

Cadastre as the Basic Tool for Land Administration – Need for a Big Leap Forward

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Key words: Cadastre 2014, Needs of modern Societies, Better Services, mental change.

SUMMARY

In 1998, FIG-Commission 7 published its brochure Cadastre 2014 – A Vision for a Future Cadastral System. In the same time the term Land Administration was launched by the UNECE Working Party for Land Administration. It seemed, that cadastre will be replaced by Land Administration.

The presentation shows that cadastre is an important tool for Land Administration and that there is a need to develop the traditional parcel-based cadastre to a registration system taking into consideration all demarcated land, land use and environment protection rights and restrictions as proposed in 'Cadastre 2014'. A mental change, both in the profession and its environment must take place helping to do the big jump forward to deliver the services needed by modern societies.

ZUSAMMENFASSUNG

Im Jahre 1998 veröffentlichte die FIG-Kommission 7 ihre Broschüre – Kataster 2014 – Eine Vision für ein zukünftiges Katastersystem. Etwa zur selben Zeit wurde der Ausdruck Land Administration von der Vorgängerorganisation der UNECE Working Party for Land Administration lanciert. Es schien damals, dass der Kataster durch die Land Administration ersetzt werde.

Das vorliegende Papier zeigt, dass der Kataster ein wichtiges Werkzeug für die Land Administration ist und dass die Notwendigkeit besteht, den traditionellen, rein auf das Grundstück bezogenen, Kataster zu einem Dokumentationssystem zu entwickeln, in dem alle räumlichen Abgrenzungen betreffend die Rechte und die Pflichten gegenüber Land im Zusammenhang mit Eigentum, Nutzung und Schutz registriert werden können. Ein solches System schlägt Cadastre 2014 vor. Ein mentaler Wandel für den Berufsstand und dessen Umgebung muss herbeigeführt werden, den grossen Sprung vorwärts herbeizuführen der zur Befriedigung der Bedürfnisse moderner Gesellschaften notwendig ist.

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1. INTRODUCTION

The world, its different cultures, and its political and economic systems are in a permanent development process. This process is driven primarily by the activity and the creativity of humankind. New medical and technical possibilities have impacts on life, on the way of living, and on the way of doing business. One effect of this development is the growth of the world's population. More and more people are to be provided with food and water, housing, household and transport equipment, energy, etc. An increasing number of people are demanding leisure activities and facilities. The demand for waste removal, water cleaning, and recycling materials is increasing.

This development leads to an increase in the consumption of natural resources, particularly of land. It has been acknowledged that disorganized consumption of natural resources will lead to a degradation of nature, of the natural world, of the environment, and finally of humankind. Efforts are being made to encourage sustainable development. That means that development should be undertaken in such a way that a minimum of resources are consumed. It is the main goal of Agenda 21 to improve awareness of and introduce measures for a sustainable development of humankind in harmony with the environment.

As land is an important part of nature and the environment is the basis for nutrition, housing, energy production, resource exploitation, leisure activities, waste disposal, economic activities - in short for the maintenance and survival of humankind - cadastres are a crucial aspect of sustainable development. Traditional cadastre systems, however, can no longer meet the high standards set by sustainable development. There is a need to adapt the currently successful operating cadastral systems to the new standards and to implement improved cadastral systems where no such infrastructure exists. This is one reason for the many ongoing cadastral reforms and efforts in the world. Unfortunately the changes are often not rigorous enough and a lot of human resources and financial means are invested with questionable results.

2. LAND POLICY, LAND MANAGEMENT, LAND ADMINISTRATION AND CADASTRE

To be able to use land and natural resources in a sustainable manner, a jurisdiction has to define a comprehensive Land Policy. To implement the policy, Land Management is necessary. Land management must base on Land Administration which is defined as 'the processes of determining, recording and disseminating information about the tenure, value and use of land when implementing land management policies'. Land Administration as Business Administration must be able to fall back on a reliable Bookkeeping System, which

provides the Administrators with correct, complete and up-to date information. The cadastre plays the role of this important bookkeeping system of the land business.

Level	General	Land/Ressource Business
Strategic (goal setting)	Policy: Sound economic development	Land Policy: Land Market, Sustainable development
Management (measures to meet strategy)	Company management	Land management (ressource management)
Administration (business processes)	Administrative Unit	Land Administration
Operation (tools for documention and monitoring)	Accounting system <ul style="list-style-type: none"> • accepted principles of bookkeeping • reliable • complete • appropriate to needs • adaptable to development 	Cadastre <ul style="list-style-type: none"> • accepted principles of documentation of rights/restr. • reliable • systematic • appropriate to needs and laws • adaptable to development • public

Figure 1, Land Business

Like the successful operation and development of a business is based on a well developed administration system the Land Business aiming at sustainable development of humankind must be supported by a complete land administration system (Figure 1). Like in a business administration system, the Land Administration System must be based on a land bookkeeping must obey clearly defined rules that are valid world-wide in principle, and may be adapted in detail to accommodate national and cultural peculiarities.

Future cadastral systems will provide this bookkeeping function to support decision-making and sustainable development. The principles of a cadastre are acknowledged world-wide. The details can be adapted to meet the needs and traditions of a particular country. Land management needs reliable information about the existing land and its resources and about the legal situation of these items. This information will be provided by future cadastral systems. Cadastres will be the basis for land administration systems that will support the world’s hopes for sustainable development.

3. CADASTRE 2014, THE BOOKKEEPING SYSTEM FOR THE LAND BUSINESS

3.1 Terms of Reference and Result

FIG, aware of the need for change in the cadastral domain and of the efforts in cadastral reform, initiated at the Melbourne 1994 FIG Congress by its Commission 7 the Working Group 7.1. The terms of reference for this Working Group were to:

- Study cadastral reform and procedures as applied in developed countries, take in consideration automation of the cadastre and the role of cadastre as part of a larger land information system, evaluate trends in this field and produce a vision of where cadastral systems will be in the next twenty years, show the means with which these changes will be achieved and describe the technology to be used in implementing these changes.

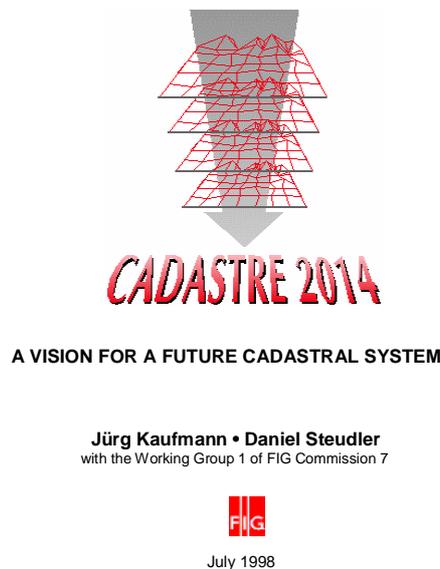


Figure 2: Cover of the publication on Cadastre 2014

Vision for a Future Cadastral System' [Kaufmann, Steudler, 1998]. (Figure 2). It was presented 1998 at the FIG Congress in Brighton.

Since 1998, the brochure was translated into more than 20 different languages. In 2001 FIG had to provide a second edition because the first was sold out.

3.2 Need for new Cadastral Systems

The investigations carried out made clear that the documentation and registration of private land rights referring to land parcels does not provide enough information to assemble a complete picture of the legal situation of land. The legal environment has changed remarkably in the last few decades. Societies introduced new laws concerning physical planning, protection of the environment, and the exploitation of limited natural resources. This process is going on and it can be considered as a fact that further legal regulations will and must be implemented.

All these regulations on one hand touch the absolute rule of the land owner, on the other hand create an unclear legal situation of land. This may in a medium term threaten the land market and hinder a sustainable development. Cadastral systems provide economies with credits secured by mortgages. In Switzerland for example more than 60% of loans in a value of

about 500 billion Swiss Francs are secured by land. Legal uncertainty can change this important role of land for the economies.

In view of the new possibilities of information and sensor technology services from cadastral systems can become more efficient and comprehensive as they normally use to be.

Modern cadastral systems must therefore be designed to be able to:

- give reliable and complete information on the legal situation of land by taking into consideration all legal impacts on land;
- adapt to the changing needs of societies by flexible organizations and well defined information structures and data models;
- work straight forward and efficiently by making use of appropriate technology;
- achieve best practice and flexibility by bundling the strengths of the public and private stakeholders;
- be run at minimum cost for citizens and communities.

To meet these requirements the principles for modern cadastral systems were developed.

4. PRINCIPLES OF CADASTRE 2014

4.1 Definitions

Cadastre 2014 applies the proven principles of the traditional cadastre but enlarges the objects to be processed by the cadastre and the content of cadastral systems.

Traditional Definition	Definition of Cadastre 2014
Land Parcel	Land Object
A land parcel is a piece of land with defined boundaries, on which a property right of an individual person or a legal entity applies.	A land object is a piece of land in which homogeneous conditions exist within its outlines. The legal land objects are described by the legal content of a right or restriction and the boundaries which demarcate where the right or restriction applies

Figure 3 New Definition Land Object

The new objects to be processed are the land objects. Land parcels are one category of land objects (Figure 3).

Traditional Definition	Definition of Cadastre 2014
Cadastre	Cadastre 2014
Cadastre is a methodically arranged public inventory of data concerning properties within a certain country or district, based on a survey of their boundaries.	Cadastre 2014 is a methodically arranged public inventory of data concerning all legal land objects in a certain country or district, based on a survey of their boundaries

Figure 4 New definition of a modern Cadastre

The new cadastre shall comprise not only the land parcels but all land objects in a defined area (Figure 4).

4.2 Principle of the Documentation of Private and Public Rights and Restrictions

The most important statement on Cadastre 2014 is:

Cadastre 2014 will show the complete legal situation of land including public rights and restrictions!

All land objects emerging from a law – and not only the land parcels as objects describing the property right - are to be carefully defined, verified, and kept in a public register.

The actual situation in the traditional parcel-based cadastres is characterized in figure 5.

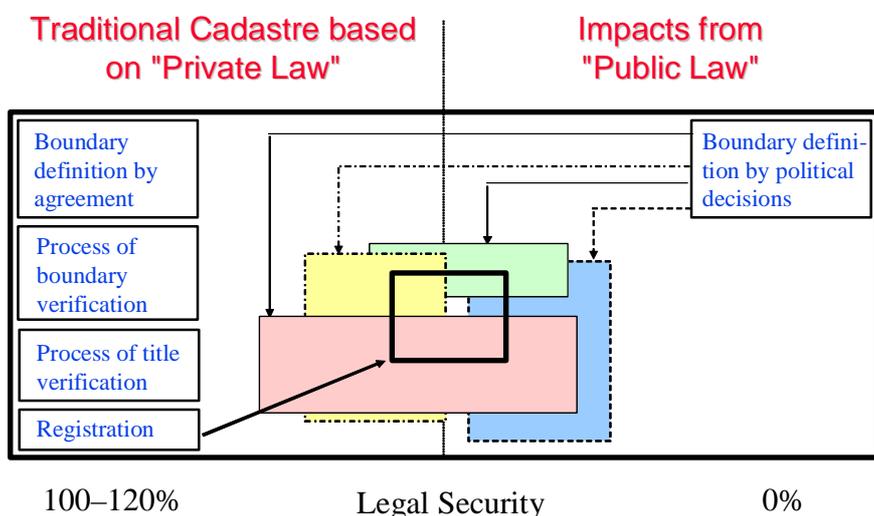


Figure 5 Lack of legal Security

Future cadastres shall correct this dangerous situation by applying the principles of cadastral systems on all legal land objects (Figure 6).

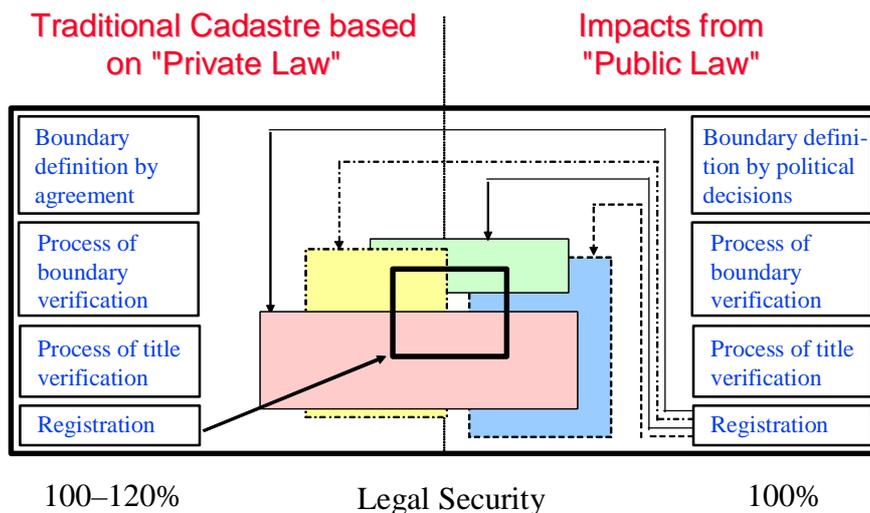


Figure 6 Cadastre 2014 documenting properly land objects defined by private and public

4.3 Principle of legal independence

The future complete documentation of the legal situation of land must respect the principle of legal independence, which is shown in figure 7.

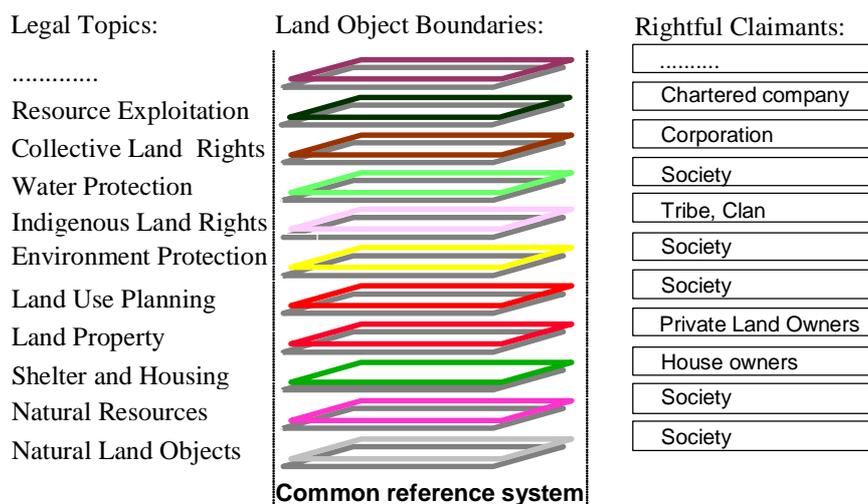


Figure 7 The principle of legal independence

The different legal land objects are to be arranged according to the laws by which they are defined. This structure allows the immediate adaptation of the cadastre to the development of the legislation. It is not necessary to rearrange the information. New legal topics can simply be added by including a further information layer.

This process can be compared with the bookkeeping system. A new account for the administration of the new Land Objects is introduced because a law defines a new category

of assets being part of the Land Business. An abrogation of a law would mean the removal of an account in the system. This happens unfortunately not to often.

4.4 Principle of Independent Topics

The realisation of the principle of legal independence results in the geometric independence. Land Object are arranged in legal topics. There is no link between Land Objects in different topics. Links between Land Objects are not stored in the system but created when needed using the fact that the Land Objects are located in the same area.

Figure 8 shows how polygon overlaying techniques help to create links between land objects.

Cadastre 2014 helps to resolve the problem when land and houses are no immovable unit. This situation occurs often in the countries in transition, where the land used to belong to the state and the houses belong to the citizens. Even when land privatisation is intended, this process takes time. Cadastre 2014 documents the rightful claimant of the land parcel independently from the rightful claimant of the house. If both objects have the same owner the parcel and the house may be considered to be a immovable property.

This technique is very favourable from the point of view of updating. There are no links to be administered and kept up-to-date. Links are created when needed.

Using this principle means to say good by to the parcel-based cadastral systems of the past.

LINKING LAND OBJECTS BY POLYGON OVERLAYING

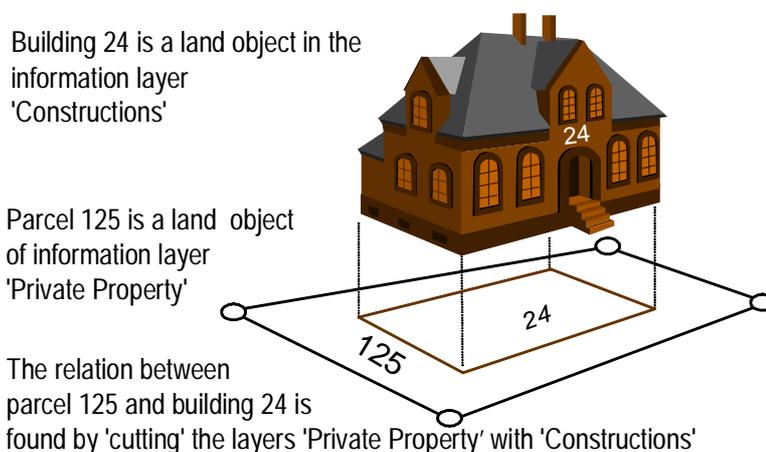


Figure 8 Finding relations between Land Objects by the 'Overlay Technique'

The future cadastral systems are therefore no longer parcel-based.

4.5 The principle of unified Cadastre and Land Registry

A second statement of Cadastre 2014 says:

The separation between 'maps' and 'registers' will be abolished!

The establishment of separate organisations for map production and land registration was often necessary because the two operations used to require different skills, and the available technology did not allow for other solutions. With modern technology (IT) it is possible to link land objects directly with the information needed for registration. The often practised separation of the physical and organisational structure will become unnecessary.

4.6 The principle of Cadastral Modelling

'Cadastral mapping' will be dead! Long live modelling!

The idea to replace the good old maps by virtual models is a mental challenge for the professionals used to think in graphical categories. Information technology works with digital data and provides the ability to model objects of the real and legal world. Maps as analogue representations will lose their function as information storehouses; their only purpose will be the representation of information. In future we will have increasingly different graphic representations as extracts of the cadastral model tailored to the needs of the individual customer. To store maps as a picture on a computer is therefore an archaic operation.

4.7 The principle of IT application

'The paper and pencil cadastre' will be gone!

This statement implies that the best technical tool for bookkeeping is IT. You can see the automation of business processes all over the world and you cannot find any cadastre project in the world where information technology is not involved. IT makes work easier and is the only way to achieve, what nowadays is called a low-cost cadastre.

4.8 The Principle of Privatisation

The trend to privatise the operational work to be executed in the field of cadastre is reflected in statement five:

Cadastre 2014 will be highly privatised! Public and private sectors are working closely together!

This is a fundamental trend. The public domain will nevertheless have to provide secure land titles but it will outsource most operational work and concentrate on supervision.

4.9 The Principle of Cost Recovery

Finally, in statement six the aspect of cost recovery which is also an international trend, is expressed:

The cost of Cadastre 2014 will be recoverable!

A functioning cadastral system represent a considerable value for a society. The awareness that public and private sectors have to cover their cost, leads to efforts to implement cost covering fees in the field of cadastre. Because cadastre is a long-term investment the depreciation period for the initial investment can be longer than for normal goods.

5. APPROPRIATE SERVICES FOR MODERN SOCIETIES

5.1 Avoid Fruitless Discussions

Modern societies need a reliable bookkeeping system for the scarce resource land. It documents facts and therefore avoids disputes. Political processes and sustainable development is often hindered by fruitless discussions. Future cadastral systems document all facts in an indisputable manner.

5.2 Better Decisions in a Shorter Time

Decisions can be taken on the basis of complete and reliable information. This accelerates the implementation of the decisions taking into consideration a correct situation.

5.3 Modelling the Future and avoid Regulation Overload

Because Cadastre 2014 provides a reliable and clearly defined model of the existing situation, the effects of planned measures can be tested in the model. Erroneous decisions can be avoided.

The danger of too much and/or inconsistent regulations hampering development, can be banned, when effects of regulations are assessed based on a model. Over-regulation and inconsistency may be identified with the help of complete and reliable cadastral information in an early stage of action.

5.4 Save Resources for Data Preparation

The time consuming acquisition of base data, which today often amounts up to 75 to 80% of the total project duration, will not be necessary when the cadastre provides complete and reliable information. Projects can be implemented in shorter periods. Money and human resources can be saved (Figure 9).

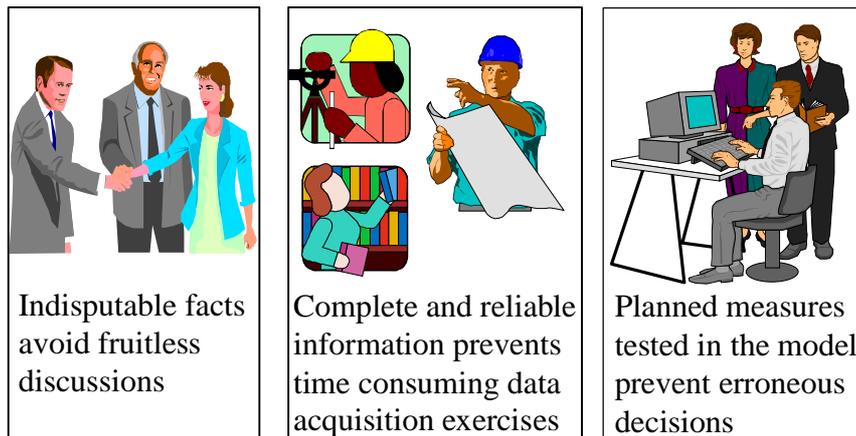


Figure 9 Effects of Cadastre 2014

6. FIRST STEPS ARE UNDERWAY

After the publication the brochure was translated into more than 20 languages. In different countries the ideas of Cadastre 2014 are discussed and first steps in view of a new cadastral system are undertaken.

In Switzerland for example the professional organisation has created pilot models of the topics emerging from the federal law. Different system suppliers have developed prototype software for cadastre 2014. The new form of information for the land owners and investors is shown as an example in Figure 10.

A Task Force Cadastre 2014 was launched in cooperation with the Federal Office for Land Rights and Land Registration. The Task Force will study the legal aspects and the necessary improvement of the legal framework for a development of the cadastral system in a new direction.

An example

Municipality	A-Dorf	Plan Nr.	8
Parcel Nr.	850	Fläche	1151 m ²
Owner:	Hans Muster Bdorfstrasse 12 9999 A Dorf		
Description	Hausplatz, Umschwung, Weg	Wohnhaus Nr. 12 Gartenhaus Nr. 12 A Geräteschuppen Nr. 12 B	
Encumbrances:			
	<i>R/L</i>	<i>R=Rechte</i>	<i>L=Lasten</i>
Private Law	R	Bauverbot z.L. 184	02.10.1924 3735
	L	Bauverbot zG 184	17.02.1926 4180
	L	Wegrecht zG 184	02.10.1924 I/3735
			06.04.1927 I/4502
	R	Zugangsrecht zu Verbindungstreppe zL 2237	08.04.1952 II/4484
Restrictions:			
Public Law	BauV, Art. 13a	Bauinventar schützenswert	
	BauV, Art. 13a	Bauinventar Situationswert	
	BauG, Art ...	Wohnzone W2	
	Bauabstand Staatsstrasse	
	LSV	LSV Zone III	
	KwaG, Art 25	Waldabstand	

Figure 10 Example for information about private and public law impacts on a land parcel

7. A BIG LEAP FORWARD IS NEEDED

Surveyors have successfully managed the traditional, parcel-based cadastral systems for the last centuries. They must develop their service for the modern societies, basing on the successful principles of the traditional cadastre. They must understand, that these principles may be applied on a wider range of legal land objects. Only reliable and complete information about the situation of land supports sustainable decision-making successfully.

Surveyors must say good by to the good old parcel-based traditional cadastral system. Additional skills are needed to understand the Land Objects as the medium for right and restriction definition. The services of a modern surveyor consist not any more of creating maps but of the preparation of data representing a model of the reality which helps political discussions to be focused on the really existing problems and the possible solutions. The modern surveyor provides the society with relevant facts.

It must be understood that the geometry helps to link objects instead of using direct links. This makes the complex model much simpler and the up-date processes much more efficient.

The modern surveyor knows to apply the information technology consequently he is a specialist in data modelling and understands to apply the principle of legal independence. He guarantees the efficient and flexible operation of the modern cadastre system.

The modern surveyor contributes to public and private sectors cooperation making a modern a smooth efficient tool in the hands of a society.

Cadastre 2014 shows the way how services of the cadastre can be improved. The profession has to take the opportunity and to undergo a mental change.

BIOGRAPHICAL NOTES

Jürg Kaufmann

Date of birth: 22. August 1942

Nationality: Swiss

Education

- Federal Institute of Technology ETH Zürich, Rural Engineering and Surveying, Diploma 1967
- Diploma of Mössinger Business-School, 1965
- Licence as Swiss Federal Licensed Surveyor, 1981

Languages

- German, English, French, Italian

Consulting Experience

- Member Project Management Board of 'Reform of the Swiss Official Cadastral Surveying'
- Consultant GIS/Cadastral/Land Administration to authorities in Switzerland and the Principality of Liechtenstein
- Consultant for Cadastral/LA Projects in Belarus, Ukraine, Georgia and Kosovo

Professional Experience

- since 1988: Independent Consulting Engineer, *KAUFMANN CONSULTING*
- CEO Keller Survey Ltd. and CEO Digital Ltd., Geomatics Services

FIG activities

- Delegate of Switzerland FIG, Commission 7, Cadastre and Land Management
- Member of working group 'Statement on the Cadastre'
- Chair of working group 'Cadastral reform and procedures; Cadastre 2014', 1994-1998
- Chair of working group 'Benchmarking Cadastral Systems', 1998-2002

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