERVICES *PUBLIC WORKS CAN.*	HARBOURS & PORTS *TRANSPORTATION CAN.*	SURVEY FIRMS
INFORMATION ON SURFACE INTERESTS	CURRENT OWNER			P			S			S	S	S	S
	RIGHTS / TITLE DOCUMENT			P		S	P			P	P	S	
	EASEMENTS / RIGHTS-OF-WAY			P			P			S	S		P
	MORTGAGES			P									
	OTHER ENCUMBARANCES			P	P								
	PROPERTY VALUE			P						P	P		
	HISTORY OF TITLE	S		P		S	P			S	S		
	PARCEL DESCRIPTION			P		S	P			P	P		P
	PROPERTY INVENTORY						S			S	P		
	SUBSURFACE AND RESOURCE RIGHTS	S					P	P	P				
	LAND USE / IMPROVEMENTS						S	S		S	S		S
	ZONING / LAND USE RESTRICTIONS												
	CO-ORDINATE VALUES		P							S	S		P
GRAPHICAL INFO	BASE MAPS		P										P
	SURVEY PLANS	S		P			P	S		S	P		P
	OTHER PROPERTY DIAGRAMS	S		P			P	S		S	S		
	CADASTRAL (PROPERTY) MAPS						P	P	S				S
	LAND USE & ZONING	S											

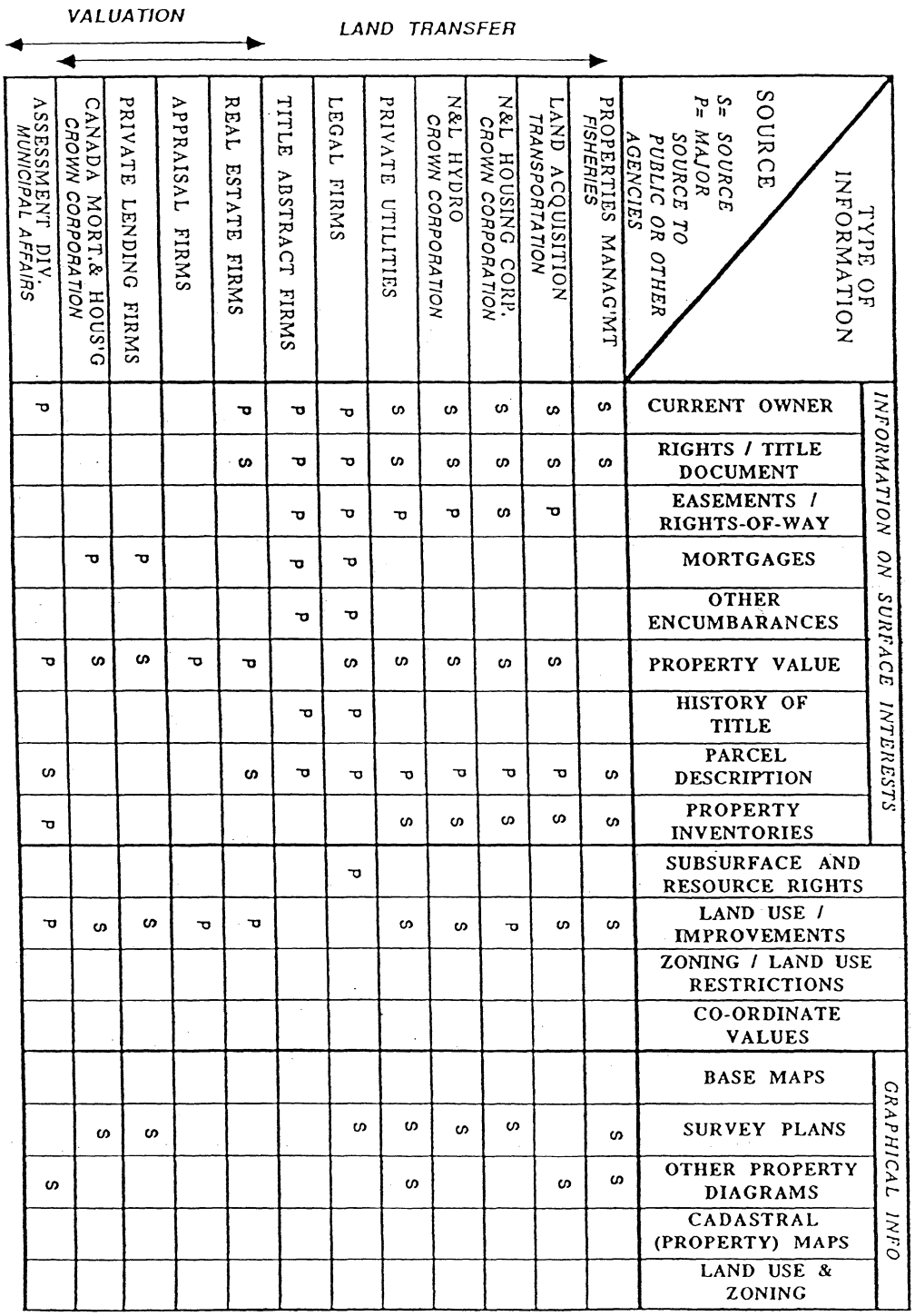


TABLE I.A.1b: Sources of Land Tenure and Related Information

TABLE I.A.1c: Sources of Land Tenure and Related Information

SOURCE (S= SOURCE, P= MAJOR SOURCE TO PUBLIC OR OTHER AGENCIES) \ TYPE OF INFORMATION	INFORMATION ON SURFACE INTERESTS											SUBSURFACE AND RESOURCE RIGHTS	LAND USE / IMPROVEMENTS	ZONING / LAND USE RESTRICTIONS	CO-ORDINATE VALUES	GRAPHICAL INFO				
	CURRENT OWNER	RIGHTS / TITLE DOCUMENT	EASEMENTS / RIGHTS-OF-WAY	MORTGAGES	OTHER ENCUMBRANCES	PROPERTY VALUE	HISTORY OF TITLE	PARCEL DESCRIPTION	PROPERTY INVENTORY							BASE MAPS	SURVEY PLANS	OTHER PROPERTY DIAGRAMS	CADASTRAL (PROPERTY) MAPS	LAND USE & ZONING
CITY OF ST. JOHN'S	P		S			P		S	P				P	P	P	P	S	S		P
ST. JOHN'S METRO BOARD	P		S			P			P				P	P	P	S			S	P
OTHER MUNICIPALITIES	P		S			P			P				P	P	P					P
SHORE ZONE MANAGM'T *DEVELOPMENT*													S	S	S				S	S
WATER RESOURCES MGT *ENVIRONMENT*												S		S	S					S
FOREST RESOURCE MGT *FOREST RES. & LANDS*												S	S			P				P
LAND MANAGEMENT *FOREST RES. & LANDS*													P	S	P					P
DEVELOPMENT CONTROL *MUNICIPAL AFFAIRS*			S										S	P				S		
PLANNING, ENG. DESIGN *MUNICIPAL AFFAIRS*			S										P	P			S			P
SOILS & LAND MANAG'T *RURAL, AGRIC. & N. DEV.*	S								S				P	P		S		S	S	P

VALUATION

LAND USE & RESOURCE MANAGEMENT

In Table I.A.2, the primary sources of information concerning property rights are described. The real estate management divisions of the provincial Department of Public Works and Services and Department of Transportation, as well as Public Works Canada, have been included because these agencies maintain major inventories of government properties. Other agencies maintain property inventories for lands under their ownership or administration. (See Tables I.A.1a, b, and c.) These agencies are also a source of information on adjacent properties collected during the land acquisition process.

Since a major concern at the 1985 Workshops on Land Ownership Information was the lack of cadastral mapping, the current sources are highlighted in Table I.A.4 with the major supporting base mapping programs being given in Table I.A.3. Other developments in cadastral mapping are discussed in sections I.A.3.3 and I.A.4.2.

I.A.2.2 Flow of land tenure information

The exchange or flow of information among agencies is characterized by the fact that the majority of public sources are centralized in St. John's. Exceptions include municipalities, the Forestry Branch and regional offices of the Departments of Forest Resources and Lands and Municipal Affairs. The federal Real Estate Services Division and Regional Surveyor's Office are located in Nova Scotia. Users generally have to contact more than one source for complete information. Even within the St. John's area, agencies are scattered throughout the city, although the new provincial complex will assist in centralizing sources near the Registry of Deeds and Lands Branch.

There are few formal procedures for the distribution of information (the processing of applications for Crown grants being one exception). Most information is

TABLE I.A.2: Major Public Sources of Information on Property Interests

* DESCRIBED IN DETAIL IN SECTION A.3

REGISTRY	TYPE OF INFORMATION	PRIMARY IDENTIFIER	GRAPHICAL PRODUCTS AVAILABLE	AUTOMATION
* REGISTRY OF DEEDS	TITLE DOCUMENTS MECHANIC'S LIENS	ALPHABETICAL (NAME)	SURVEY PLANS PARCEL DIAGRAMS	AUTOMATED STORAGE AND RETRIEVAL SYSTEM
SHERIFF'S OFFICE	LIENS ON PROPERTY - LEVIES & EXECUTIONS ON REAL PROPERTY	ALPHABETICAL (NAME)		JUSTICE AND LAW SOCIETY REVIEWING POTENTIAL SYSTEMS FOR ALL REGISTRIES
COURT REGISTRY	COURT JUDGEMENTS- ESTATES / QUIETING OF TITLES	ALPHABETICAL (NAME)		
* CROWN LANDS REGISTRY	GRANTS, LEASES, PERMITS & LICENCES OF CROWN LANDS	ALPHABETICAL (NAME) SEQUENTIAL #	SURVEY PLANS PARCEL DIAGRAMS CADASTRAL MAPS	AUTOMATED STORAGE & LISTING - LEASES & PERMITS NEW SYSTEM IN DEVELOPMENT STAGE
MINERAL LANDS & MINES REGISTRY	MINERAL RIGHTS QUARRY PERMITS	SEQUENTIAL # ALPHABETICAL (NAME)	LEASE SURVEY PLANS WHEN REQUIRED CLAIMS MAPS	INVESTIGATING AUTOMATION FOR ANALYSIS
REALITY SERVICES DIV. PUBLIC WORKS	LAND ACQUISITIONS & DISPOSALS FOR MOST GOV'T AGENCIES (EXCEPT TRANSPORTATION)	ALPHABETICAL (NAME) INDEX- SEQ. # & LOCATION	COPY OF SURVEY PLAN OR DIAGRAM	
LAND ACQUISITION, TRANSPORTTION	LAND ACQUISITIONS FOR HIGHWAYS	LOCATION # SEQ. DOC #	PLANS & PROPERTY DIAGRAMS PREPARED BY STAFF	AUTOMATED MICROFILM STORAGE AND RETRIEVAL SYSTEM FOR DOCUMENT FILES
REAL ESTATE SERVICES, P.W. CANADA	LAND ACQUISITIONS & DISPOSALS FOR FEDERAL GOV'T AGENCIES	CENTRAL REAL PROPERTY CODE	COPIES OF SURVEY PLANS PHOTO MAPS OF SOME COASTAL AREAS SHOWING FED. PARCELS	AUTOMATED INVENTORY OF FEDERAL PROPERTIES - NOT COMPLETE

TABLE I.A.3: Major Sources of Base Maps

AGENCY	TYPE OF PRODUCT	SCALE	COVERAGE	DESCRIPTION
SURVEYS AND MAPPING DIVISIONS, LANDS BRANCH (DISTRIBUTED AT MAP OFFICE, LANDS BRANCH)	TOPOGRAPHIC BASE MAPS	1:5,000 1:2,500	APPROX 55% COMPLETE FOR COMMUNITIES	LARGE SCALE COMMUNITY MAPPING BEGUN UNDER FED/PROV. AGREEMENT (1969-1977) LINE MAPS SHOWING INFRASTRUCTURE AND PHYSICAL EVIDENCE OF TENURE (E.G., BUILDINGS, CUT LINES) USED AS BASE FOR MOST CADASTRAL MAPPING PROJECTS
		1:10,000	APPROX 30% COMPLETE	RESOURCE MAPPING BEGUN UNDER FED/PROV AGREEMENT (1972-1979)
		1:12,500 1:25,000 1:50,000 & SMALLER	MOSTLY CENTRAL ISLAND PROVINCE EXCEPT PARTS OF LABRADOR	SMALL SCALE MAPPING (1:25 000 & SMALLER) IS RESPONSIBILITY OF ENERGY, MINES & RESOURCES CANADA - AVAILABLE THROUGH MAP DISTIRBUTION OFFICE IN LANDS BRANCH - 1:25 000 DISCONTINUED / NEW 1: 50 000 NTS SHEETS ARE PRODUCED DIGITALY
FOREST RESOURCES DIV.	FOREST INVENTORY AND RESOURCE MANAGEMENT MAPS	1:12,500 & SMALLER VARIOUS SCALES POSSIBLE WITH NEW SYSTEM	FOREST AREAS - NOT COMPLETE FOR PROVINCE	MAPPING PRODUCED FOR FOREST INVENTORY; SHOWS SOME TENURE BOUNDARIES; MAPS HAVE BEEN REDRAFTED BY SOILS AND LANDS DIV. TO ELIMINATE DETAIL HAVE IMPLEMENTED COMPUTER MAPPING FACITLITIES - PLAN TO ADD TENURE AS ONE LAYER OF INFORMATION
CITY OF ST. JOHN'S	TOPOGRAPHIC MAPS	1"=400' 1:500 (NEW MAPPING)	COMPLETE WITHIN OLD CITY LIMITS NOW COMPLETING	NEW MAPPING COMPILED BY SURVEY FORM IN DIGITAL FORMAT BUT ONLY HARD COPY REPRODUCIBLE MAPS ARE CURRENTLY USED BY CITY MAPS SHOW SOME PROPERTY BOUNDARIES, E.G., SUBDIVISIONS AND FENCE/BUILDING LINES, BUT PRIMARILY INTENDED FOR ENGINEERING AND PLANNING OLDER MAPS SHOWING PROPERTY BOUNDARIES STORED IN ASSESSMENT DIVISION - NOT UPDATED

TABLE I.A.4: Major Sources of Cadastral Mapping

AGENCY	TYPE OF PRODUCT	SCALE	COVERAGE	DESCRIPTION /COMMENTS
CROWN LANDS ADMINISTRAT'N LANDS BRANCH	CADASTRAL MAPS OF CROWN GRANTS AND LEASES	1:2,500	COMPLETE COVERAGE IN 1-2 YEARS	PLOTTED ON BASE MAPS FROM INTERPRETATION OF ALL AVIALABLE EVIDENCE - LITTLE FIELD CHECKING TO RESOLVE AMBIGUITIES - DO NOT SHOW CURRENT TENURE PARCEL IDENTIFIED BY GRANTEE, VOL, FOLIO # OR LEASEE AND LEASE #
	CADASTRAL MAPS OF LAND TENURE (HISTORICAL)	VARIOUS 1:12,500 AND LARGER	MANY RURAL COMMUNITIES	PREPARED FROM FIELD INFORMATION MAINLY IN EARLY 1900s - DEPICTS OWNERSHIP AT THAT TIME INCLUDING GRANTS, LEASES, SUBDIVISIONS, AND OCCUPATION
MINERAL LANDS AND MINES	CLAIM SHEETS	1:50,000	PROVINCE	MINERAL CLAIMS AND LEASES - IDENTIFIED BY NAME OF APPLICANT; CLAIM / BLOCK #; LICENCE #
ST. JOHN'S METRO AREA BOARD	CADASTRAL MAPS - CURRENT TENURE	1:2,500	2- 3 METRO COMMUNITIES COMPLETED	PROJECT USING PART TIME STAFF TO PLOT CURRENT TENURE FROM REGISTRY OF DEEDS CROWN LANDS AND ASSESSMENT INFO. ASSISTED BY LANDS BRANCH PLAN TO COMPLETE METRO BOARD AREA
SOILS & LAND MANAGEMENT DIVISION	CADASTRAL MAPS AGRICULTURAL DEVELOPMENT AREA BOUNDARIES	VARIOUS 1:2,500 TO 1:12 500	DEVELOPMENT AREAS IN PROVINCE - COVERAGE VARIES	1: 12 500 MAPS HAVE BEEN REDRAFTED TO ELIMINATE CONTOURS AND OTHER DETAIL; SOME PARCEL BOUNDARIES HAVE BEEN PLOTTED FROM CROWN LANDS MAPS AND OTHER INFORMATION AS OBTAINED IN THE FIELD OR FROM PLANS COLLECTED; MAINTAINS MAP LIBRARY
SHORE ZONE MANAGEMENT DIVISION	CADASTRAL MAPS - CURRENT TENURE	VARIOUS	2 -3 COASTAL COMMUNITIES	SEVERAL MAPS PREPARED BY CONSULTING FIRMS TO SUPPORT LAND USE PLANNING - INVESTIGATING AUTOMATED MAPPING SYSTEM FOR PLANNING INFORMATION
REAL ESTATE SERVICES, PUBLIC WORKS CANADA	CADASTRAL MAPS - FEDERAL PROPERTIES	1:5,000	SEVERAL COASTAL COMMUNITIES	PHOTOGRAMETRIC MAPS PREPARED IN CONJUNCTION WITH FISHERIES AND OCEANS CANADA TO IDENTIFY FEDERAL PARCELS

collected, stored, and distributed on an as needed basis. Although some agencies have introduced computerization, there is no automatic transmission of data among land tenure information systems, except in cases where the Newfoundland and Labrador Computer Services Corporation has established linkages to its central system for data processing (See, for example, Figure I.A.6 on the Assessment Division.)

Figures I.A.1 and I.A.2 illustrate the flow patterns for information on the current status of land ownership and for graphical information on land parcels, respectively. These have been chosen to represent the complexity of arrangements and to further identify primary sources and users. More detailed flow diagrams are presented in section I.2.

I.A.2.3 Evaluation of the provision of tenure information

Major concerns of participants at the 1985 Workshops were the provision and unavailability of information, as well as the lack of a centralized information service. Problems include the following:

a. **Lack of Information - Inventory of Current Tenure:** There is no complete inventory of current land tenure interests for the province. Some government agencies maintain inventories of their own holdings or lands they administer, but many of these are incomplete (older records are often missing) and are difficult to access. The Registry of Deeds maintains an inventory of documents from which title can be determined, when all documents have been registered. The Assessment Division (and municipalities) maintain inventories, but coverage for the province is not complete and the assessment roll does not necessarily reflect legal interests or boundaries.

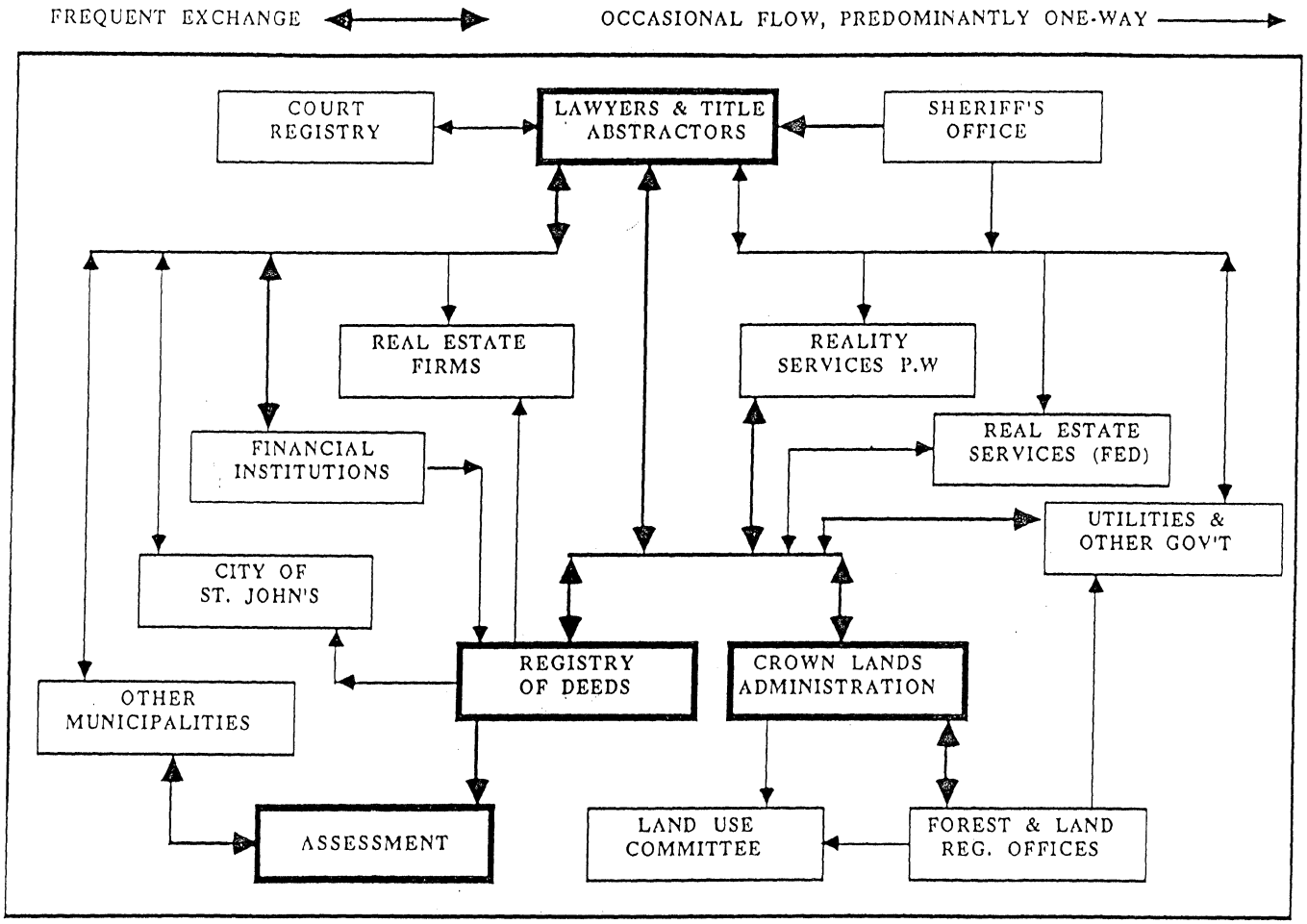


FIGURE I.A.1: Major Flow Patterns of Textual Information Regarding Ownership Status (Surface Interests)

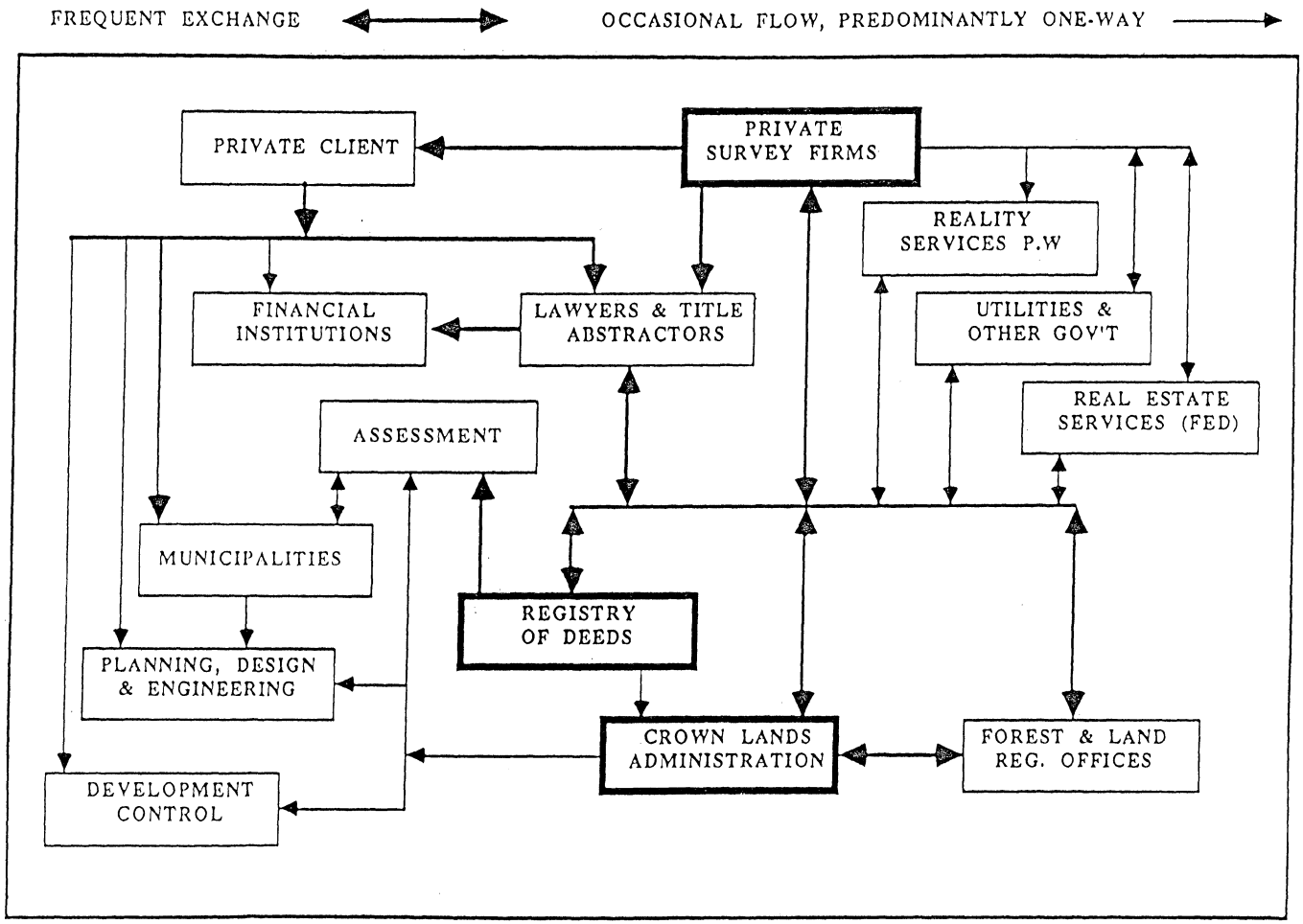


FIGURE I.A.2: Major Flow Patterns of Cadastral Survey Plans and Parcel Diagrams (for Surface Interests)

b. **Lack of Information - Cadastral Maps:** No agency maintains a complete graphical record of current land tenure. Many of the cadastral maps that have been compiled show only partial tenure and have not been kept up-to-date. Most are produced without consistent standards or verification of information that has been used to identify parcels.

c. **Lack of Information - Survey Plans:** Surveys are often not conducted during the land transfer process (cost is cited as the major factor) and survey plans are not always registered. Legal surveys have not, for example, been conducted for most highway rights-of-way although diagrams are stored by the Department of Transportation. There is no plan registry for systematically storing and accessing all survey plans.

d. **Lack of Information and Duplication of Information Collection:** All of the above problems contribute to the fact that information collection is duplicated by agencies. For each project requiring tenure information in a particular location, information collected by one agency is either not readily available to other agencies or is inappropriate in terms of content or quality. Especially among resource management and planning agencies who are concerned with large geographical areas, this duplication reduces the human and financial resources that could be allocated to fulfilling their respective mandates. Property assessors have also expended a large percentage of time for data collection, yet the lack of standards for collection and privacy of some information limits use by other agencies. (See section I.1.2.)

e. **Inefficient Access - Number and Location of Sources:** Since more than one information source must generally be contacted to obtain complete information, the collection time is increased. While the problem to users within St. John's is the dispersion of sources throughout the city, the lack of decentralized information services throughout the province limits direct access for other users. Of major

concern is the lack of access outside St. John's to registry information as listed in Table I.A.2, with the exception of the Crown Lands Registry. Information for conveyancing and surveys is collected by title abstract firms in St. John's. Time limits on land transfers and distance preclude direct verification by lawyers and surveyors. Abstractors are probably more familiar with the title searching process and sources, but lawyers and surveyors are ultimately responsible as professionals for decisions based on the information collected and should have the opportunity to conduct direct checks.

f. **Poor Quality of Information:** Since there is no examination for most title documents and plans and since there are few standards for data collection and mapping, the information available is often of uncertain accuracy. (Note that in the last few years, the Association of Newfoundland Land Surveyors has implemented improved standards for surveys and survey plans.) In the past, decisions based on poor information may have gone unnoticed or were easily rectified. Today, the greater number of property transactions and higher property values increase the potential for litigation or costly settlements due to errors in judgement by those involved in land transfer and land use regulation.

I.A.3 Systems Development

I.A.3.1 The role of Newfoundland and Labrador Computer Services

Although automation of land tenure information records has only been a relatively recent development in Newfoundland, many agencies are now either implementing or considering computer systems. Newfoundland and Labrador Computer Services (hereafter referred to as Computer Services) is a provincial Crown corporation that provides, on request, consulting services for the design,

implementation, and maintenance of computer systems, as well as data storage and processing facilities. Computer Services has 2 AMDHAL 5860 processors with an IBM operating system. Direct high speed lines are available to the Confederation Building and adjacent complex, and to Gander, Grand Falls, and Corner Brook. Other linkages are provided to St. Anthony, Stephenville, and Clarenville.

I.A.3.2 The Registry of Deeds, Companies, and Securities

In 1984, the Registry of Deeds began implementation of a computerized system in response to the immediate need to accommodate a rapidly increasing number of documents in a limited storage space and without adding additional staff. Benefits of the system include: 1) reduction of binding costs (approximately 300 volumes per year); 2) better security for registry documents; 3) reduction of registration time; 4) improved searching capabilities.

A description of the registry system (manual and computerized) is provided in Figure I.A.3. Since July, 1984 all new documents have been registered only in the new system. During the previous five months the manual system was run concurrently. Conversion of the document volumes began in 1985, progressing back in time, and is expected to be complete by approximately 1988. The system was upgraded in 1985 to reduce the time devoted to backing up daily entries for data security.

User problems to date are largely related to the conversion process, e.g., there are not enough terminals available for users and older documents still have to be searched in the original indices and volumes. However, geographic searches can be conducted and location can be combined with other criteria (e.g., grantor name and document type). Figure I.A.4 is a sample of data retrieved in a search. Copies of the search findings are available, as well as paper copies of the microfilmed documents, but the latter are sometimes poor in quality.

PURPOSE OF SYSTEM: Registration of documents affecting title to surface interests in real property for the province.

PERSONNEL MAINTAINING SYSTEM: Approximately 14 (Registry of Deeds only)

VOLUME OF ACTIVITY: Approximately 200 documents registered per day

MAJOR DATA BASES:

1. DOCUMENT VOLUMES: Copies of title documents filed at registry (e.g., deeds, probated wills, moprtgages)

   INDICES: Grantor / grantor indices giving volume and page of document

   PRIMARY IDENTIFIERS: grantor/ grantee name / document #

   SIZE: 4149 Volumes (to July, 1984)

2. MICROFILM DOCUMENTS Microfilm copies of documents

   COVERAGE: Feb., 1984 forward; currently adding earlier documents to data base - estaimated to be complete by 1988

   INDEX: Automated data base-index allowing selective searches in one or more of the following main fields:

   1. from (grantor)
   2. to (grantee)
   3. situation (e.g., street)
   4. town
   5. document date
   6. registration date
   7. document type code
   8. Parcel Identifier (not available)

   USE: Location of document (microfilm roll and frame number) and view of information entered on the documents meeting selection criteria are provided as search output. Once roll is loaded, frame can be automatically selected for viewing the document. Paper copies of documents and search output can be produced.

   PRIMARY IDENTIFIER: grantor/grantee name; document #

   SIZE: approximately 800 microfilm rolls

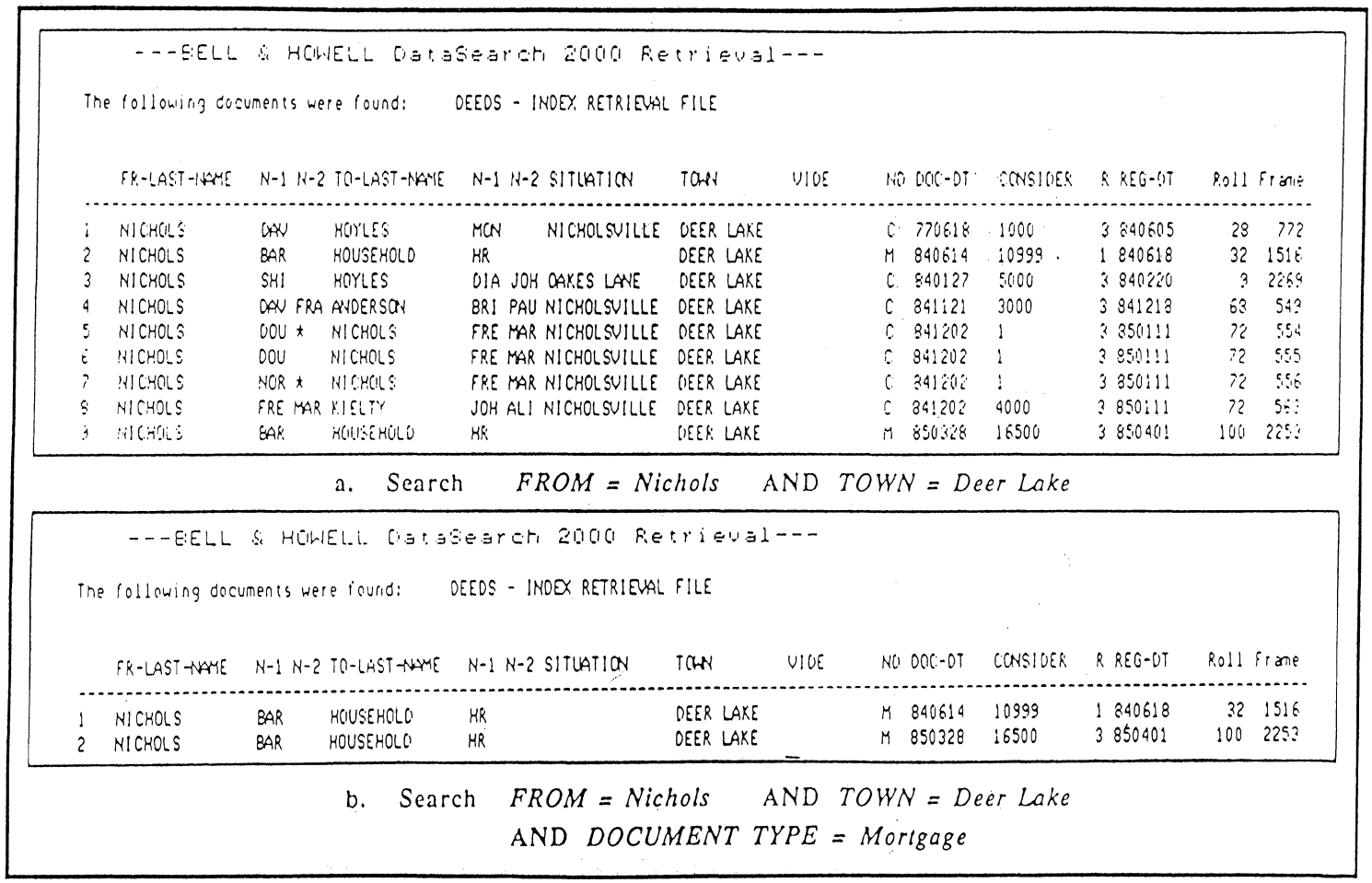
3. SUBDIVISION PLANS: subdivision plans filed in registry - no legal requirement for registration

4. MECHANIC'S LIENS:

   INDEX: by name (alphabetical) giving sequential lien number, parties involved, date registered and location of parcel affected

AUTOMATION : BELL AND HOWELL Data Search 2000 system originally implemented on a PDP 1123 Minicomputer (1984) - System was upgraded in 1985 to a Vax computer system to facilitate volume of data entry and storage. In 1985, 8 terminals were in use (3 for public enquiry; 4 for system coinversion; 1 for input of current registrations)

FIGURE I.A.3: Major Systems - Registry of Deeds, Justice



---BELL & HOWELL DataSearch 2000 Retrieval---

The following documents were found: DEEDS - INDEX RETRIEVAL FILE

	FR-LAST-NAME	N-1	N-2	TO-LAST-NAME	N-1	N-2	SITUATION	TOWN	VIDE	NO	DOC-DT	CONSIDER	R	REG-DT	Roll	Frame
1	NICHOLS	DAV		HOYLES	MON		NICHOLSVILLE	DEER LAKE		C	770618	1000	3	840605	28	772
2	NICHOLS	BAR		HOUSEHOLD	HR			DEER LAKE		M	840614	10999	1	840618	32	1516
3	NICHOLS	SHI		HOYLES	DIA	JOH	OAKES LANE	DEER LAKE		C	840127	5000	3	840220	9	2269
4	NICHOLS	DAV	FRA	ANDERSON	BRI	PAU	NICHOLSVILLE	DEER LAKE		C	841121	3000	3	841218	63	549
5	NICHOLS	DOU	*	NICHOLS	FRE	MAR	NICHOLSVILLE	DEER LAKE		C	841202	1	3	850111	72	554
6	NICHOLS	DOU		NICHOLS	FRE	MAR	NICHOLSVILLE	DEER LAKE		C	841202	1	3	850111	72	555
7	NICHOLS	NOR	*	NICHOLS	FRE	MAR	NICHOLSVILLE	DEER LAKE		C	841202	1	3	850111	72	556
8	NICHOLS	FRE	MAR	KIELTY	JOH	ALI	NICHOLSVILLE	DEER LAKE		C	841202	4000	3	850111	72	563
9	NICHOLS	BAR		HOUSEHOLD	HR			DEER LAKE		M	850328	16500	3	850401	100	2253

a. Search *FROM = Nichols* AND *TOWN = Deer Lake*

---BELL & HOWELL DataSearch 2000 Retrieval---

The following documents were found: DEEDS - INDEX RETRIEVAL FILE

	FR-LAST-NAME	N-1	N-2	TO-LAST-NAME	N-1	N-2	SITUATION	TOWN	VIDE	NO	DOC-DT	CONSIDER	R	REG-DT	Roll	Frame
1	NICHOLS	BAR		HOUSEHOLD	HR			DEER LAKE		M	840614	10999	1	840618	32	1516
2	NICHOLS	BAR		HOUSEHOLD	HR			DEER LAKE		M	850328	16500	3	850401	100	2253

b. Search *FROM = Nichols* AND *TOWN = Deer Lake* AND *DOCUMENT TYPE = Mortgage*

FIGURE I.A.4: Example of a Search Sheet from the Registry of Deeds (Note: System has since been upgraded to increase fields)

Frequent users, such as title searchers, Revenue Canada, and the Assessment Division, will be able to purchase copies of microfilm documents. Once the conversion process has been completed, the potential development of off-site data retrieval in other locations (in St. John's and other cities) will also be considered.

I.A.3.3 The Crown Lands Administration Division, Lands Branch

This division manages the Crown Lands Registry which is composed of two major data bases: documents related to Crown land dispositions and cadastral maps. Figure I.A.5 provides a summary of the system. The division is in the process of developing a computerized system, with assistance from Computer Services, for data retrieval on all Crown land dispositions. Both current and historical data are being coded for entry.

The cadastral (or grant) mapping program began in 1979 to support identification of Crown land boundaries for administration and land management. These maps depict Crown land grants and leases. Although some current land tenure is shown (e.g., current leases) the maps do not show subsequent subdivisions or ownership of land parcels. Field verification of boundaries (where required to resolve ambiguities in descriptions) was planned, but the program was reduced in 1983.

For the most part, the information shown on the maps is based on an interpretation of descriptions and diagrams. Since early descriptions and surveys were often poorly referenced and since documents have been lost, only approximately 50% of parcels can be plotted [Tobin, 1985]. Improved survey regulations and plan examination with reference to the maps have helped to eliminate the overlaps, gaps, and poorly identified boundaries that existed with earlier grants.

PURPOSE OF SYSTEM: Maintenance of records of Crown Land allocations to support the processing of new applications, to support the management of Crown Lands, and to provide a public information service.

PERSONNEL MAINTAINING SYSTEM : Approximately 20 persons including processing of applications (10); mapping (5); Registry (5) (excludes regional staff)

VOLUME OF ACTIVITY: Approximately 2,500 applications per year

ADMINISTRATIVE STRUCTURE: Crown Lands Registry in Central Office - St. John's; copies of records and initial processing of applications in three regional offices: Pleasantville, Gander, Corner Brook.

MAJOR DATA BASES:

1. CROWN GRANTS: historical records of Crown land grants in bound volumes including parcel diagrams; microfiche for all documents related to each grant

   INDICES: Geographic index by community / road
   Grantee index (being implemented on word processor -WP)
   Numerical index - listing by Grant number(being implemented on WP)

   PRIMARY IDENTIFIER: Grantee name / grant number / volume & folio

   SIZE: approximately 179 volumes - 30,000 grants (1985)

   LOCATION: Copies of all grants maintained in Crown Lands Registry; Copies of documents sent to Regional Office since 1976 and microfilm copies of grants and indices maintained in all offices;

2. LEASES AND PERMITS: historical and current documents pertaining to leases and permits to occupy

   INDICES: Grantee listing (now on wordprocessor) ; Numerical listing (now on wordprocessor)

   PRIMARY IDENTIFIER: Applicant name / lease or permit number

   LOCATION: Same as grants - microfilm copies in all offices

3. CADASTRAL MAPS: Historical maps showing land tenure; new standardized maps showing Crown land allocations at 1:2,500 begun in 1979

   ACCESS KEY: Map number - by region and community

   SIZE: Approximately 1000 including new mapping

4. OTHER RECORDS: Correspondence regarding applications and miscellaneous documentation (e.g., Orders in Council for transfer of federal - provincial lands) on microfiche; Misc. historical plans and maps stored in vault

AUTOMATION: The Division has been using a word processor to inventory and prepare application documents; Currently a computerized system for all allocations, including historical documents is being developed in co-operation with N & L Computer Services.

FIGURE I.A.5: Major Systems - Crown Lands Administration Division, Forest Resources and Lands

I.A.3.4 The Assessment Division, Municipal Affairs

The Assessment Divison maintains the major systematic inventory of land tenure for the province. The data collected in the initial assessment process has, since 1982, been entered in a data base developed with Computer Services. (See Figure I.A.6.) Data entry is currently restricted to the St. John's Assessment Office and valuation is not automated. Municipalities send updates on property status (e.g., ownership and building changes) to the Assessment Division to be added to the data base. Hardcopy output of the assessment roll is produced through Computer Services and distributed to municipalities.

I.A.3.5 Other major systems development

With the assistance of Computer Services, the Forestry Branch began the design and implementation of a computerized land information system, using ESRI software, for forest management. This system has digital mapping capabilities (e.g., storage and manipulation of graphical data in digital format and the automated production of specialized maps) linked to a data base of attribute information for statistical analysis. The Branch is currently entering topographic and forestry data in the system and plans to add land tenure data. (See Table I.A.3.)

Several major municipalities, such as St. John's and Corner Brook, have implemented computer systems. Assessment for the City of St. John's is computerized and the primary access key is the property assessment number. During the last few years, an expanded system has been under development that will eventually reference information maintained by other departments (e.g., building, utility, and land use information) to the assessment code. In effect, this will create a multipurpose parcel-

PURPOSE OF SYSTEM: Maintenance of real property inventory for property assessment, in particular for production of annual assessment roll

PERSONNEL MAINTAINING SYSTEM: Approximately 30 field assessors; 9 managerial/clerical of which 3 maintain automated system

VOLUME OF ACTIVITY: Approximately 105,000 accounts (1985) - 150,000 accounts for 170 municipalities and 21 school tax authorities estimated for 1988

Approximately 7,000 to 10,000 new assessments annually
Reassessments are conducted every 6 years

ADMINISTRATIVE STRUCTURE: Central Office and 2 Regional Offices (Corner Brook; Gander) automated system currently maintained in St. John's

MAJOR DATA BASES:

1. ASSESSMENT CARDS: field cards denoting assessment data used to compile assessment roll and to determine property value

   PRIMARY IDENTIFIER: Municipal (Assessment) roll number: e.g. 02-1650-420-0-0120-000-1-R

   (Region# - Municipality# - Street # - Side of Street # - Lot Location by Frontage - Unit number for tenants - check digit - property type code)

   CONTENTS: 1. improvements and characteristics (e.g., buildings, services)
   2. improvement value 3. land and building diagrams
   4. land dimensions and area 5. land value
   6. recorded sales 7. market value
   8. recorded building permits - nature of change

   LOCATION: Maintained by municipalities

2. ASSESSMENT ROLL DATA BASE: Automated data base maintaining information required for production of assessment roll

   IDENTIFIER/ ACCESS KEY: Assessment roll number (e.g., access by property, municipality, region, or property type code, etc.)

   CONTENTS: For each account:

   1. parcel identifier - roll number 2. owner name
   3. parcel area and/or frontage 4. municipal address
   5. land / improvement value 6. total values taxable / nontaxable
   7. value assessed to tenants

   SIZE: Approximately 105,000 records (1985)

   USE: System is maintained by central office staff. Updated assessment roll data is collected by municipalities and forwarded to Central Office for input. Value changes are computed by Assessment Division and entered. Updated sheets are forwarded to municiplaities.

AUTOMATION: Automated system for assessment roll data was implemented in 1982. System was designed and is maintained by Newfoundland & Labrador Computer Services. Assessment Division has terminal for data input. Printing facilities through N & L. Computer Services. Decentralization of system to regions is being considered.

FIGURE I.A.6: Major Systems - Assessment Division, Municipal Affairs

based LIS for the city. St. John's has also begun production of a new topographic mapping series in digital format. (See Table I.A.3.)

Other developments include the compilation of an inventory of provincial properties from historical records by the Realty Services Division. Since the Department of Transportation handles its own land acquisitions, records for this department are not filed with the Realty Services. An index has been started for highway acquisitions and diagrams are now indexed by location along roads. A computerized data retrieval system for microfilmed documents, similar to the Registry of Deeds system, has been implemented by Transportation.

I.A.3.6 Evaluation of systems development

Significant improvements have taken place since the 1978 study conducted by Decision Dynamics. The automation and microfilming of documents in Registry of Deeds and Crown Lands Registry have addressed major problems, such as the searching, security, and distribution of records. But several persistent problems should be noted.

a. **Inefficient Access - Limited Geographical Referencing:** Many systems have attempted to include some geographical reference in their indices to facilitate searching. Listings of tenure information by region or community can be obtained from most automated systems. Community and street data have been entered in the Registry of Deeds system when cited in documents, but the data are not sufficiently precise to ensure that all documents for a specific area are accessed in a search. For example, corner lots are referenced to only one street.

b. **Inefficient Access - Lack of a Common Parcel Identifier:** There is no unique parcel identifier for referencing and accessing information common to all systems. In most systems, the primary identifiers and access keys are still alphabetical (e.g.,

grantor name) or a sequential document or file number, each designed to meet the needs of one agency. (See, for example, Table I.A.2.) Although assessment parcel identifiers contain some location information, the lack of corresponding index maps and the length of the parcel codes limit the use of these identifiers by other agencies.

c. **Lack of Cadastral Maps to Support Parcel and Geographic Indexing:** Cadastral or parcel index maps provide a direct graphical representation of parcel location. If unique identifiers are also assigned to each parcel shown on the maps, information in data bases can be directly indexed and accessed using the identifier. In the Registry of Deeds system, space has been included for a parcel identifier, but without index maps showing current tenure, unique PIDs cannot be assigned.

d. **Lack of Base Maps:** Base mapping programs at both the provincial and municipal levels (See Table I.A.3) have been held back due to lack of financial support. Without a complete, consistent series of base maps, systematic cadastral mapping programs are also limited. The lack of large-scale base maps (e.g., 1:10 000 and 1:2 500) in the province has also been one factor in the duplication of mapping within the Department of Forest Resources and Lands. It has also encouraged the use of maps of different scales by other agencies for plotting land use and tenure information. Since older forestry maps (1:12 500) show forestry information, users such as the Soils and Land Management Division (Agriculture), have had to redraft maps to eliminate unnecessary detail. The introduction of digital mapping should help to solve this problem in the future. But the scale, accuracy, and limited coverage of the new forestry maps will not meet all of the long term requirements for standardized, multi-user base maps for the province.

e. **Limits of Computer Systems - Lack of Information:** The introduction of computerized and microfilm / microfiche data bases has not addressed the

underlying problems related to the lack and quality of information on land tenure discussed in section I.A.2.3.

f. **Limited System Co-ordination:** There is no strategy for interrelating land tenure information systems. The result has been the implementation of noncompatible computer systems designed to meet only the needs of individual agencies. While short term needs may be met, over the long term, opportunities to share information, to reduce duplication, and to improve information services without extensive system modification are lost.

I.A.4 Other Land Information Management Activities

I.A.4.1 Design of an information system plan

The provincial government has recognized the increasing role of computerized information systems and the need to co-ordinate the development of systems. In 1985, the Organization and Management Division of the Treasury Board began development of a three year information system plan for the provincial government. Some of the objectives of the plan are: 1) to provide more effective (specifically, cost effective) use of resources; 2) to ensure that systems meet user needs; 3) to promote standardization of technologies used. During the planning process, input has been required from departmental planning committees regarding current projects, future needs, and priorities for system development. The final plan will be used in allocating budgets and other system support. [Treasury, Board, 1985]

I.A.4.2 Special projects

Besides the systems development discussed in section I.A.3, several special projects have been undertaken in recent years to improve the land tenure information arrangements. These include 1) monitoring of survey plans in the Registry of Deeds by the Association of Newfoundland Land Surveyors; 2) submission of report in 1984 to the provincial government by the same Association documenting the need for cadastral mapping; 3) joint investigation of registry services and systems by the Justice Department and Crown Lands Administration; 4) several cadastral mapping projects, two of which are described here.

One project monitored during the course of this study was a cadastral mapping by the Planning Divison of the St. John's Metro Board. Two students were hired to plot parcels on 1:2 500 maps for two communities in the Metro Board jurisdiction. Support in designing a strategy and collecting information was also provided by staff in the Surveys and Mapping Divisions of the Lands Branch. Parcels were plotted using assessment, registry, and Crown Lands records. The Metro Board intends to continue the project when staff time and funds are available.

The Director of Land Surveys and Mapping has been supervising two pilot projects in mapping current land tenure in the Lands Branch. Maps have been compiled for two map sheets in the Seal Cove Area and for Pouch Cove in order: 1) to assess the quality of information available and 2) to develop standard procedures for data collection and mapping. A demonstration project using digital mapping is planned. A report documenting a strategy for cadastral mapping and adjudication of customary tenure was also prepared [Tobin, 1985].

The projects are an initial start in mapping current tenure; they also demonstrate some of the problems that would be encountered in any cadastral mapping program. The grant mapping program has, for example, faced similar problems.

a. **Time for Data Collection:** A major portion of the project time was devoted to collecting information from various sources for plotting parcels.

b. **Inconsistent Information:** Current tenure as indicated by title records and assessment data frequently did not correspond to grants and leases shown on Crown Lands maps. Assessment data identified most parcels and frontages along roads provided a location reference. But rear boundaries of parcels could only be identified approximately, if at all, from assessment information. In addition, the completed maps indicated many overlaps and gaps between adjacent parcels.

c. **Poor Quality of Parcel Descriptions and Plans:** It was difficult to locate the precise location of parcel boundaries because descriptions and plans were generally not referenced to survey control monuments or identifiable features.

d. **Lack of Mapping Standards:** The part time mapping technicians were insufficiently trained in the interpretation and weighting of evidence. The lack of precise rules for interpreting and plotting descriptions, together with the poor quality of information available and the lack of time allotted for field checks, limit the quality of the final products.

e. **Insufficient Support for Project Continuation:** Cadastral mapping projects (and other land tenure record projects) are often dependent on special funding and student employment. Often no permanent provisions (e.g., additional staff and financing) for maintenance or completion of the projects is available to the agency.

I.A.4.3 Communication through user forums

As mentioned in section I.1, two workshops on Land Ownership (or Tenure) Information were sponsored by the Department of Forest Resources and Lands in 1985. The importance of these workshops as a forum for users and sources should be emphasized. While some groups have been actively addressing the problems related to

land tenure information for many years, the workshops helped other groups, such as appraisers, planners, and resource managers, to voice their concerns. All participants were given an opportunity to discuss problems, to review possible solutions, and to learn about new project and system developments. T he workshops also promoted a better understanding of the problems within the management and political levels of government. Subsequently, concrete action was taken through the appointment of a task force.

I.A.4.4 Formation of an official working group

In July, 1986 a Task Force on Land Tenure (now called the Land Tenure Advisory Committee), reporting to the Minister of Forest Resources and Lands, was appointed by Order-in-Council. This group consists of the same members of the Ad Hoc Steering Committee recommended from the May, 1985 workshop: the Director of Land Surveys, the Registrar of Deeds, the Director of Assessment, the Director of Expropriations (Public Works and Services), and the Town Planner of the St. John's Metro Area Board. While the name of the group and its specific terms of reference have not been specified at the time of writing, it has as one objective the preparation of a plan for addressing many of the problems identified in this report and at the workshops.

I.A.4.5 Evaluation of the management environment

The appointment of a permanent working group demonstrates the commitment of the Newfoundland government to improving the land tenure information environment. In concert with other activities discussed in this section, the Task Force will give the province an opportunity to take direct action in finding appropriate

solutions for information problems. Some of the general management issues that should be addressed are:

a. **Information Standards and Standardized Procedures:** Information programs, in general, have been department or project oriented. If standards have been developed for the collection, storage, access, updating, and/or display of information, they have been designed to meet the needs of the agency involved rather than the wider user community. In most cases, there has been little concern with standards at all. The result has been the production of information of uncertain validity. Users must then either accept the information available, or as is all too often the case, duplicate the data collection process to update information or to produce an appropriate product for their task.

b. **Program and Project Continuity:** Many activities, such as the base mapping and grant mapping programs of the Lands Branch, have suffered from reduced financial support. Other projects have been abandoned or put on hold. Since land tenure information is a constantly changing resource and requires continuous updating to be of benefit to users, data collection programs must have on-going support.

c. **Full Time Staff to Manage Programs:** While members of the Advisory Committee and others in the public and private sectors have given time to developing projects and to co-ordinating activities, this time must be taken from their primary responsibilities. Without persons who can devote considerable time, projects and programs will not receive the active and continuous management they require to ensure success.

d. **Communication:** The workshops were major initiatives in addressing problems as a united group and in communicating problems and developments. However, major interest groups, such as municipalities, the legal profession, title searchers, appraisers, and real estate agents have played a relatively small role to date. To

implement major programs, the support of these and other groups should be actively enlisted.

e. **Strategy for Land Tenure Information Management:** Although the Treasury Board has addressed the need for a plan for computerized information systems, the problems related to land tenure information systems have to be viewed in a wider context. Agencies involved span several levels of government and the private sector. Manual systems still form a major part of the information environment. Furthermore, improvements to land tenure information may encompass institutional as well as technical changes. To date, improvements have occurred sporadically and addressed the immediate needs of special interest groups. Only a comprehensive strategy can address the underlying information problems and help to co-ordinate future system development.

APPENDIX II

AN ORGANIZATIONAL STRATEGY FOR CO-ORDINATING LAND TENURE INFORMATION IN PRINCE EDWARD ISLAND

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AN ORGANIZATIONAL STRATEGY FOR CO-ORDINATING LAND TENURE INFORMATION IN PRINCE EDWARD ISLAND

The development of land information systems (LIS) has been compared to building the Tower of Babel. This is an example of engineering design gone awry, despite many good intentions and despite a multitude of workers, administrators, and consultants (there were surely a few). Reaching for the sky was not enough in Babylon nor is reaching for the technology of tomorrow enough to build a successful LIS today. The Babylonians were defeated by an ancient problem – the inability to communicate and hence the inability to co-ordinate their activities. So too, land information managers today have found that communication, co-operation, and co-ordination are an essential part of a strong LIS foundation.

Prince Edward Island (P.E.I.) provides an example of how these three elements can lead to effective land information management. The land tenure subsystems that make up the LIS for the province and the flow of information among these subsystems illustrate some of the benefits of placing priority on policies, organization, and standards. Certainly there are problems. But a strong LIS foundation has put the province in an excellent position to resolve them and develop an improved system.

In 1986, the Provincial Cabinet commissioned a study to evaluate the current systems and the requirements for parcel-based information. This study was conducted by the Maritime Resource Management Service (MRMS) and the recommendations formed the basis for a new provincial policy in 1988. A major recommendation was the integration of property mapping, property assessment, and the Registry of Deeds in one division (called Land Records Office in the reports) within the Department of Finance to co-ordinate system development. In 1989 this Real Property Records Division was established in P.E.I.. The purpose here is to outline LIS development in P.E.I. and the

conclusions of the study. Some of the subsequent activities are highlighted in the text and in endnotes.

II.1 Early Developments

P.E.I. is Canada's smallest province and with only approximately 170,000 people, it can be compared in many ways to a rural-based municipality. The relatively small size of the island, the provincial government, and its information systems is certainly a factor in the success of LIS programmes. But as in any other province, the government is responsible for a much wider range of activities than municipal authorities. Tourism and fishing are major industries on the island, and government activities regarding land and resources are dominated by agriculture. Land management issues include soil capability and conservation, water resource management, and land tenure. The family farm is still the essence of P.E.I. culture and land tenure information has been recognized as an essential part of land administration and land management policies.

Information on land tenure has been collected on the island since the early 1700s. During the eighteenth century several census were conducted, first by the French and later by the British, to report on existing settlement patterns. The most ambitious inventory of settlement and resources was undertaken by Sir Samuel Holland from 1764 to 1766 as part of the British policy to encourage immigration and settlement. Holland surveyed the entire island, subdividing it into 66 townships of approximately 20,000 acres each. These townships were then sold by lottery to English landlords who were to rent their lands to Protestant immigrants. Although settlement did increase, the land tenure system consisted largely of absentee landowners, unhappy tenants, and squatters. This semi-feudal land tenure pattern remained until the late 1800s. Despite a series of

laws passed to regulate surveys, to establish a rudimentary deed registry system (1833), and to require fenced boundaries, the "Land Question" was not resolved until 1875.[1]

The lots laid out in Holland's survey were irregular but the framework had a systematic orientation based on the magnetic north of the survey. The boundaries are still reflected in the network of roads and farms today. But during the next two centuries survey information for the subdivided lots was not collected systematically. As in other Maritime Provinces, some plans were deposited in the Registry of Deeds. More recently surveys have been tied to a common control system, but most land parcel descriptions are still by metes and bounds.

In 1880 an atlas was prepared for school board districts responsible for property taxation. A 1920 revised atlas documented the existing parcels, their ownership, and other information regarding farms. Together with the information contained in the Registries of Deeds, the atlases were the primary sources of information on land tenure until the late 1960s when federally funded programs were initiated to develop a modern LIS.

By the time the Land Registration and Information Service (LRIS) was established in 1972, several land information projects had been undertaken by the province with financial assistance from the federal government, including establishment of a survey control framework and systematic, large scale mapping under the Atlantic Provinces Survey and Mapping Program (APSAMP). Soil inventories at 1:10,000 were also conducted and property mapping was initiated in 1967, in part to identify *bona fide* farmers for preferential property taxation. Assessors assigned a unique identifier to each parcel which became the primary parcel code for both the LRIS Property Index and for the Provincial Department of Valuation and Assessment, also established in 1972.

With a headstart and with a small area to be covered, Prince Edward Island was the first province in the Maritimes to have a densified survey control network, base mapping, and property mapping completed under the subsequent LRIS programme.

Rural base mapping and property mapping are at scales of 1:5000 rather than 1:10,000 as in Nova Scotia and New Brunswick. Prince Edward Island has also played a much larger role than the other two provinces in maintaining the LRIS programme components in the province. For example, property mapping and the computerized parcel index were maintained by the Property Mapping Unit of the Department of Public Works and Transportation until the recent departmental reorganization. This agency was also responsible for the provincial map library and map distribution services. As main sources of land information, the Property Mapping Unit, Assessment Division, and Registry of Deeds were the focus of the MRMS study.

II.2 The MRMS Study Findings

By 1985 there were a number of concerns that instigated development of a new strategy for LIS in the province. Although legislation had been passed in the 1970s to implement a land titles system, it had not been enacted. With the Albert County land titles pilot project beginning in New Brunswick, LRIS and the P.E.I. Department of Justice were again investigating the possibilities for registry reform. LRIS was also starting conversion of base maps to digital format and there were a number of related issues, including the need for digital property mapping and the fact that at least two government departments were considering the acquisition of geographic information systems (GIS).

Two major computer data bases existed by 1985: the parcel index file maintained by the property mappers and the property assessment data base. The latter was first set up in 1972 but a modern system with more parcel-related information and with greater capabilities was completed by 1986. Since some duplication already existed in these data bases, as well as potentially much greater duplication in information and technical

facilities in the future, there was a need to review the requirements for land information and to develop a new LIS strategy that could encorporate all of these developments.

The Request for Proposal for the information requirements study focussed on parcel-based information, although this was to include soils and other information related to land parcels. The MRMS study team,[2] in consultation with the provincial Land Information Steering Committee, broadened this focus to consider environmental and, to a more limited extent, socio-economic information. But the primary emphasis remained on land tenure information as the foundation of the provincial LIS.

The MRMS study team was faced with an unusual problem. While the needs of users could be documented, few dramatic problems in the existing subsystems surfaced in the analysis that could be the basis for system recommendations. Instead the Background Report,[3] the Discussion Paper,[4] and Final Report[5] focussed on the fact that P.E.I. is in a relatively favourable position regarding LIS compared to other jurisdictions, including Nova Scotia and New Brunswick which have also benefited from the LRIS programme.

While the provincial government had been concerned with duplication, sometimes referred to as triplication, in the Property Mapping, Registry, and Assessment data bases, the arrangements among the agencies involved provide an excellent example of communication and co-ordination. The three agencies, although residing in separate departments, had developed a set of records updating procedures as follows (Figure II.1):

- The property maps and parcel index are updated daily from the documents and survey plans received in the Registry (less often for the Registry in Summerside).
- Standard forms for notification of an ownership or boundary change are sent, again on a daily basis, from the Property Mapping Section to the Assessment Division to update the assessment system.

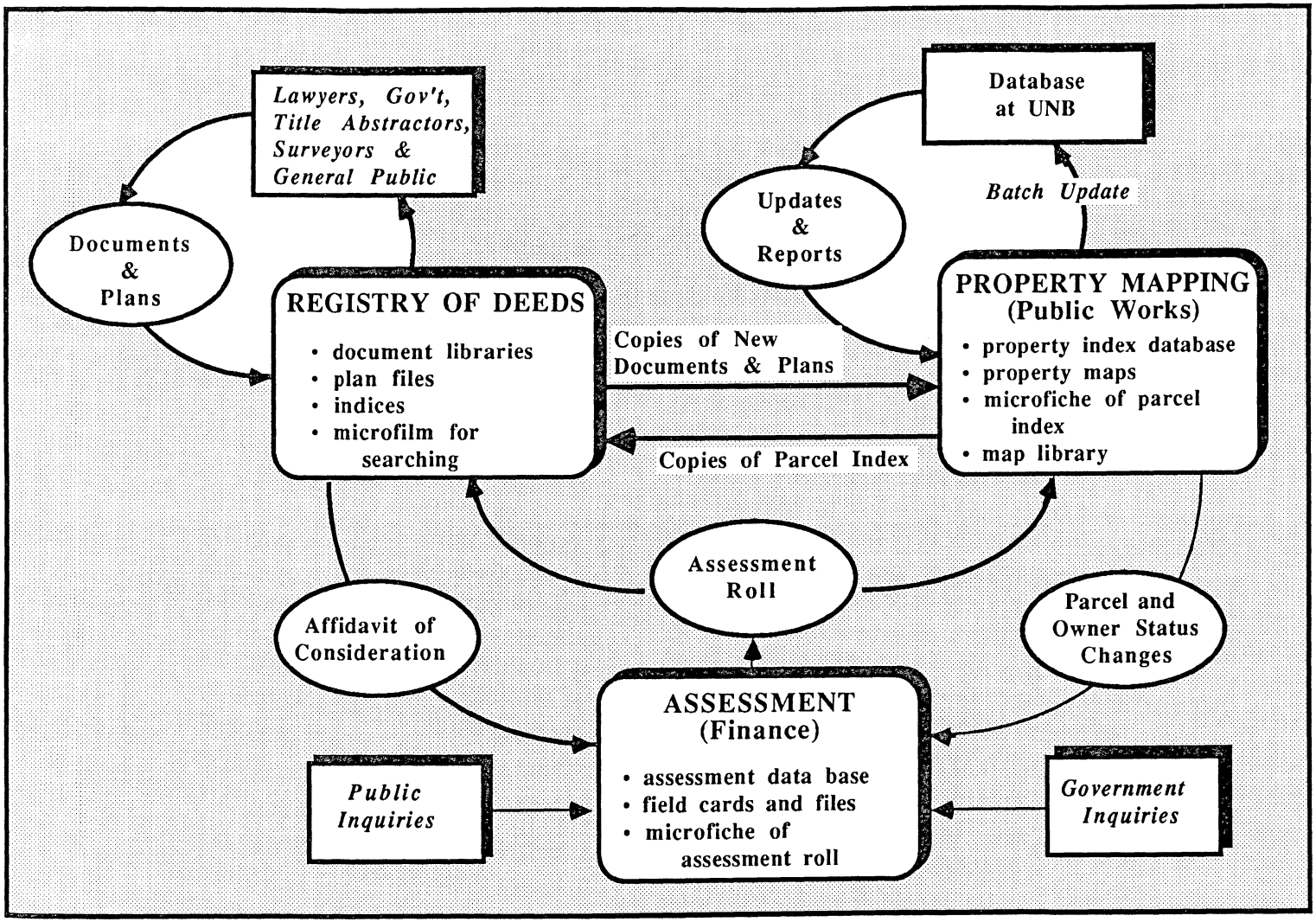

FIGURE II.1: Primary flow of tenure information in PEI (c. 1986)

- If any inconsistencies exist in the parcel description or ownership between the two files, the Assessment Division notifies the property mappers and the problem is investigated and resolved. Occasionally this involves an inspection of the property by a survey crew.
- Property value information for transfers is also forwarded to the Assessment Division by the Registrar on a daily basis and no changes of ownership are made in the assessment data base until this confirmation of sale is registered. While this policy has no official standing, it is results in conducive registration of nearly all documents.

This flow of information is facilitated by the close proximity of the three offices and the fact that, from the beginning, the same parcel identifier has been used by the assessors and property mappers (a suffix is added to the PID codes for assessment purposes but the root PID is the same). Although the Registry of Deeds is still based on a grantee-grantor index, a print-out of the computerized parcel index is available in the Registry for cross-reference between owner names and parcel-identifier. This in turn becomes the key to identify the location of the parcel on the property maps.

While these and similar arrangements ensure that data bases are kept up-to-date and that the reliability of the information is continually being improved, the study did identify several issues that needed to be addressed by the province, including the following:

- Although hard copy listings on property holdings have been available from the Property Mapping Section and on microfiche from the Assessment Division, at the time of the study there was no on-line access to property information despite two computerized data bases. The property index data base is on the U.N.B. computer. While economical, this policy does not give the provincial government control over the format or use of the data base.[6]

- If reforms are made to the Registry, this would probably include automation of the deed registry indices and/or introduction of a land titles system. Both would result in increased duplication of data entry and storage unless linkages to the other main systems are included.[7]
- The Assessment Division has had an on-going project to transfer data from the 1:10,000 soil classification maps to the 1:5000 soil maps so that additional soil information can be included in the property valuation. This project would be completed more efficiently using digital mapping.[8]
- Since the Department of Forestry and the Department of Agriculture were considering GIS technology incompatible with that being used for digital base mapping and probably inconsistent with any future digital property mapping, the province would soon be in the same situation as New Brunswick, for example, with several stand-alone systems. This situation would result in duplication in data conversion and storage, as well as incompatibility in the various data sets.[9]

Since the mid 1970s, the acquisition of information technology in P.E.I. had been closely regulated by the Computer Priorities Committee (for purchases over $12,000) and by the Computer Service Division for all other purchases. Among the objectives of the acquisition review are to ensure

- a rational use of province's limited resources (economic justification of the proposed system);
- compatibility of the proposed system with the government's Sperry system;
- efficient implementation, use, and maintenance of the proposed system with assistance from the Computer Services Division.[10]

The MRMS study concluded that more specific guidelines were required if digital mapping and GIS technology was to be considered. Even where such technology is obtained with federal funding, the province would still be responsible for the costs of

collecting and maintaining the data in various systems. Data conversion is the major cost in GIS development.[11]

II.3 The Proposed Strategy

To avoid these potential problems, MRMS proposed a revised approach for the province called the Strategic Land Information Management System (SLIMS).[12] The strategy was presented to government representatives at a workshop held in Charlottetown in May, 1987. The concept was readily adopted by the study Steering Committee and the wide range of workshop participants; MRMS was subsequently asked to design a framework for implementation. The implementation strategy was accepted by the Steering Committee in the fall of 1987 and recommendations were abstracted from this study in a submission to Cabinet for approval. Only those recommendations will be discussed here.

The underlying theme in the SLIMS proposal was that the parcel-based systems – together with the survey control network and LRIS base mapping – form the foundation for other subsystems. Thus the major recommended changes addressed these subsystems; development of other subsystems would be co-ordinated with the foundation LIS. This was certainly not a new concept, but the approach was designed to ensure continued compatibility and information sharing among the foundation and resource subsystems.

The implementation plan had two major recommendations. One of these was the reorganization of government departments to place the foundation subsystems (Property Mapping and Surveying, Registry, and Assessment) in one agency (called the Land Records Office) to be housed within the Department of Finance. The proposed reorganization is shown in Figure II.2. One function of the Land Records Office would be to administer the LRIS and MRMS allocation fund.[13] Others would be to co-ordinate

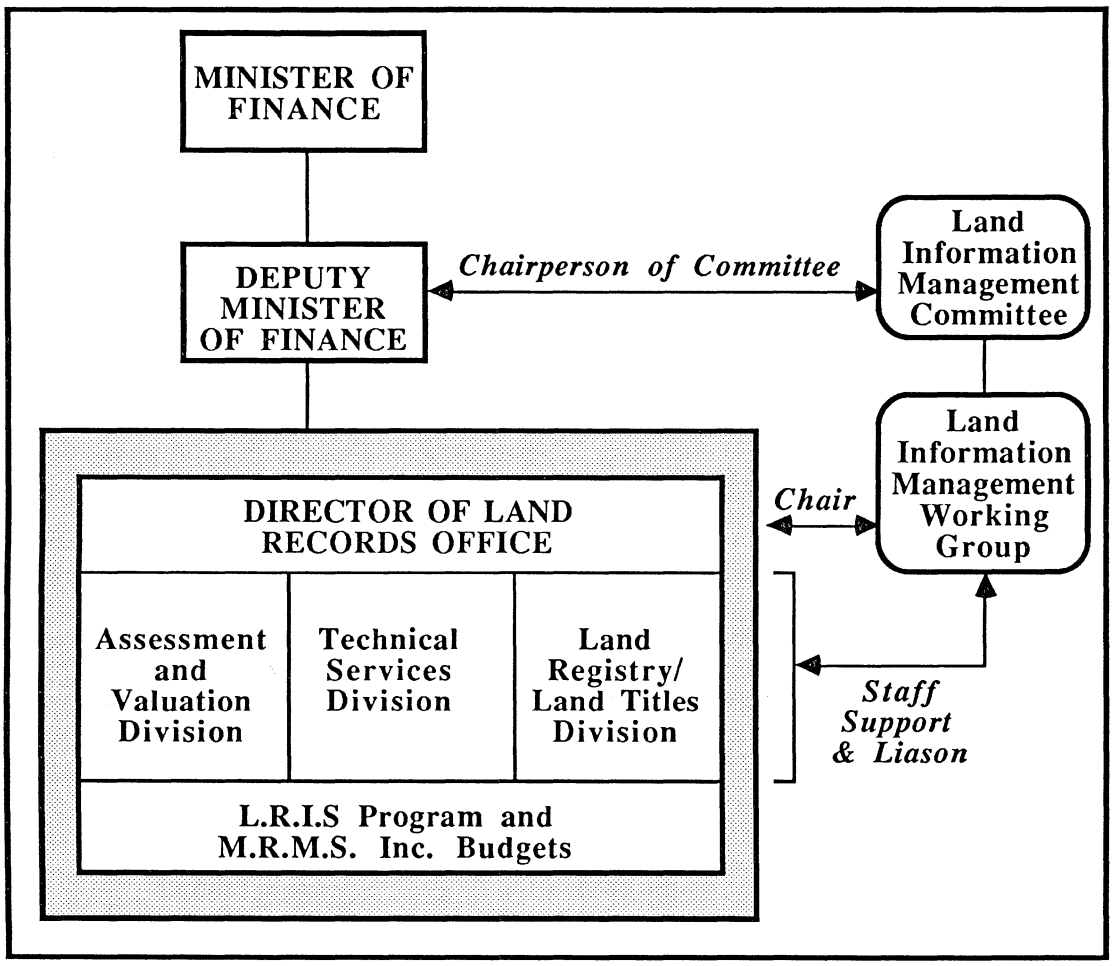

Figure II.2: Proposed Land Records Office[14]

the implementation of land registration reforms and to ensure efficient development of a computerized foundation subsystem. Again this was not a new concept; similar arrangements exist in Australia. But it was new for a Canadian province to have land registration, surveying, and mapping within one organization.

The second major recommendation was the formation of a Land Information Management Committee at the Deputy Minister Level to co-ordinate all of the provincial land information subsystems. Another function of the Committee would be to assist the Land Records Office in developing the foundation subsystems. Chaired by the Deputy-Minister for Finance, this committee would include representatives from all departments with LIS concerns. It was also proposed that an LIM Working Group be formed to advise the Committee and to implement its directives. See Figure II.3.

The MRMS Final Report made several other recommendations for implementing SLIMS and a corporate policy for LIM in the province. These include the following:

- adoption of a Corporate Land Information Technology Policy to ensure GIS compatibility and linkages, including a moratorium on GIS purchases until technical specifications appropriate for the province were developed;
- priority be given to automating the land tenure and base mapping subsystems, in particular base and property mapping since this information is required in other resource based GIS;
- greater emphasis on cost-recovery through fees for services (the report included a recommendation on paying for conversion through a small increase in property taxes);
- greater involvement of the private sector where appropriate (e.g., data conversion);
- use provincial or regional companies whenever possible.[15]

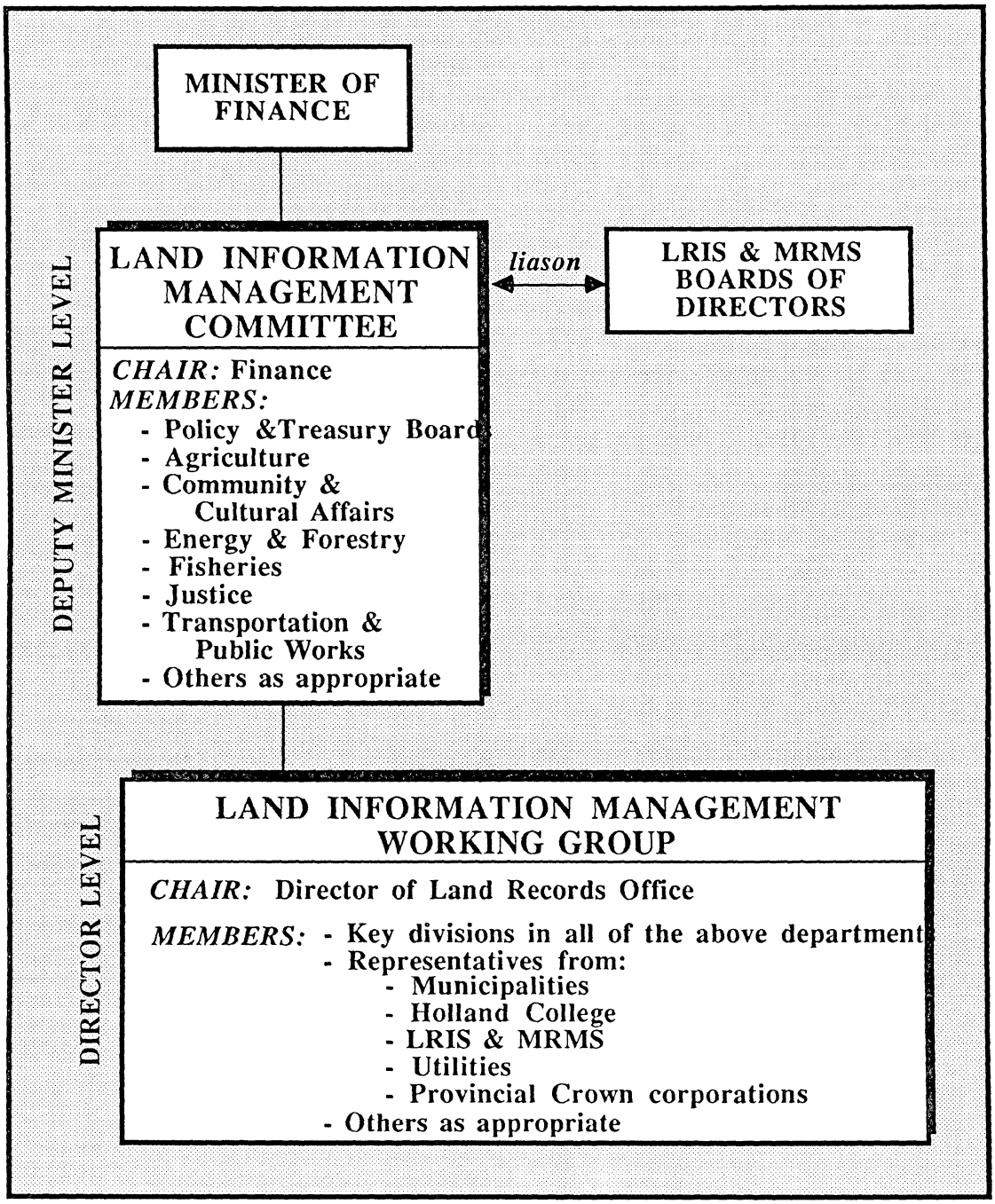

FIGURE II.3: Proposed Land Information Management Committee and Working Group[16]

The purpose of this information management policy was to highlight the need for planned system. This planning was consistent with established policies of the Computer Priorities Committee and the recommendations received support by the Director of the Computer Services Division.

II.4 Summary

The province was receptive to the recommendations of the study in part because they were consistent with past efforts and other government policies. Building on previous programmes (the APSAMP and LRIS), the proposed amalgamation of land tenure systems was a logical next step. This reorganization within what became the Real Property Records Division is consistent with provincial efforts to make efficient use of its human and technical resources. The new division provides a vehicle for co-ordinating various land information activities.

Crucial to the success of the proposal was the positive response from the LIS community. The public forum in which initial recommendations were discussed by the various agencies involved ensured that major contentious issues were considered – there were no surprises. The approach that has been adopted is based on planned incremental development and co-ordination. There are several "leaders" in key positions who are also committed to further developing the existing LIS in a manner appropriate for the island. They understand the existing and potential problems. But perhaps more importantly, they have a vision of what can be accomplished if the technology is managed well.

II.5 Endotes

1 A.H. Clark[1959], *Three Centuries and the Island,* Toronto: University of Toronto Press; I.R. Robertson, ed. [1988], *The Prince Edward Island Land Commission of 1860,* Fredericton: Acadiensis Press.

2 The 4 people who conducted the study formed a multidisciplinary team with backgrounds in surveying, land use planning, and resource management and each with experience in LIS programs in the Atlantic provinces. It is the belief of the author that this greatly influenced the direction of the study, enhanced communication with various members of the LIS community in PEI, and contributed to the breadth of the findings and recommendations.

3 Maritime Resource Management Service [1986], *Background Report: The Land Information Management Environment in Prince Edward Island,* Report submitted to the Government of Prince Edward Island prepared by MRMS in association with S. Nichols and G.A. Post, Oct. 1986.

4 Maritime Resource Management Service [1987], *A Recommended Strategy for Land Information Management for the Province of Prince Edward Island: A Discussion Paper,* Report submitted to the Government of Prince Edward Island prepared by MRMS in association with S. Nichols and G.A. Post, April, 1987.

5 Maritime Resource Management Service [1987], *A Corporate Approach Towards Land Information Management in the Province of Prince Edward Island: Final Report,* Report submitted to the Government of Prince Edward Island prepared by MRMS in association with S. Nichols and G.A. Post, July, 1987.

6 The property index was part of the LRIS property mapping programme and data for all three provinces is maintained on the UNB mainframe computer through batch updates from regional offices. The fact that this data was never provided to the public on-line might be considered a sigificant failure of the LRIS programme. Sweden, for example, began providing on-line access in the 1970s, although the availability of new computer and network technologies in the 1980s enhanced the services available. In contrast the Maritime Provinces still only provides hardcopy listings and microfiche of the index. According to the former Director of LRIS, Willis Roberts, there was no particular reason for not persuing improved user access in the 1970s other than the fact that it was not considered a priority and it was thought best to wait until smaller and cheaper computer technology was available. The data was also collected from various sources and to be more than 60-70% accurate, needed to be improved over time. But by the 1980s, LRIS had begun losing political and financial support (and thus resources for new projects) and conversion to land titles became the major focus of attention. As is discussed in Appendix III, increasing user reliance on on-line information services in Sweden has been one of the reasons the system maintained political support for 20 years.

7 An LRIS study on land titles and registry reforms was conducted in parallel to the MRMS study. But the PEI government decided not to implement land titles legislation. A system for computerizing the deed registry indices with parcel referencing is now under development in conjunction with reforms in assessment and property mapping.

8 Since the study the Real Property Records Division has begun computerizing the property maps using CARIS and developing a GIS.

9 The new Division is a co-ordinating agency for GIS.

10 E. Lawlor [1986], Personal communication. Director, Computer Services Division, PEI Department of Finance, April 23, 1986, Charlottetown, P.E.I.

11 The Atlantic Provinces are very dependent on federal funding for such projects as GIS. Federal agencies are not always concerned with compatibility among systems within the provinces. Another major problem is timing because if money becomes available through a federal program, provincial departments cannot afford to wait until "foundation" systems for base mapping are developed. In PEI both the Forestry and Agriculture Departments were involved in these issues.

12 MRMS [1987], *supra,* note 2.

13 This fund is the share of LRIS and MRMS resources that PEI had each year. At the time MRMS and LRIS were under the Council of Maritime Premiers. Shortly after the study, MRMS became part of LRIS. LRIS is now being phased out as well with the provinces each creating their own land information organizations.

14 MRMS [1987], *supra,* note 3. These are basically the organizational arrangements put in place in 1989.

15 This was controversial with regard to GIS development, but the underlying objective of the recommendation was to ensure that CARIS (used by LRIS for base mapping) would at least be considered for resource systems.

16 MRMS [1987], *supra,* note 3.

APPENDIX III

MANAGEMENT OF A LAND TENURE INFORMATION SYSTEM: WHAT CAN BE LEARNED FROM SWEDEN?

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III.1 Introduction[1]

Recent research on land information systems (LIS) has emphasized the importance of management and institutional issues. But the question of how established LIS programs and organizations should be managed over the long term has received little attention. Perhaps the major reason is the fact that most large (e.g., provincial, national) LIS are still in the first stages of development where the focus is on system design and initiating technical and organizational reform.

What is missing are reviews of well established LIS to determine what, if any, common guidelines can be derived to assist system managers. There is a need for case studies to learn how mature LIS have addressed the issues -- what worked, what didn't, and why? One such case study was conducted in Sweden in the summer of 1989 and this paper reports some of the findings.

For approximately 20 years, Sweden's Central Board for Real Estate Data (Centralnämnden för Fastighetsdata, or CFD) has been responsible for co-ordinating the automation of land title and other cadastral records throughout the country and for managing the Swedish Land Data Bank System. While a brief description of the Swedish system is given here, the objective of this paper is to highlight how the CFD has addressed such management issues as user education, political support, marketing strategy, personnel development, and internal organizational structure. The changing requirements of leadership and management style over the life cycle of an LIS are also briefly considered.

III.2 The CFD and Swedish Land Data Bank System

The CFD is a national administrative board, similar in some respects to a Crown corporation in Canada but with more responsibility for direct implementation of government policy. There are approximately 175 employees, nearly half of which are specialists and professionals such as lawyers, surveyors, system analysts, economists, planners. The CFD is headed by a Director-General who chairs the Board of Directors and reports directly to a Cabinet Minister.

As the organization responsible for co-ordinating the automation of records on title and properties, the CFD has two main functions:

- creation and maintenance of the Swedish Land Data Bank System (LDBS) which is the official register of land title and property information for areas where conversion is complete;
- provision of information services to government agencies and private users.

The primary information contained in the LDBS is obtained from the 95 land registration and the 55 real property registration authorities. Land registration in Sweden is a form of European title registration and is under the jurisdiction of the National Court Administration (NCA). Real property registration, which records the subdivision of land into real property units, is under the supervision of the National Land Survey (NLS) although 34 of these registries are maintained by municipalities. The basic spatial unit for organizing all records in both the manual registries and the LDBS is the *property* which may consist of one or more land parcels and special rights attached to the land.

Conversion of the manual land title and real property registers to computer format is carried out systematically, area by area. During conversion, each property is assigned a unique identifier (e.g., Gävle Väster 20:2)[2] and a co-ordinate value (x,y) is registered for the visual centroid of each parcel. The hierarchical property identifier is the primary

access key to the LDBS, but the centroid provides an additional spatial reference for geographical analysis and display of the data.

When conversion of an area has been completed, the integrated records in the LDBS become the official registry. Changes in title or boundaries are entered on terminals by the appropriate registration authority. Once a transaction has been approved by the registrar, the LDBS is updated. Updating is done nightly in batch mode. Data from other public agencies, including valuation data, addresses, municipal and environmental plans, and building data, are stored in the system. In addition, there are on-line linkages for special queries to several public registries, such as the population (census) register.

The LDBS is a centralized system with decentralized updating and user access. Along with registration agencies, local real property formation (cadastral survey) offices, and municipalities, the major on-line users are banks and real estate offices which perform most conveyancing activities. Access is provided through various network configurations and through a public video text service. In June, 1989 there were 7438 terminals[3] accessing the system in 2613 public and private offices; it is estimated that the system now handles approximately 10 million queries per year, 2 million of which are made by users other than the registration authorities. Hardcopy print-outs and reports may also be obtained and the CFD provides all certificates of title, certificates of search, and mortgage bonds in areas that have been converted. As conversion is completed, enhancement of these information services has become a major function of the CFD.

III.3 Evolution of the CFD

The need for registry automation had been recognized by two parliamentary commissions of inquiry[4] in the 1960s. The first study began in 1961 and was concerned

with real property registration. Specific issues included: lack of standardization among the local registries; the need to integrate registry information with other information for land use planning through a network of computerized systems; and the need for geographical referencing using co-ordinates.[5] Among the concerns in the second inquiry on land registration were increasing delays in registering transactions (3-4 weeks) and the expected costs of adding staff and facilities as the number of land transactions escalated.[6] Together, the two commission reports provided the justification for creating the CFD. Formed in 1968 as a committee to oversee a pilot project, the organization became a central administrative board under the Ministry of Justice in 1971.

Although the commission studies provided the mandate and the initial system requirements, the technical and operational design of the system was largely developed in the pilot project conducted in Uppsala County from 1969 to 1975. In effect, the pilot project was a form of prototyping. The system was developed with the co-operation of local registration agencies; changes in the system were implemented as problems were encountered; and representative users, including banks and mortgage companies, were connected to the system to help evaluate the performance.[7] The project provided a valuable learning experience and CFD staff who were involved cite the pilot project as one reason for the relatively smooth implementation of the LDBS in other counties.

The LDBS officially replaced the manual system in Uppsala County on January 1, 1976 and conversion then began in major municipalities. The next decade was marked by political uncertainty and system refinement. Conversion was slowed by two related parliamentary inquiries on the CFD, which extended from approximately 1974 to 1982. Among the issues involved were decentralization of the system and proposed changes in the CFD mandate. Two benefits of the inquiries were that they forced the CFD staff to critically examine all aspects of the system and they provided a period for system refinement. The original data base management system was replaced, computer

facilities were rapidly increased, new information and data base capabilities were added, and access methods were improved.

In 1985 the CFD received full parliamentary support from all political parties to complete conversion as quickly as possible. The rate of conversion was increased in 1985 from 220,000 to 330,000 properties per year. Registry authorities and users in areas with manual systems are currently demanding conversion as soon as possible. By June 1989, approximately 60% of the estimated 4.2 million properties (active and historical) had been converted. It is expected that all of Sweden will be converted by 1995. Until this time, while emphasis will remain on conversion, the further development of system capabilities also has high priority. This includes developing a building registry and reforming the registration process, in particular the possibility of direct mortgage registration by banks.

III.4 The CFD from a Management Perspective

Management can mean many things in different contexts. In general, it can be defined as *the judicious use of means to accomplish some perceived end.* It involves defining overall goals and setting specific objectives which will lead to attainment of these goals. Management involves decision making and establishing priorities -- allocating and organizing the available resources, whether these resources be money, personnel, equipment, facilities, or time. Moreover, management involves directing and controlling the operations and processes which will achieve the defined objectives.

Some of the special features of the CFD are presented here to illustrate how it has addressed management issues common to any large LIS program and organization. Such issues include: maintaining political and financial support over a development and implementation period which may span decades; meeting user requirements; recovering

costs; maintaining a program focus and achieving objectives; personnel management; and providing an effective organizational structure.

III.4.1 Emphasis on data integrity and system reliability

From the early developmental stages, the CFD emphasized that users must be able to rely on the system and the information contained within it. System reliability and data integrity have created confidence in the system and have thus generated user support. It has also meant that there have been no situations, such as major system failure or litigation,[8] which might erode political support.

The CFD estimates that the automated records are more accurate than the original manual registers. Some of the mechanisms put in place to ensure data integrity during and after conversion include: procedures for reducing errors in data entry; extensive verification of data using specially designed computer programs; a policy making the original sources of data (i.e., the registries) responsible for all data entry after conversion; and procedures for correcting any data problem *as soon as it is identified.*

As custodian of a legal register, the CFD also has many provisions in place to restore data and operations in cases of system failure, including standard back-up procedures and alternative data storage. System downtime has been reduced from 10-15% experienced in the early 1970s to less than 2% today. Technical personnel from several divisions have a regular morning meeting to discuss and resolve any problems which may affect system operation. Emergency arrangements have also been made to restore service using private facilities and it is estimated that even after a major disaster, caused for instance by fire or sabotage, the CFD could be operational within 24 hours .

III.4.2 Emphasis on providing user support

Another aspect of the Swedish system which has helped to gain user confidence and satisfaction is the CFD's high priority on providing effective training during the conversion process and on continuing to support users once the system is operational. In particular, the CFD has developed a unique system for user education that spans nearly four years during conversion.

Approximately two years before the LDBS officially replaces the manual system, CFD senior management staff conduct the first user seminar for local registry clerks. The objectives of this seminar are to provide an introduction to the system and to dispel, at an early stage, any resistance to or fear of change. Actual conversion of the records (e.g., coding, data entry, and verification) takes approximately 6 to 7 months. During this time, land and property registry staff receive several 4 to 5 day training sessions. These are held at the CFD headquarters in Gävle rather than in the local offices to reduce the distraction of daily responsibilities. Once the system is in place, experts assist the clerks on-site. Follow-up sessions are given about two years later to help registry clerks deal with difficult cases. All of the training is preplanned years in advance and the CFD has special facilities and data bases for training. These are also used for special education programs conducted on request for private users and municipalities.

A related service is the provision of continuing user support. If a registry clerk or a private user has a problem using the system, designated CFD experts can be contacted *directly* during operational hours. Most problems can be solved over the phone. If the problem appears to be within the system itself (e.g., with the data or programs), then this problem is referred to the appropriate person in the CFD and is resolved during that day if at all possible.

III.4.3 Emphasis on a marketable product

The CFD has maintained a sharply focused program by concentrating most of its resources on fulfilling its primary mandate, i.e., automation of the registry data. The LDBS is therefore a textual system, although by using the centroid co-ordinates the data can be analyzed and displayed spatially. Development of a graphical component was given more emphasis in the original system design, but by the mid 1970s it was recognized that a diffusion of projects could seriously hamper efficient conversion of the registries. The newly reorganized National Land Survey assumed the mandate for a national digital mapping program and within the CFD a decision was made to focus on the textual data routinely required by many users.

Experience has shown that property data in textual format has a high user demand.[9] The data contained in the LDBS is therefore a highly marketable product -- municipal authorities, banks, real estate agencies, and other users *require this data daily and are willing to pay for it.* The LDBS has been designed to meet that demand through, for example, the development of special query screens for on-line access and the provision of special products on request. By marketing this data as soon as conversion is completed in a region and by converting municipalities with a high level of property transactions first, the CFD has been able to show significant revenues and cost savings relatively early in the total implementation program.[10] By meeting a need and creating a demand, the CFD has also raised user expectations such that abandonment of the program today would probably be politically unacceptable.

III.4.4 Emphasis on realistic, long-term planning

As a government organization, the CFD prepares 5 year program plans, 3-4 year computer acquisition plans, and annual plans for budget estimates. Attention is therefore

given to establishing priorities and objectives and to scheduling. Planning for the conversion program, for example, is based on detailed statistical analysis of past performance and estimated requirements. The day on which system conversion will be complete in a particular area is planned years in advance and, to date, the CFD has *remained on schedule and within budget.*

There is an emphasis on defining achievable objectives and then meeting those objectives. This was noted as being a critical factor in maintaining political support for the program, especially during the parliamentary reviews.

III.4.5 Emphasis on personnel development

The CFD has several formal and informal management policies that directly contribute to the efficient use of human resources and that assist in maintaining a high level of staff expertise. Tasks are allocated to staff who have the required specialized training or expertise to increase efficiency and effectiveness. Thus, for example, surveyors manage property registration, computer specialists design and operate the system, and trained key punch operators rather than existing registry staff are used for data input during conversion. The result is a multidisciplinary team which can provide many perspectives in problem solving, in research and development work, and in defining the overall direction of the program.

At the same time, there is an effort to ensure that each staff member has some knowledge of all parts of the system and understands how his task or project fits within the total program. For example, lawyers know something of data base structures and understand why a particular modification can or cannot be made. Similarly, system analysists have some understanding of the legal implications of the data bases they are designing. This cross-fertilization of knowledge is encouraged through several means,

notably: short course instruction on initial employment; participation in user training and CFD public seminars; and a management style and organization which facilitates communication.

III.4.6 Emphasis on communication

There are many facets of the CFD that could be used to illustrate a high degree of communication within the organization and with users. Externally, the CFD emphasizes communication with users through publications, seminars, and training. Within the organization, there is a formal exchange of information in a series of regularly scheduled meetings for operations, strategic planning, and administrative control. Such meetings usually have specific objectives and involve individuals from most, if not all, divisions. Complementing these formal arrangements is a management style within the organization which encourages communication on a more informal level.

A further means by which the CFD encourages information sharing is through use of a two dimensional, rather than completely hierarchical, organizational structure. Figure III.1 illustrates this matrix management approach.[11] There are seven units or divisions which carry out specific functions, such as operation of the computer system. Four programs that represent the primary CFD functions cut across these divisional boundaries and provide an integrated, multidisciplinary approach to divisional activities. Thus, for instance, the implementation program which co-ordinates conversion may involve staff from all seven divisions.

This formal arrangement for co-ordinating activities helps to ensure that the primary objectives of the CFD are achieved and allows appropriate staff to be allocated to programs and projects as required. Although there are problems with this type of structure -- e.g., certain individuals may report to several supervisors or may have too

Programs / *Divisions (Units)*	Operations	Implementation (Conversion)	Development	Commercial
Administration				
Staff (Planning)				
Real Property Registration				
Land Registration				
Development				
Technical				
Operations				

FIGURE III.1: Matrix management - divisions and programs of the CFD

many simultaneous commitments -- it has a number of advantages. These include: being able to draw on the required expertise from any division for project teams; motivating staff by providing opportunities for special assignments and new learning experiences; and enhancing communication and co-ordination within the organization.

III.5 Leadership and Management Style

Many of the features discussed above could not exist without appropriate leadership and management style. During the case study, leadership was identified by most long-term CFD staff as a critical element in the survival of the organization and successful implementation of its mandate. How the requirements for leadership and management style change over the life cycle of a typical LIS are considered here briefly and in general terms, based not only on the Swedish experience but also on LIS developments in other countries.

To some degree, all of the characteristics of leadership and management style illustrated in Figure III.2 are required simultaneously throughout the LIS life cycle. However, systems seem to fail or stagnate if certain qualities do not exist at critical stages. These qualities may not necessarily be provided by a single individual -- there may be a team approach to providing effective leadership at the senior level, so long as the person with ultimate authority has created an appropriate management environment.

In the initial stage of LIS development, priority is on developing new ideas, expanding horizons, and creating a vision of the future. Leadership must provide this vision and be able to inspire those who will ultimately make the concepts a reality. Management style during the initial system design stage is characterized by flexibility and should produce an environment conducive to creativity and innovation.

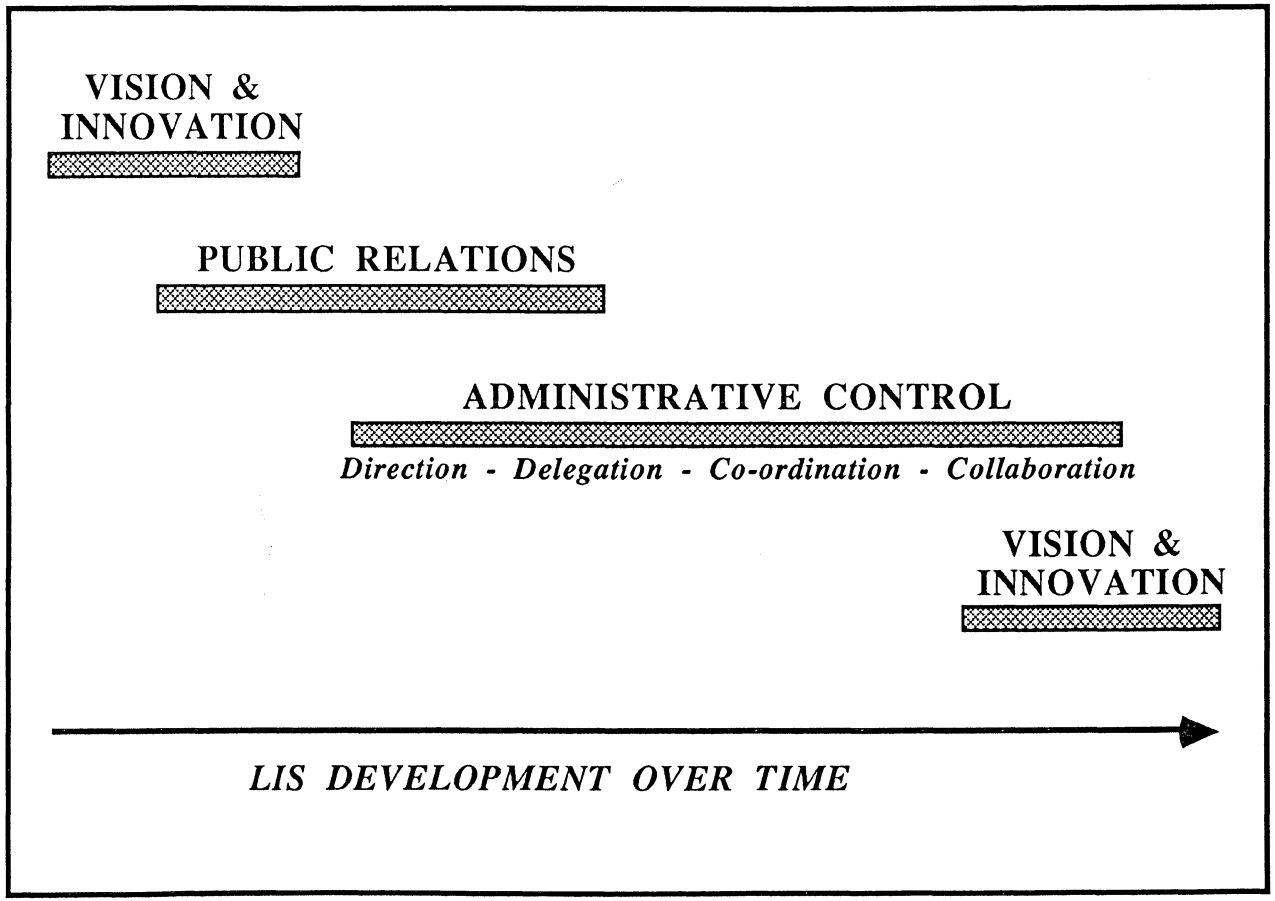

FIGURE III.2: Changing requirements for leadership and management style over the LIS life cycle

Implementing a new LIS involves changing traditional organizational structures, responsibilities, and activities. Leaders must therefore be able to counter opposition and skepticism and be able to handle critical system reviews which seem to occur in any LIS program. Good public relations is an essential management feature: the benefits of the system need to be communicated effectively to those in power, to users, to staff, and to others who may affect implementation or offer resistance to change. Long-term political and economic support for the system should be secured at this stage, and without politically astute leadership, the LIS concept may never be fully realized.

As implementation proceeds, emphasis must be placed on management and administrative control. Leaders with organizational skills are required -- people who can define specific objectives and who can achieve those objectives by allocating resources effectively. This is a period when management of the organization and the program will help determine the success or failure of the LIS as measured, for example, by whether the original goals are achieved, by whether schedules and budgets are met, and by what opportunities exist for future development.

Greiner [12] identifies four progressive management styles within this control stage:

- *direction* -- characterized, for example, by job specialization, formalization of objectives and lines of communication, and development of standards;
- *delegation* -- increased decentralization of authority and decision-making, with senior executives managing by exception;
- *co-ordination* -- involving reorganization for maximum program effectiveness, with priority on planning, budgeting, and procedures;
- *collaboration* -- development of an interdisciplinary (interagency) project team approach for problem solving and encouraging innovation rather than bureaucracy.

Although Greiner leaves any further evolution unidentified, this may be the point in LIS development where the cycle is complete and a new vision is required.

Since management has been concentrating on controlling and promoting the current system during implementation, there is a danger that the LIS may eventually become unresponsive to new needs or ideas outside the organization. Implementation may take decades and during this time user requirements, system concepts, and technological capabilities may change dramatically. To keep the system dynamic, leaders need to identify opportunities for further development and possibly create a new overall vision for the LIS. Once again creativity, flexibility, and openness to innovation are essential characteristics of management style.

III.6 Summary

The management problems facing LIS organizations are in many ways similar worldwide. While specific solutions must, of course, be formulated within the context of a particular set of program goals and a particular institutional environment, system managers can benefit from examining other LIS. What can be learned from the Swedish experience, for example, is that establishing certain priorities may assist in solving typical LIS issues such as developing and maintaining support from politicians and users. Some of these priorities include:

- ensuring that the data, system, and organization can be relied upon;
- developing procedures for effective user education;
- setting realistic objectives and planning to ensure those objectives are met;
- maintaining a well-focussed program during implementation;
- providing a product that users need and are willing to pay for;
- using personnel effectively and facilitating a transfer of knowledge among staff;

- providing an organizational structure which promotes communication and coordination.

How well these and other principles can be realized in practice will depend on the leadership and management style within the LIS organization. Moreover, to be effective, both leadership and management style must evolve with the system. Being aware of and responding appropriately to changing management requirements may be the key to implementing an LIS successfully.

III.7 Endnotes

1 This paper was first presented at the International Seminar on Land Registration, sponsored by the Atlantic Institute and the Department of Surveying Engineering, University of Maine, Orono, Maine, July, 1989.

2 Gävle is the municipality; Väster is the local village name; 20:2 refers to the block and property number, respectively. This is similar to property designations in the manual books and many of the traditional parish or village names have been preserved. If a property consists of more than one parcel, then a superscript may be used (e.g., 20:21 and 20:22) on NLS cadastral maps to identify the parcels belonging to the property.

3 This figure includes 434 terminals in 103 land and real property registration authority offices connected to the Land Data Bank System as of June, 1989.

4 Parliamentary or royal commissions of inquiry in Sweden are a major means of initiating legal reform and developing public policy. They generally consist of intensive reviews of issues with the objective of making specific recommendations to government for legislative reform; the final reports are published in what is known as the SOU series of government documents. The commissions may take years to complete and provide a highly organized means for obtaining input from all groups and organizations concerned with the issue. One administrative function of the central boards is to review and provide input to a variety of commission reports. According to Anton, T.J. [1980]. *Administrative Politics: Elite Political Culture in Sweden.* Boston: Martinus Nijhoff Publishing, there might be as many as 75 commissions initiated each year and 300 commissions on-going at any one time.

5 Government of Sweden [1966], *Report on Real Estate Registration,* SOU 1966:63.

6 Government of Sweden [1969], *Report on Land Registration,* SOU 1969:9.

7 Central Board for Real Estate Data (CFD) [1975], *Handläggnings - försök med Fastighetsdatasystemet - Repport från försöksverksamhet i Uppsala län.* CFD, Gävle, Sweden.

8 One case in the 1970s involved access to information contained in the LDBS but not data accuracy.

9 See, for example, Andersson, S. [1989]. "Demand for access to the Swedish Land Data Bank System - A Second Wave." *Mapping Awareness,* 3(1), pp. 9-12; Sedunary, M. [1985]. "LOTS, and the nodal approach to a total land information system." In *The Decision Maker and Land Information Systems,* Hamilton, A.C. and J.D. McLaughlin, eds. Ottawa: Canadian Institute of Surveying and Mapping, pp. 69-80.

10 See, for example, Andersson, *supra,* note 10. Figures in this paper show revenue as currently being more than double the costs of conversion and system operation, but part of this revenue would have been collected through the land registration process without the LDBS. Although benefits and costs are difficult to isolate since three agencies (NLS, NCA, and CFD) are involved, a recent economic study determined that significant benefits have accrued through, for example, staff reduction in the registries (approximately 200 person years) and revenues from expanded information services. Statskontoret [1988]. *Utvärdering av FastighetsDataSystem - en Efterstudie.* 1988:42, Government of Sweden, Stockholm.

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VITA

Name: Susan Elizabeth Nichols

Place and Date of Birth: Middleton, Nova Scotia / December 16, 1951

Permanent Address: c/o Department of Surveying Engineering
University of New Brunswick
Fredericton, New Brunswick Canada E3B 5A3

Schools Attended: Halifax Grammar School (1970)
Nova Scotia Land Survey Institute (1978)

Universities Attended: Acadia University (1974) B.Sc.(Hon)
University of British Columbia (1974-1975)
University of New Brunswick (1983) M.Eng.
University of New Brunswick (1992) Ph.D.

Publications:

Nichols, S. and J. McLaughlin [1993]. "National spatial data infrastructure: opportunities, challenges, and issues." In *SIRC 93: Spatial Information Systems: Practice and Research,* G. Benwell and N.C. Sutherland, eds., Proceedings of the Fifth Annual Colloquium of the Spatial Information Research Centre, University of Otago, Dunedin, New Zealand, May 17-19, 1993, pp. 17-24.

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