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CADASTRAL REFORM AND THE FUTURE OF THE SURVEYING PROFESSION

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INTRODUCTION

By understanding history and current international developments which are impacting on society, and by relating these to cadastral trends, it is possible to visualise the future of the Australian land surveying profession.

In achieving this objective it is necessary to describe the changing relationship of humankind to land and how that has affected and will continue to affect the future role of surveyors. The paper also reviews world trends, influences and initiatives, particularly those undertaken or highlighted by the United Nations and World Bank. These not only confirm the importance of land surveyors in a modern society but also provide an indication of the future role of the surveyor.

The paper also describes the joint United Nations and International Federation of Surveyors International Workshop and Conference in 1999 concerned with land tenure and cadastral infrastructures to support sustainable development for the next millennium. This workshop and conference will result in a joint UN/FIG Declaration which again will assist the

surveying profession to chart its future. Importantly this initiative is being driven by surveyors.

These world trends allow us to have a better understanding of future cadastres which, together with a review of the development of the Australian surveying profession over the last 150 years, permits a look into the future at the challenges facing the profession, as well as understanding the opportunities available to it.

WORLD INITIATIVES AND TRENDS

The last decade of the 20th Century has seen the United Nations organise a number of global initiatives which have not only helped set a path for the world to follow in the next millennium, but have also highlighted the importance of the land surveying profession to economic development, environmental management and social stability in all member states. These initiatives included the United Nations Earth Summit in Rio de Janeiro in 1992, the United Nations Social Summit in Copenhagen in 1995, the United Nations Women's Summit in Beijing in 1995, the United Nations City Summit in Istanbul in 1996, and the United Nations Food Summit in Rome in 1996. All these initiatives have pointed to sustainable development being a key issue in the next millennium.

As highlighted by these summits, sustainable development requires improved land administration and land management. This in turn requires access to appropriate land information. The Summits particularly highlight issues of access to land, and security of tenure for women, minorities and indigenous groups.

Another authoritative source on international trends are the World Development Reports produced by the World Bank each year which again highlight the importance of land administration and management, and access to appropriate land information (Williamson, 1997b).

An important contribution that surveyors can make to sustainable development can also be seen in the initiatives undertaken by the International Federation of Surveyors in all their commissions, the latest being the Task Force on Sustainable Development. However other initiatives such as those by Commission 7 (Cadastre and Land Management) which resulted in the Bogor Declaration on Cadastral Reform (UN, 1996a), the Statement on the Cadastre (FIG, 1995) and "Cadastre 2014" (Kaufmann and Steudler, 1998) clearly show the contribution that surveyors can and are making on a global scale.

The above Summits and reports identify key world trends which must be taken into account in charting a future for our profession. These include:

- a rapidly increasing world population
- the growth of cities, particularly in the developing world
- continuing environmental degradation
- continuing tension between economic development and poverty
- increasing awareness of the need for social equity
- the effect of globalisation together with a move from the Industrial Revolution to the Information Revolution, and now the Knowledge Revolution where the often talked about concept of the "Global Village" is now becoming a reality

All these developments and trends point to the need for the global community to increasingly focus on sustainable development, that is to keep living, developing and hopefully maintaining our life style in balance with the environment such that our life styles and activities can continue in perpetuity.

This presentation uses these global trends to develop a framework to help chart a future for the land surveying profession in Australia. The result of such analyses clearly shows that the surveying profession has a fundamental role to play in society, both nationally and internationally. However the profession cannot escape international trends and pressures. We are part of the global village and global society – whether we like it or not. So increasingly any view of the future for our profession must recognise world trends and the effect of globalisation.

LAND ADMINISTRATION CHANGE

In looking to the future role of a land surveyor, it is essential to understand the changing relationship of humankind to land over the centuries and the effect this has had on our land management and land administration institutions and structures.

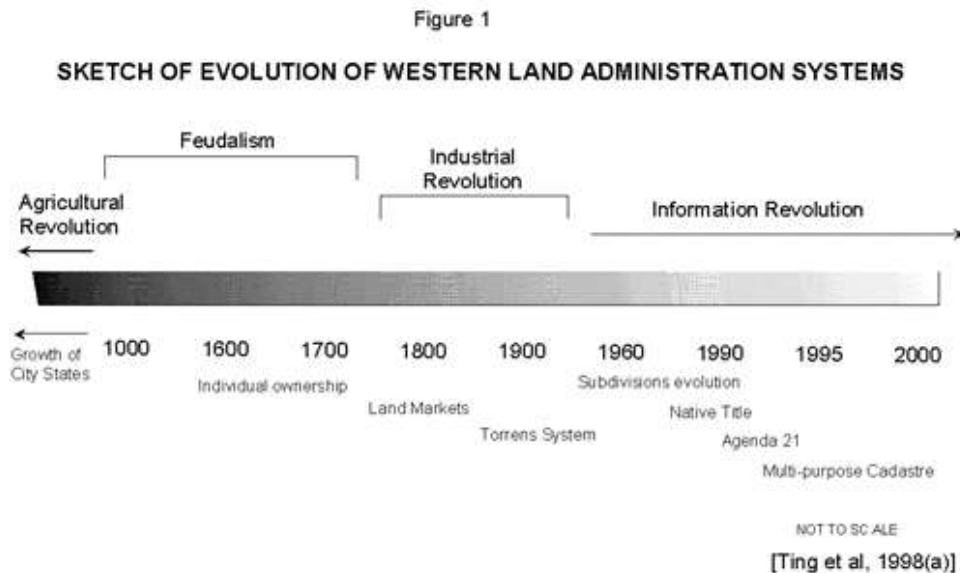


Figure 1 shows in very simple terms the changing relationship of humankind to land (Ting et al., 1998a, Ting et al., 1998b). It highlights that land markets, as we know them and take for granted today, which are an integral part of the land development process, are relatively recent. They basically came about as a result of the Industrial Revolution and the growth of cities in the late 18th and early 19th Centuries. The introduction of the Torrens System of title registration in the mid 19th Century was the result of a need to improve the operation of these newly developing land markets and particularly to provide an institutional, legal and technical infrastructure to allow the opening up of the vast expanse of Australia. This was driven very much by an economic desire for greater efficiency.

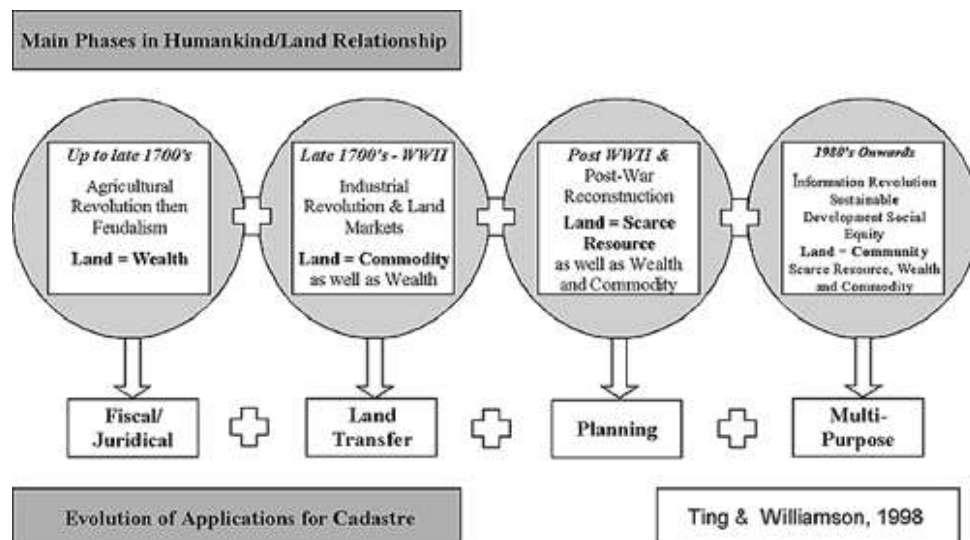
The concept of planning as we know it today was only really developed in the Post World War II era, while the concept of strata titles was only developed in the 1960s, and the concept of cluster titles and community titles in the 1980s. At the same time the 1980s saw the increasing importance of environmental considerations and environmental statements in the

land development process. During the 1990s the environmental considerations have also been modified by social influences which have increasingly had an effect on the economic imperative.

There is no doubt that the impact of global environmental issues will become more important, as well as an increasing social consciousness for the rights of minorities, women and indigenous peoples. All these changes, within an environment of economic rationalism and globalisation, will continue to change the relationship of humankind to land in the next millennium.

How then does this affect our land administration (and cadastral survey) systems? Without doubt changes in the relationship of humankind to land have evoked many revolutionary changes in our land administration systems and the function of cadastres as shown in Figure 2 (Ting and Williamson, 1998).

Figure 2



In the early stages of human settlement, land was undisputedly the primary source of wealth and power. In that context cadastre's central function was as a record of ownership and as a physical tool. The Domesday Book in England in the 11th Century and the Royal Registry of Ancient Egypt are prime examples. In summary "land" equated with wealth and the cadastre was seen as a basic record and a physical tool during the feudal period and up to the Industrial Revolution.

The usurping of land's position as the primary source of wealth began with the Industrial Revolution and the rise of capital. This in turn created a further important function of the cadastre as a tool to support the growth of land markets and land transfers.

As a result, land increasingly became a commodity and a cadastre became a land market tool. The Torrens System, which suited 19th Century imperatives in a young country such as

Australia with large tracts of unsurveyed untitled land, is interesting. In a sense, it is an example of legal change responding to society's needs, then propelling further changes in land markets and land administration, including surveying methods. The intended effect this had on the cadastre was to create a land register and maps that could state unequivocally the description of every parcel of registered land and its owner. Together with the government guarantee of certainty, the cadastre and land administration system that developed based on Torrens, greatly assisted the development of the land market and fulfilled colonial society's desire to rapidly settle the vastness that was Australia (Williamson and Ting, 1998).

In short, cadastres now existed to facilitate land markets, and particularly land transfers, as well as serving the purposes of recording ownership and in many countries land taxation.

The post World War II reconstruction period and subsequent population boom saw the need for better spatial planning, particularly in urban areas. There was an increased need for land administration laws and systems to address broad acre subdivisions. Land title systems had to evolve to accommodate the desire to own a piece of property within a high rise building – condominiums or strata subdivisions. To achieve this also required a cadastral system that could describe ownership of space in three dimensions.

A cadastre, as the record of land parcels and registry of ownership, became a useful tool (when linked to large-scale maps) for city planning and the delivery of vital services like electricity, water, sewerage and so forth. Thus a focus on planning was added to the pre-existing applications of cadastre as a fiscal and land transfer tool, although this linkage was often poor.

As today's society faces continuing land shortages and resource scarcity, the imperative exists to better manage and plan land use. The concerns about sustainable development and the environment are evident from such international instruments as Agenda 21 and the Habitat II Agenda arising out of the UN initiatives mentioned previously. There are also concerns for social equity such as indigenous and women's rights, also mentioned previously. Thinking has moved beyond giving more people the possibility of ownership of space over the same parcel of land (strata title).

Concern now focuses on how land can be better managed in a variety of circumstances, whether for town planning purposes or for rural agricultural development. Society now needs multi-purpose cadastres to answer its fiscal requirements and land transfer needs, as well as facilitating land management. The achievement of a useful multi-purpose cadastre is made possible today by the potential of the information revolution and the technology that has continued to evolve with it. The more difficult hurdle is the fundamental legal and institutional reforms that will facilitate the data-sharing necessary to develop, support and maintain information for a multi-purpose cadastre.

In summary in the next millennium land will increasingly become a scarce community resource and cadastre will be used increasingly as a land management tool, where the environmental and social considerations will increasingly temper economic imperatives.

It is therefore essential for the surveying profession to fully understand these trends and the new institutional, legal and technical infrastructure that will need to be put in place to manage these complex restrictions and responsibilities which will pertain to land in the future.

UN/FIG GLOBAL WORKSHOP AND CONFERENCE ON LAND TENURE AND CADASTRAL INFRASTRUCTURES TO SUPPORT SUSTAINABLE DEVELOPMENT

An example of the role that surveyors are playing in the changing relationship of humankind to land internationally can be seen in the joint United Nations/International Federation of Surveyors (FIG) Global Workshop and Conference on Land Tenure and Cadastral Infrastructures to support sustainable development in the next millennium. This initiative, which will involve five commissions from FIG, six United Nations organisations or affiliated institutions, The Institution of Surveyors Australia, the Surveyor-General's Department of New South Wales, Land Victoria and the University of Melbourne, is a good example of the leadership that the surveying profession is providing in attempting to understand the relationship of humankind to land. Such initiatives will ensure that the profession will be better able to understand its role in the future.

The joint UN/FIG initiative will include a number of activities. First there will be a workshop from 18 to 22 October 1999 held in Bathurst, New South Wales. Second, there will be an international conference where the results of that Workshop will be reported. This will run from 25 to 27 October 1999. Both initiatives are jointly coordinated by Don Grant and Ian Williamson. At the same time the key land-related and professional commissions in the FIG will coordinate an FIG/UN Roundtable on Sustainable Development on 27 October 1999. The timing of the UN/FIG conference is such that participants can then move on to participate in the 40th Australian Surveyors Congress and the 6th Southeast Asian Survey Congress in Perth from 28 October to 3 November 1999.

The objectives of the Bathurst Workshop are to explore humankind-land relationships for the next millennium to determine a broad vision and a set of guidelines for appropriate land tenure and cadastral infrastructures to support sustainable development and to prepare a UN/FIG Declaration on the topic. The Workshop will comprise about thirty invited cadastral and land management experts from twenty five countries representing all continents. It will have a broad representation from the surveying, engineering, legal, planning, valuation, water policy, economics, environmental management, land administration and land title disciplines. It will represent government, private and academic sectors, as well as the International Federation of Surveyors and a number of United Nations agencies.

The Bathurst Declaration will recognise the trend for current formal land administration systems (for example, the Torrens System) to move their focus on simple ownership and transfer to the management of a complex land information system comprising overlapping land rights, responsibilities and restrictions, representing both private and government interests (Figure 3).

The International Conference from 25 to 27 October 1999 in Melbourne will be the forum for the presentation of the keynote papers produced by the world experts involved in the Bathurst Workshop. The Conference will also present the Bathurst Declaration and will provide an opportunity for discussion as well as a plenary session. The Conference is also providing a day to review the operations and activities of Land Victoria. It is hoped to attract up to 400 national and international participants to the Conference. More information about the Conference can be obtained on the web page: <http://www.sli.unimelb.edu.au/UNConf99>.

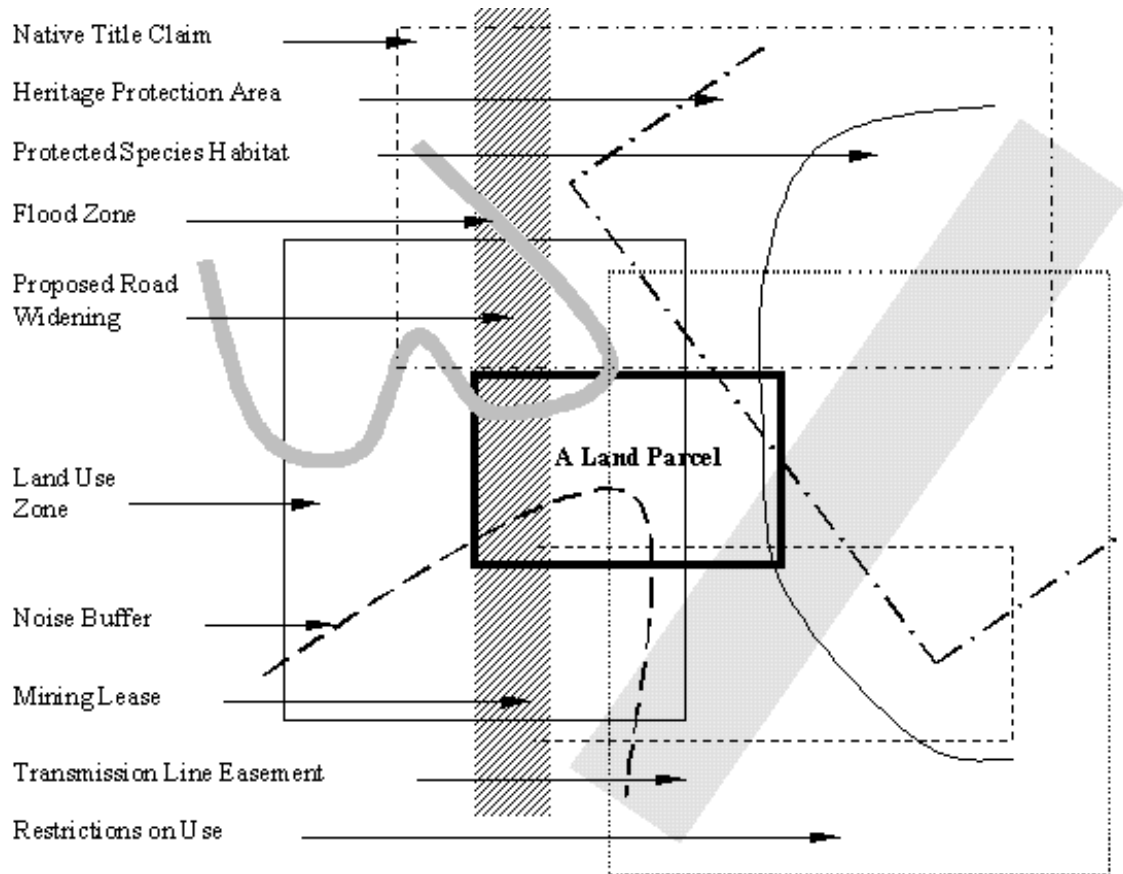
This Conference will be an excellent opportunity for surveyors to get an insight into the increasingly complex land administration arrangements which will occur in the next

millennium. Hopefully it will provide a framework upon which the land surveying profession can plan its future.

Figure 3

Schematic of overlapping rights, restrictions and responsibilities in a modern multi-purpose cadastre

Boundaries of:



INTERNATIONAL CADASTRAL TRENDS

A number of international cadastral trends have been described above which are directly affecting the future role of the professional land surveyor. These trends are particularly highlighted in the proceedings and documentation developed by Commission 7 (Cadastre and Land Management) of the International Federation of Surveyors (http://www.sli.unimelb.edu.au/research/publications/IPW_publ.html) and the Land Administration Guidelines developed by the Meeting of Land Administrators (MOLA) (<http://www.sigov.si/mola/>) organised by the United Nations Economic Commission for Europe.

Some of the key trends include an increasing focus on cadastral processes rather than cadastral institutions or functions. For example the actual processes of land transfer and land subdivision from beginning to end are much more important than historic or anachronistic government institutions or professional monopolies. The trend has increasingly seen the development of cadastral visions and a lot of attention being given to understanding 'why we are doing what we are doing' and where we are taking the discipline.

A parallel trend, which together with cadastral reform is having an increasing impact on the surveying profession and will increasingly play a very significant role for the profession, is the development of spatial data infrastructures. These infrastructures at global, regional, national, state and local levels are increasingly integrating cadastral data, with the aggregation in Australia currently at the national level which was used for the 1996 census.

There is an increasing recognition around the world that each country, due to its individual legal, cultural and technical development, requires a different cadastral system. However there is a range of common cadastral options described by the 'toolbox' concept. This concept was the key outcome of the joint FIG/United Nations Bogor Declaration on Cadastral Reform in 1996 (UN, 1996a, UN, 1996b).

Some of the most important influences affecting cadastral trends, which are also having a dramatic impact on the surveying profession, are information technology, automation and the impact of the Internet. Within tomorrow's information society, the Internet (and the WWW) in particular is increasingly permeating every aspect of human activity.

As a result of international cadastral trends, there is an increasing need to develop a clear cadastral vision. An example of such vision is described within the Bogor Declaration (UN, 1996a) where the vision is to develop modern cadastral infrastructures that facilitate efficient land and property markets and support long-term sustainable development and land management; and secondly to facilitate the planning and development of national cadastral infrastructures so that they may fully service the escalating needs of greatly increasing populations.

The concept of a vision has been taken a step further by the activities of Working Group 7.1 of Commission 7 (Cadastre and Land Management), FIG (1994-98), and described in the publication "Cadastre 2014" (Kaufmann and Steudler, 1998). The vision of Cadastre 2014 is a well-organised inventory of data concerning all legal land objects in a country or district, based on a survey of their boundaries. It will replace the traditional institutions of cadastre and land registration. Cadastre 2014 will show the complete legal situation of land, including public rights and restrictions. It is a vision of legal independence where a wide range of legal interests will be shown within a multi-purpose cadastre.

Of interest all the trends highlighted in this presentation were confirmed at the FIG Congress in Brighton in July this year and particularly the Commission 7 proceedings (see WWW address below for full set of Commission 7 proceedings). The Congress also confirmed the growth of the use of the term "Geomatics", "Geo-Informatics" and "Geomatics Engineering" as the surveying profession struggles to find a way of describing itself in the next millennium. Importantly the Congress re-emphasized that the strength of the surveying profession is still the link and synergy between measurement and land. This link has been the strategic advantage of the profession for over a century and there appears to be no indication that its importance is reducing.

Certainly the impact of the World Wide Web and communications technologies were strongly emphasized at the Congress. However there were two other interesting results from the Congress which were not immediately apparent. One was that within the increasingly hi-tech and IT world that we are living there appears to be an increasing recognition of the human dimension and the importance of human needs. For example the recognition that humans, by their very nature, are gregarious animals which need to meet face to face, discuss, debate, argue and enjoy each other's company. This is seen as a tempering of the hard IT environment within which society has been living for the last decade. Electronic mail, the WWW and video conferences have their uses but also their limitations.

The other interesting result from the Brighton Congress was the increasing influence that the FIG is having at a policy level with national governments and particularly at the international level with the United Nations.

Finally the Commission 7 program at Brighton confirmed that cadastre and cadastral issues are "on a roll" albeit not in the traditional sense. Increasingly the importance of cadastre, both today and in the future, is seen as integral to economic development, social stability and environmental management.

A HISTORIC AUSTRALIAN PERSPECTIVE

History confirms continuous cadastral change and an ongoing change in the role of the surveyor in Australia. In the early years of Australia's development, surveyors played a very significant role in opening up the country. Surveyors were recognised as having a balance between measurement, mapping and land management. The strength of a surveyor arising from the close relationship between measurement and land was confirmed in the early part of the 19th Century.

The surveyor's expertise was also recognised in construction, road building and general development. With the growth of cities, particularly as a result of the First and Second World Wars, the surveyors' expertise in urban planning, land development and construction was confirmed. This was particularly the case after the Second World War, with the major focus on infrastructure building of large projects such as the Snowy Hydro-electric Scheme. This resulted in a golden era for surveying. This saw an increased emphasis on the measurement aspect of surveying, both in engineering surveying and national mapping. This golden era saw geodesy, photogrammetry and mapping completely overshadow the ongoing role of the surveyor in land development and land management, even though these activities continued. This national need saw the growth of many university or college degrees in surveying, where the primary focus was on measurement, with often only token attention given to cadastre or land management.

The 1960s, 1970s and 1980s saw the increasing impact of technology, and particularly measurement, positioning and information technology, on the profession. During the latter part of the 20th Century land and geographic information systems and spatial data infrastructures became the focus and assumed a high profile in the profession. Today most of the developments in Australia in these areas are still being promoted by members of the surveying profession. Importantly the surveying programs around Australia eagerly adopted these technologies and provided leadership in their use in the wider Australian community.

However, while the surveying profession still maintained a leadership role in the new spatial information technologies in the latter part of the 20th Century, including the Institution of Surveyors Australia, due to the focus of the Institution on its traditional cadastral base, other professional bodies and learned societies also moved into these areas. The surveying profession lost its core responsibility of planning with the growth of the planning profession and the Royal Australian Planning Institute. Interestingly this did not happen in some countries, with Scandinavian countries being prime examples.

At the same time the Institution of Surveyors, Australia lost the high ground on mapping, and engineering and mining surveying, as well as spatial information management. This period saw the growth of the Australian Institute of Cartographers (now the Australian Institute of Mapping Sciences) and the Australian Institute of Engineering and Mining Surveyors, as well as the establishment of the Australasian Urban and Regional Information Systems Association.

At the end of the 20th Century, while many surveyors are still playing a leadership role in the emerging geospatial information technologies, the profession has become fragmented and the flagship of the profession, the Institution of Surveyors Australia, has not fully accepted the changes in the discipline. The perception is that it is still driven by cadastral surveying and land development interests. Unfortunately the cadastral surveying interests in the profession have in general not operated at a senior policy level, with the profession still primarily driven at the practical and technical level within a relatively narrow perspective of cadastral surveying and land development.

The above changes during the last decade of the 20th Century were within the context of all governments in Australia adopting micro-economic reform and society increasingly being driven by information technology as Australia comes to grips with its position in a global world.

Some of the important lessons from this brief historical review are that the underlying philosophy of the profession has not changed; that is measurement science linked to land management and administration. This linkage is still the strategic advantage of our profession. While that linkage and strength was very evident during the 19th Century and the early part of the 20th Century, it had a much lower profile during the golden era of mapping and infrastructure building at the end of the Second World War. However, with the growth in importance of environmental issues and sustainable development, the balance is now returning particularly with the growth of the spatial information industry. This underlying philosophy will continue to be an essential element which will allow our profession to continue to be relevant to society in the decades ahead (Williamson, 1997a).

CHALLENGES TO THE AUSTRALIAN CADASTRAL PROFESSION

While it is possible to understand the reasons for the development of our profession in the past, planning where we are heading in the future is much more difficult. Our changing world and changing technology will inevitably result in changes to our profession. The lessons from the past confirm that change is continuous and inevitable.

In retrospect the surveying profession's legislative cadastral blanket, while important in the past, is arguably now holding the profession back. In many cases the legislative blanket has resulted in a narrow, parochial and often conservative professional perspective. For example

it helped engender a view in many land surveyors for much of the 20th Century that Australia had the best cadastral system in the world. Fortunately this view has changed with the profession actively supporting technological, legal and institutional change in Australian cadastral systems. Any profession that does not recognise its weaknesses and endeavour to continue to pursue continual improvement in procedures, legislation and institutional arrangements has an uncertain future.

Changing technology is also having a dramatic impact on the profession. "Black box" technology has arrived as we move into a virtual world based around a knowledge based society where communication technologies and the World Wide Web permeate every area of activity. More importantly, the spatial paradigm, which has been the cornerstone of our profession, is now permeating many areas of management and information systems.

With the growth of its importance, there is also an unfortunate recognition by many of our bureaucratic and political leaders that this area is now "too important" to be left to surveyors. While many surveyors keep up-to-date, and enthusiastically embrace the modern information era and the rapid data acquisition technologies, these technologies are now not the sole preserve of the surveying profession.

It is now much clearer to see the impact that our changing world and technology is having on the surveying profession. Without doubt in the last century and the early half of this century, the licensing or registration of surveyors gave the profession a very strong professional basis and an important position in society. The profession supported the growth of the Torrens System and played a very significant role in government in providing surveying expertise, generally up to the 1970s. We saw the strength of reciprocity of registration.

While in the first half of the 20th Century surveying qualifications were administered primarily by Licensing or Registration Boards, this changed in the mid-part of the 20th Century with the growth of educational institutions providing university degrees in surveying. However, due to the need for academic credibility, traditional land surveying and land management strengths of the profession usually did not receive a high profile in these programs. In some courses this continued into the latter part of the 20th Century. In general the emphasis has tended to focus more on technology and measurement science, rather than on the maintenance of a balance between measurement science and land related studies in university degrees.

The latter half of the 20th Century saw a dramatic change in the role of government in the profession with deregulation, smaller government and the growth of the private sector. The traditional strength of government in the surveying and mapping area, the influence of Surveyors' Registration Boards and the influence of Surveyors General in general, has declined significantly in the last couple of decades of the 20th Century, with only a few notable exceptions.

These changes have been very positive for the private sector which to some degree has grasped the opportunity, particularly in some states where the government has undertaken massive downsizing or privatisation. At the same time, with fewer cadastral surveyors required as a result of improved technologies and efficiencies, the educational institutions in surveying have struggled for a new identity and a new clientele. Simply the cadastral surveying profession has become a small 'client' for universities with few surveying graduates being taken by this area. As a result the academic institutions have moved rapidly

to assume a leadership role in geospatial information sciences and related technologies, both from a survival perspective and because they saw a business opportunity. They have continued to maintain an international focus with one of the results being the adoption of the term "Geomatics", "Geomatics Engineering" and "Geo-Informatics" in accordance with world trends. All programs still try to service the cadastral and land development profession but this emphasis continues to decrease in many programs.

The dilemma facing the profession can be seen by examining the numbers of surveying graduates from universities who became registered land surveyors. In the 1970s it was about 90% however this has now changed to less than 30% and in some states, as low as 10% in the 1990s. The reality is that the profession's traditional cadastral base is contracting and continues to contract, primarily as a result of increased efficiencies and technology. With the age profile of cadastral surveyors increasing, the future may see a resurgence in demand for young graduates to enter the cadastral field in the next decade, although this change is still not evident. The effect of the reduced demand by the cadastral profession for surveying graduates can be seen in an estimate of the number of graduates:

1960s	50
1970s	200
1980s	300
1990s	150
2000 and later	100 (estimated)

During this time there has been an increasing private sector focus throughout the profession which has been actively pursued and promoted by the Association of Consulting Surveyors Australia (ACSA). At the same time there is a greater alignment between geographic information systems, IT, information systems and the engineering professions, as well as professionals who would have traditionally been surveyors and are increasingly becoming spatial data managers responsible for aspects of spatial data infrastructures. There has also been a trend for these spatial information professionals to become more aware of economic, legal, environmental and social consequences. These trends have seen stronger partnerships and clearer roles developing between government, private and academic sectors in the profession.

It is only a matter of time before the establishment of a College or a Society of Geomatics Engineering within the Institution of Engineers, Australia (ISA).

Unfortunately Australia has not seen a similar change within our peak professional body, the Institution of Surveyors Australia, even though many leaders in the profession have endeavoured to move the ISA in this direction, often to their frustration. The reality is that the profession nationally is still dominated by a "cadastral club" in a traditional sense to the detriment of other existing and emerging opportunities for the profession. If this is not the reality, it is the perception, especially after the decision not to amalgamate the ISA at the 38th Annual Surveyors Congress in Newcastle last year, with the other spatial information professional bodies. While licensing and registration to undertake cadastral surveys is obviously still important, and will continue to be important for many years to come, it is a fact that its influence and its control over the surveying profession have dramatically reduced over the last couple of decades.

The reality is that the world, as does the humankind-land relationship, continues to change with the rate of change increasing. The change is continuous and is facilitated by a combination of political, economic and technological factors.

What are the options for the land surveying profession? Is it pessimism and regulation to maintain our "patch" in survival mode? Or is it optimism, grasping all opportunities as they arrive and expansion of the discipline?

A FUTURE SCENARIO

In trying to envisage the role of the professional land surveyor in ten years' time it is important to try and understand what society in Australia will look like in ten years' time:

we will live in a virtual world

society will be very mobile

economics will still be the driver of society but it will be increasingly tempered by environmental and social imperatives

we will be part of the global world

there will be clear divisions between government, the private sector and the role of universities

the role of the private sector will permeate all activities

we will increasingly adopt risk management within a quality culture

In this scenario society will still need:

a place to live and work,

to manage our cities,

to manage the land and marine environment, and

to build and maintain physical infrastructure.

Within these needs, society will have specific spatial needs. That is society will need expertise to design, build and manage our spatial world. In particular this will require:

the designing, building and managing of spatial data infrastructures,

the designing, building and managing of spatial business systems for the natural and built environment,

the designing, building and managing urban and rural habitation, and

the designing, building and managing measurement systems.

Figure 4

This results in a growing need for a profession which is responsible for "designing, building and managing the spatial dimension of our natural and built environment through a strong engineering paradigm" (Figure 4). The core of this profession is spatial information management which is supported by:

measurement science

spatial information science

land administration and land management

The synergy from this mix has its roots in the relationship of measurement to land early in the last century which is still the key which gives our profession its strategic advantage. This

profession will increasingly have a strong design, build and manage focus which it shares with other engineering professions. This vision can be seen conceptually in how Geomatics is approached at the University of Melbourne.

The core disciplines in Geomatics are:

Geomatics engineering
Surveying, mapping and measurement science
Remote sensing
Spatial information systems
Cartography and presentation graphics
Land administration, land development and land management
Professional studies

The Department of Geomatics has also adopted a strategy of using combined degree structures to promote the different directions in which the discipline is heading. All combined degree programs permit graduates to become Licensed Professional Land Surveyors (members of The Institution of Surveyors, Australia) and Chartered Professional Engineers (members of The Institution of Engineers, Australia). While the

basic Bachelor of Geomatics is a four year full time degree, most students study five year combined degree programs where they usually specialise as follows (although any discipline can be combined from the generalist degrees with Geomatics):

BGeom/BSc Geomatics and Computer Science

BGeom/BSc Geomatics and Environmental Science

BGeom/BA Geomatics and Geography

BGeom/BA Geomatics and Environmental Studies

BGeom/LLB Geomatics and Law

BGeom/BInfoSys Geomatics and Information Systems

The Department is currently negotiating a new combined degree program to focus on educating professionals specifically for the property and development market. This will be with a new Bachelor of Property and Development taught by the Faculty of Architecture, Planning and Building.

BGeom/BPropDevel Geomatics and Property and Development

Within Geomatics, cadastral issues have had a significant resurgence as indicated previously. This is also reflected in current cadastral research being undertaken at the Department of Geomatics in the University of Melbourne as follows:

the changing relationship of humankind to land
the effect of adverse possession to "part" on the operation of land markets (as a result of the effect on boundary definition)
the role of the cadastral component in spatial data infrastructures

metadata engines, cadastral data and spatial data infrastructures

cadastral data and the WWW

digital lodgement of cadastral data

urban information systems

Importantly, aspects of the cadastral systems in Australia which have been taken for granted and often been exported overseas have never been fully analysed and researched. For example the effect of adverse possession to "part" within title legislation has never been examined to any significant degree, particularly as it impacts on cadastral surveying, boundary definition and the operation of land markets. This is a good example since the inclusion or deletion of one or two sections in "Torrens" legislation can have a dramatic impact on the operation and efficiency of a cadastral system and particularly the cadastral surveying system.

Current research into this area identifies the two extremes where Victoria permits adverse possession as to "part" whereas New South Wales does not. What is the effect of this on the operation of land markets? To what extent are identification surveys a result of this legislative position? What effect does this have on survey and plan examination? What effect does this have on the design of the State's digital cadastral database? What effect does this have on national cadastres or a national digital cadastral database? What effect does this have on a desire for common cadastral legislation across Australia?

The reality is that it can have a very significant effect on all these aspects. But it does not just affect Australia. Those countries which have imported the Torrens System must fully understand the impact of importing either a "New South Wales" or "Victoria" system. These differences can in fact affect whole segments of a nation's economy.

IMPACT ON THE INSTITUTION OF SURVEYORS AUSTRALIA

As argued, the Institution of Surveyors Australia is still dominated by a "cadastral club", but this is changing. On the other hand the spatial information professions are still fragmented, but there is an increasing recognition that they must amalgamate to get stronger or they will significantly reduce their influence. Professions are being deregulated and the roles of Boards of Surveyors are changing. Simply less and less surveyors over the last couple of decades have moved into the cadastral surveying area, the province and strength of the Board of Surveyors. One result has been the decline in the membership in the Institution of Surveyors Australia. Simply the ISA is not generally attracting spatial information professionals, but it is not too late since much of the spatial information industry is still being driven by surveyors who maintain an allegiance to the ISA; but this will increasingly reduce over time.

The surveying departments in universities around Australia have changed their focus and role over the last decade in particular. This is an opportunity for the ISA, not a threat.

As argued above, in ten years society will still require a spatial information profession – ideally this should be controlled or coordinated by the Institution of Surveyors Australia or it should grow out of the Institution of Surveyors Australia.

At the same time the Institution of Surveyors Australia has played a very significant leadership role internationally over the last decade. This gives the ISA a very strong foundation as Australia is increasingly affected by globalisation in the international marketplace.

There is an opportunity for the ISA or whatever body evolves in the next decade to accredit spatial information professionals. These professionals must grasp the spatial data infrastructure agenda in a similar way to the academic institutions, particularly regarding the role of cadastre in spatial data infrastructures. The surveying profession must provide leadership in the changing relationship of humankind to land. The leadership the profession has played, particularly in Queensland, but supported nationally, in the Mabo and Wik debate is very positive.

In summary, the above trends will force the ISA to consider or re-consider the following for its survival and growth:

The need to amalgamate all spatial information professions to form one spatial information organisation in Australia. A new term may be required to describe the new body; geomatics and spatial information sciences are two options.

A growing relationship between the surveying (geomatics) profession and the engineering profession. One possible outcome is an amalgamation between ISAust (or the new amalgamated body) and IEAust. Another outcome is the establishment of a College of Geomatics Engineering.

A continuing relevance of cadastral surveying and registration (or licensing) of cadastral surveyors, but this could be accommodated in a "Cadastral Surveying Commission or Society", within a larger body.

The need to accredit all spatial information professionals by a national accreditation authority.

The need for rigorous accreditation of all surveying or geomatics or spatial information science programs in universities by a national organisation.

CONCLUSION

The message from this presentation is that change is constant and inevitable, and as a result our profession must change to survive and grow. However, the underlying philosophy of our profession, that is the relationship between measurement and land, has not changed. This is our strength and our strategic advantage. So while the traditional image of our profession must change for our survival, as is occurring in the education institutions and in many private sector companies as they move to grasp the growing opportunities being presented to them, there should be great optimism about the future.

At the same time the importance of cadastre and parcel based land information systems has never been stronger. The profession has an excellent opportunity to build on its traditional cadastral strengths to ensure it remains at the forefront of spatial information developments. At no time in my surveying career, which is now into its fourth decade, have I been more positive and as excited about the future of our profession and discipline.

So while there should be great optimism about the future of our profession, such a vision will only be achieved by those who understand our history, understand what is happening in the world around us, recognise that change is constant and inevitable, and reach out and grasp the opportunities.

REFERENCES

FIG (1995). Statement on the Cadastre, International Federation of Surveyors. FIG Bureau (1992-95), Canberra, Australia, pp22.

Kaufmann, J. and Steudler, D. (1998). Cadastre 2014, Working Group 7.1, Commission 7, International Federation of Surveyors (1994-98), pp51.

Ting, L. and Williamson, I.P. (1998). "Cadastral and Land Administration Trends". In preparation for AGENDA .

Ting, L., Williamson, I.P., Grant, D.M. and Parker, J. (1998a). "The evolution of western land administration systems". In International Conference on Land Tenure in the Developing World, 27-29 January, 1998, Cape Town, South Africa, University of Cape Town, 536-548.

Ting, L., Williamson, I.P., Grant, D.M. and Parker, J. (1998b). "Understanding the Evolution of Western Societies' Land Administration Systems: a basis for cadastral reform". Submitted to The Survey Review, pp17.

UN (1996a). The Bogor Declaration on Cadastral Reform, United Nations-FIG Interregional Meeting of Experts on the Cadastre, Bogor, Indonesia, Published by Land Information Centre, NSW, Australia, pp16.

UN (1996b). Report of United Nations/FIG Interregional Meeting of Experts on the Cadastre, Bogor, Indonesia, Published by Land Information Centre, NSW, Australia, pp36.

Williamson, I.P. (1997a). "The Future of The Surveying Profession - An Australian Perspective". GEOMATICA 51, 387-399.

Williamson, I.P. (1997b). "The Justification of Cadastral Systems in Developing Countries". GEOMATICA 51, 21-36.

Williamson, I.P. and Ting, L. (1998). "Cadastral trends - a synthesis". In Cadastral Congress, 17-20 November, 1998, Commission 7, International Federation of Surveyors, Warsaw, Poland, pp15.

Many of the references indicated in this paper are available on the WWW at http://www.sli.unimelb.edu.au/research/publications/IPW_publ.html