

A Systems Approach to Land Registration and Cadastre

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***Abstract.** The article is based on the dissertation ‘Systems of Land Registration – Aspects and their Effects’ (Zevenbergen 2002), which applies the systems approach to the field of land registration and cadastre. It focuses on the technical, legal and organisational aspects, and their interrelation, of such systems of land registration. It includes a case study of four countries (the Netherlands, Indonesia, Austria and Ghana). The system of land registration is modelled, both by a static and by a dynamic model. The three main functions from the latter model (adjudication, transfer and subdivision) are elaborated as well. The importance of emergent properties within the systems approach is introduced; the example with regard to land registration being ‘trustworthiness’.*

***Keywords:** land registration, cadastre, systems approach, static and dynamic model*

1 Introduction

Land registration and cadastre together play an important role in a society, as long as they function well and fulfil the goals set by that society. Although different countries and experts have different opinions, the following descriptions of land registration and cadastre, including the strong relation between them (also depicted in Figure 1), are generally accepted:

Land registration is a process of official recording of rights in land through deeds or title (on properties). It means that there is an official record (the land register) of rights on land or of deeds concerning changes in the legal situation of defined units of land. It gives an answer to the question “who” and “how”.

Cadastre is a methodically arranged public inventory of data concerning properties within a certain country or district, based on a survey of their boundaries. Such properties are systematically identified by means of some separate designation. The outlines or boundaries of the property and the parcel identifier are normally shown on large scale maps which, together with registers, may show for each separate property the nature, size, value and legal rights

associated with the parcel. It gives an answer to the questions “where” and “how much”. (Henssen and Williamson 1990, p. 20.)

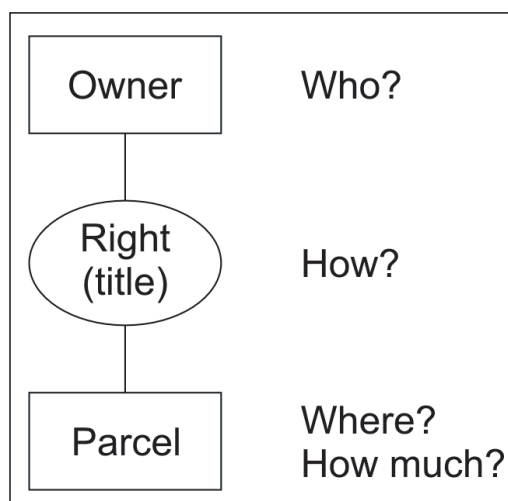


Figure 1. Core entities connected

In many cases the land registration and cadastral functions are organised independently, and regularly they are not co-operating in the most effective way. Improvements, both technological and others, in quite some cases only mend one or a few links in the chain formed by land registration and cadastre. Often not even the weakest link.

To fully understand land registration and cadastre, however, it should be treated as an integrated system, and be studied, analysed and improved in its wholeness. This is done in more and more publications, although this integrated system is called by different names, like

- land administration system (which usually includes (some) value and land use related information as well, e.g. Twaroch and Muggenhuber 1997 and publications by MOLA/WPLA¹)
- cadastral system (Silva and Stubkjær 2002, p. 410; Bogaerts and Zevenbergen 2001, p. 327)
- system of land registration (Zevenbergen 2002 and this article, where sometimes land registration is used when meaning the whole system).

The system of land registration, as used here, is based on the systems approach. It should never be seen as an aim in itself, and one should always keep

¹ Meeting of Officials, later Working Party, on Land Administration, working under the auspices of the UN ECE (European Council for Europe), www.unece.org/env/hs/wpla.

the goals of it in mind. Although the goals could be manifold, the focus here is on supplying legal security of land rights (to right holder and potential buyer).

In this article a short introduction is given into the systems approach and the system of land registration, including a static and a dynamic model of the system of land registration. The three main functions of the dynamic model (adjudication, transfer and subdivision) are further elaborated. Finally 'trustworthiness' is presented as an emergent property of the system of land registration. Emergence is a term used to describe an attribute contributed to the system as a whole and not to one or more elements as such.

2 Systems approach

The tendency within the field of land registration and cadastre to approach the object of study with a lot of emphasis on relative details, has led to one-dimensional classifications (like deeds versus title registration or fixed versus general boundaries). To break away from this, there is a need for a framework to approach land registration as much as possible as a whole. Such a framework can be found in the 'systems approach'. A characteristic of the systems approach is that a system is studied with emphasis on the relations between its elements and the common goal this wholeness is aimed at. Traditionally subsystems are studied separately, with the idea to later put the parts together into the whole. According to the systems approach this is not possible and the starting point has to be with the total system. (Kast and Rosenzweig 1970, p. 115.)

There are many definitions of systems. Virtually all of them include the idea of wholeness, and the idea of (inter-)relation between components. A part of the definitions adds to this the idea of purpose towards which the activities of the system and its parts are working. (Keuning 1973, p. 56-57.) Thus, for the purpose of studying land registration, a system is "a set of elements together with relationships between the elements and between their attributes related to each other and to their environment so as to form a whole that aims to reach a certain goal." (Zevenbergen 2002, p. 87.)

'Whole' is the most fundamental word in the definition. The 'system as a whole' is more than its parts together. Groups of elements have attributes that are only meaningful when they are attributed to the whole, not to its parts. And although they are derived from its component activities and their structure, they cannot be reduced to them. These attributes are the so-called emergent properties. This principle of emergence can be seen for instance with the smell of ammonia, the picture emerging from a completed jigsaw, the self-awareness of a brain or the vehicular potential of a bicycle. (Hitchins 1992, p. 10.)

The system of land registration, being a so-called open system, can be depicted as a 'black box' in an input - throughput - output model. Since the focus is on increasing the legal security of people holding interests in land with the system of land registration, the input into the system is the (factual) land tenure situation and the output the legal security (Figure 2).



Figure 2. System of land registration as a black box

Another way to look at the system of land registration would be to see it primarily as an information processing system, with for instance ‘agreement’ as input and ‘information’ as output. However, this undervalues the importance of land registration in providing legal security for persons holding or purchasing rights in land. The ‘information’ is not the end product, and should be included within the system.

Although the systems approach teaches us to look at the whole first, it allows for identifying and studying part systems. Two types of part systems exist: subsystems and aspect systems. A subsystem consists of a part of the elements of the system, where we consider all relations in that part of the system. In an aspect system, however, we consider only a part of all the relations that can be found between the elements, and neglect the rest of the relations. With regard to systems of land registration a first division in subsystems would be one subsystem land registry and one subsystem cadastre, which is mirrored by institutional arrangements in for instance Austria. In Austria both subsystem clearly cooperate and exchange information (even share a database), making it very useful to see the whole as one system.

Regarding the aspect systems of the system of land registration, Zevenbergen (2002) focused on three of those, being the technical, legal and organizational aspect systems². Studying each of the aspect systems separately is done by the relevant aspect disciplines (like surveying and database technology; law (jurisprudence); and sociology and management science). However, to ‘make a land registration go round’ it is not enough to look at it from one aspect system. Doing that is likely to lead to a suboptimal solution or strengthening the wrong link in the chain (not the weakest). The interrelations between the different aspect systems play an important role, and they are constantly influencing each other. A well known example are survey regulations (part of the legal aspect system) which are so strict and detailed that they stand in the way of applying later developed technologies (part of the technical aspect system). Once again a clear reason for primarily looking at the whole of the system of land registration, in an interdisciplinary way.

² It is clear that more aspect systems exist and are relevant, for instance the social, cultural and economical aspect systems.

4 Modelling systems of land registration

4.1 Static and dynamic systems

Several classifications of systems are used, one of them making the distinction between static and dynamic systems. Kast and Rosenzweig consider structure and processes to represent the static and dynamic features of organisations. In some cases the static features are the most important for investigation, in other cases the dynamic features (Kast and Rosenzweig 1970, p. 171). When describing land registration both are useful. The static model of the system of land registration focuses on describing which information is kept, with regard to which objects and with which identifiers. The dynamic model of the system of land registration focuses on describing and understanding the main functions, being adjudication, transfer and subdivision.

4.2 Static model of the system of land registration

The static form of the system of land registration is represented by the regularly used figure that connects owner, right and parcel (Figure 1), and exists in several varieties (e.g. Henssen 1995, p. 6; Kaufmann and Steudler 1998, p. 37-38; Zevenbergen 1998, p. 133). It also represents the question which person holds which parcel with which right. Each of these three questions is related to one of the main objects, being owner, right and parcel. Each of these has to be identified correctly and unambiguously. These objects are very closely interrelated, and only when they are interconnected we can talk about a system of land registration. The owner (or person) represents an individual or a group of people who are the rightful claimant, and gives the answer to the question 'who'. The parcel represents a certain part of land that is seen as a property, and gives the answer to the questions 'where' (location) and 'how much' (size and/or value). The right or title represents a certain legal relation (ownership, leasehold, other form of tenure, etceteras) and gives the answer to the question 'how'. The three entities are closely interrelated, and can represent different varieties of 'humankind to land relationships'. Regrettably a one-directional arrow is added to the figure in 'Cadastré 2014' (Kaufmann and Steudler 1998, p. 37-38). They assume an arrow pointing from person to parcel in Henssen's variety of figure, which they dub the 'deeds approach'. In system's terminology it could be described as a view from the legal aspect system. An alternative view is suggested in 'Cadastré 2014' in which the arrow points from parcel to person (and the whole figure is flipped around). It takes the point of view of (geo) information management (a part of the technical aspect system). That view is equally limited, since it might encourage seeing land registration (and the wider land administration) as an end in itself, without looking at its goals. If an arrow has to be added, it should be a bi-directional one.

The focus of several earlier publications was on this static model of the system of land registration (Zevenbergen 1995, Zevenbergen 1998). But it falls short when trying to understand for instance the interaction between systems of

land registration and land markets, the reasons for unregistered transactions, and the 'trustworthiness' of the whole.

4.3 Dynamic model of the system of land registration

The dynamic model of the system of land registration can help here. Within the dynamic system three functions have to be fulfilled, being adjudication, transfer and subdivision. Similarly described by Soni Harsono (1996, p. 3-4) as "the three main cadastral processes of adjudication of land rights, land transfer and mutation (subdivision or consolidation)". It can be seen here that the system of land registration has to be treated as one integrated system, as a whole, since each of the three functions is only useful when the other functions are fulfilled as well. There needs to be something present in order to be able to update, and if no updating takes place the initial compilation becomes quite useless very fast. Depending on the history and development of a country the emphasis might be more on first registration or on updating. It is not easy to tackle both at the same time in a 'trustworthy' manner. (Figure 3.)

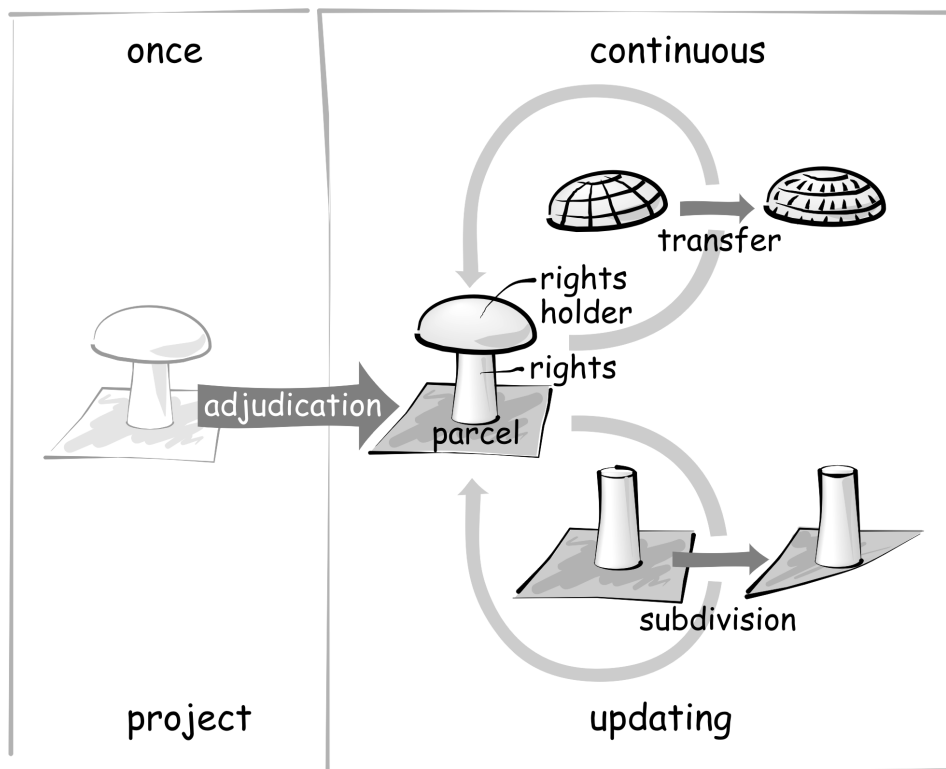


Figure 3. Dynamic model of system of land registration ('mushroom' encompasses the static model)

In developing countries (like Indonesia and Ghana) the first function is of great interest since most of the land is still unregistered. However, many persons holding interests are not really looking for registration, because the benefits of it -as they perceive them- do not compensate for the time and money they will have to invest. Furthermore even transactions with regard to land that has been put on the register before, take place without updating the register. In certain cases even the Indonesian courts have ruled such 'informal' transactions legally valid.

The system of land registration is depicted in the figure with the emphasis on the dynamic model, but it includes the static model as well. At the left-hand side we find an unregistered land tenure situation, which is transformed into a registered situation through adjudication, which can be seen as a project that is executed once. In the middle is the registered situation (with owner, right and parcel connected to each other, here represented by a 'mushroom'). This registered situation is part of two circular processes, being the transfer and subdivision. This has to be seen as updating, a continuous activity. Both types of updating concentrate on a different part of the 'mushroom'. Nevertheless it can be seen that the change in the identity of one of the three objects that make up the static model of the system of land registration, is only a useful activity as long as it remains connected to the other objects. This can be seen as another reason for looking at the system of land registration firstly as a whole, as the systems approach learns us.

3.3.1 Adjudication

Adjudication, the first of the three functions that the system of land registration has to fulfill, is the most common form of first registration. When a system of land registration is being introduced for the first time in an area, the system will have to cope with 'first registration' or 'land titling'. These deal with the initial compilation of the registers. It is of great importance when no (real) system of land registration exists yet in an area. In certain cases of cadastral reform conversion from the 'old' to the 'new' system may be applied. But when virtually no written documentation is available, a careful procedure is necessary to inventory all relevant interests that exist and should be entered in the register. This process is called 'adjudication'. During adjudication particulars of all rights and liabilities in a parcel must be ascertained and determined conclusively (Larsson 1991, p. 101). Often the existing rights that will be registered as a result of adjudication have not been totally defined. Their exact meaning might be vague, especially when it concerns unwritten law. Adjudication in the end is a process with a strong legal impact. Often the courts, or a special Land Tribunal, play an important role in finalizing the results of the process. It tends to be slow and expensive. In many cases, when the claim is going to be disputed, one needs legal counsel, and *de facto* the underprivileged find themselves in great danger of losing their rights, even when their claim is legitimate. This can be solved to some extent by using administrative instead of juridical procedures. This means that claimants

who are not satisfied with the preliminary register can make objections before an 'adjudication committee' before they will have to appeal to the court.

Two methods of adjudication can be used: systematic and sporadic adjudication³. The last one has two variants:

- systematic
- sporadic
 - obligatory
 - voluntarily.

In case of systematic adjudication, the proper authorities will declare one or more areas (usually corresponding with the territories of local government) as a registration area. For this whole area cadastral (index) maps are being prepared at the same time. Usually the right holders in the area are mandated to indicate their boundaries in the terrain, preferably in agreement with the neighboring right holder. In addition to the mapping of the boundaries, everybody has to state the right he or she claims to the authorities, and has to support his or her claim by evidence. Written evidence is preferred, but if not available sworn statements by the right holder, supported by local (and/or customary) officials, are usually accepted as well. In addition to the map, a list is made of every parcel that has been identified indicating who has what right to that parcel. This list is then put up for public inspection (for a few months). Rights on the list that are not contested at the end of the inspection period, become final (unless there was not enough evidence, in which case so called 'provisional' or 'qualified' titles are given). In case of contestation, both claimants will have to try and prove which one has the best right. A decision can be taken by the adjudication committee, and if necessary ultimately by the courts. This type of systematic registration has been applied in e.g. several Caribbean islands.

In case of sporadic adjudication, the authorities take less action. They will set up an office and declare a certain area open for registration, after which people can come to apply for first registration. In theory right holders, realizing the advantages of the (new) system, should come quickly in great numbers. In practice they do not often bring their title up for registration (see Simpson 1976, p. 72).

Most jurisdictions make it obligatory to register in certain cases, which will at least include a transfer due to a sales contract. In such a case the parcel in which the sold right is vested, will have to be brought 'on the register'. This means that for this individual parcel its boundaries will have to be determined, usually by a local survey. Often this means that *ad hoc* the adjoining neighbors will have to be consulted. In addition the title has to be proven as good as possible. In these cases written evidence is even more important. Although some kind of publicity is given

³ A more elaborate explanation of the differences and the advantages and disadvantages of them in different circumstances can be found in e.g. Bogaerts and Zevenbergen 2001.

to the claim, it is never as well known as when the whole area is under scrutiny, and absentee owners stand a serious change of not being aware of possible infringements on their rights. Depending on the exact wording of the law at hand, they might lose these rights as soon as the claim is settled, or they will still have a certain 'grace' period to find out and react, e.g. through primarily issuing qualified or provisional titles. A distinction can be made between titles that are qualified with regard to boundaries, and with regard to title. Titles are qualified with regard to boundaries when an elaborate and expensive process of demarcation and surveying of the (fixed) boundary is replaced by a simple (general) boundary approach. When necessary the title can be upgraded through a final survey. Titles are qualified with regard to title when collecting enough evidence to establish a title without any legal doubts is not possible or not reasonably possible. This could be the case when there is not enough (written) evidence to fully support a claim or to limit problems caused by the limited publicity under sporadic registration. Usually such a qualified title can grow into a full title over time, when it is not contested within the set period.

Adjudication is an expensive process. Depending on the methods chosen, the surveying work will often contribute highly to the total costs. It is accepted in general that under systematic registration, the right holders will not have to pay all the costs involved, but that subsequent transfer will be charged at (near) cost recovery fees. Many of the right holders will have little cash, and would not be able to stomach any serious fees on first registration (often many of them do not even pay the small fee to get a title certificate at the end of the process). When a transaction takes place, there usually is cash at hand. In such cases more realistic fees can be charged. The same of course applies to sporadic adjudication, which usually takes place at the time of a transaction.

For the government systematic adjudication is therefore more expensive than sporadic registration, since the right holders bear most of the costs in the latter case. Per parcel, however, sporadic adjudication is much more expensive, since economies of scale can be reached under systematic adjudication. Furthermore cadastral (index) maps and registers which are area covering, can be used as an important base for land information systems and other GIS applications. Under sporadic registration it will be a long time before a substantial part of the area is covered, and certain types of land are unlikely to be ever entered (especially land owned by the state, municipalities, religious organizations, railways, trusts etceteras will rarely change hands). To get complete coverage in the end a systematic completion phase would be needed in all cases.

3.3.2 Subsequent transfers

If the information gathered through the function of adjudication is not kept up-to-date, it will soon become outdated, and lose its value. To avoid this virtually every subsequent transaction that takes place has to be actually registered. Even making registration as such mandatory (by law) does not guarantee success. When the

disadvantages of going through a lengthy, expensive and bureaucratic procedure are perceived to be higher than the disadvantages of being an informal land holder, compulsion does not necessarily lead to completeness. Incentives to register (both by having a smooth procedure and by having clear benefits when registered (esp. access to credit)) are more likely to succeed than merely demanding registration by law (Palmer 1996). This updating can be described by the two remaining functions, which are called transfer (of whole parcel) and subdivision. The first form deals with updating the existing registers with the subsequent changes due to the transfer of rights to an unchanged property unit (parcel), whereas the second one deals with the updating of the existing registers (usually including maps) due to subsequent changes in the boundaries of the property unit -sometimes called property formation- which can not only take the form of subdividing, but also of amalgamating (compare Mattsson 1997).

The transfer of rights is the most common. It deals with the situation that one person takes over from another person, an interest in a property unit that remains the same well-defined parcel. If the system is working properly the former right holder is known to the system, and upon receipt of the notice of change (document) the information can be updated. Usually the register is only updated after certain conditions are checked. Sometimes the check is limited to purely formal conditions, in other cases the check includes several legal aspects of the transfer itself. This type of changes takes place for several reasons, of which sales transactions are the most important ones in case of an active land market, and inheritance in case of a more frozen situation. Especially with regard to sales transactions the legal security of the purchaser can be greatly enhanced when there is a good system of land registration. In principle the procedures for this situation can and should be kept relatively simple, not involving too many organizations, taking too long or being too expensive.

The other variety of subsequent transfers deals with the case that the property unit changes. This means that the existing registers (usually including maps) have to be updated due to subsequent changes in the boundaries of the parcel (subdividing, amalgamating). This is also called property formation. Although this is less common, it is of great importance. It deals with a change in the part of the continuum we want to regard as one parcel. And since real properties could be seen as being liquid, subdividing and amalgamating existing parcels should be possible and is often even desirable. These changes often take place in conjuncture with a change in the land rights and/or the usage of the land. The formation of a new property unit needs to be accompanied by the redefining of a newly identified parcel, which will then become the object to which the land rights are (re-)connected. The procedures for this are often quite complicated. This is partly because of the control necessary to come (again) to a clearly defined and uniquely identified parcel, to which the correct persons will have to be (re-)connected with the correct rights as well. Further complications are present in most countries because of land control mechanisms (need to get one or more permits from the

relevant (local) authority) and the fact that these changes coincide with changes in rights and/or usage of the land. Often many (if not all) of these activities are performed by different organizations.

In most systems of land registration, the new boundaries that subdivision creates will have to be surveyed. In a rare exception existing topographic features visible on a map or (aerial) photograph can be used to do this in the office, but in virtually all cases new measurements will have to be made (usually by field survey; airborne methods are not so efficient here because of the incremental nature of these changes). Quite a number of countries demand the erection of visible boundary markers, being either fences, ditches or hedges on the one hand, or special corner stones ('monuments') on the other hand. The cadastral surveys usually need to have been completed before the land rights can be vested in the newly formed properties. And the cadastral map and plans have to be ready in their updated form before the transfer documentation can be fully processed.

If the transfers and subdivisions are not processed effectively for a while, the land registration loses much of its value, and to get it working properly again a kind of adjudication would be needed (again). Clearly that is not a very efficient way to use money.

4 Trustworthiness

An important reason for something to be seen as a system is found in it having emergent properties. For systems of land registration 'trustworthiness' can be seen as the main emergent property. This can not be attributed to one or a few elements, but it depends on the system as a whole. 'Trustworthiness' could be seen as the ultimate expectation society has of the system of land registration; society wants to be able to trust the system. If that is possible or not depends on the way in which features and criteria as for instance mentioned in the Statement on the Cadastre (FIG 1995, p. 19-20) are being met⁴.

The success of a system of land registration in the end depends on society's view on it. Society has to realize that it needs such a system, society has to support the system in place and society has to use and rely on the system of land registration and the information from it. However, in general the existing systems of land registration are not really tuned towards the needs and interests of the right holders. Even though 'customer demands' is an often-used buzzword, most right holders consider getting a land transfer finalized a pain in the neck. Land registration procedures are often expensive, slow and bureaucratic in their minds. (Zevenbergen 1999). Still, it is the willingness of these individual members of society to use and rely on the system, especially when they want to transact or mortgage a land right, that makes or breaks the system. Different individuals can

⁴ Listed are a number of well recognized criteria for measuring the actual or potential success of a Cadastre, being security, clarity and simplicity, timeliness, fairness, accessibility, cost and sustainability (FIG 1995: 19-20).

be in different circumstances or might perceive their circumstances differently. This influences the balance between incentives and disincentives to use and rely on the system of land registration, and in the end the level of success of the system. The ultimate question is whether they have TRUST in the system.

In many countries there is ongoing work done on improving the system of land registration, but these improvements usually mean that some legal intricacy is further refined, that the accuracy of the surveying work is improved, or that the data has been moved to a new medium. These improvements might be interesting for the ‘technocrats’ involved, but often have very little bearing on the perception the right holders have of the whole system. His/her perception of the ‘trustworthiness’ of the system is much more influenced by the administrative layout and day-to-day operation. Although those are influenced by the limits of the law and other preconditions, it is the “daily practice” that really counts. Similarly Twaroch and Muggenhuber say that “Independent from legal and technical solutions a LAS⁵ is successful when all partners involved in land management (owners, banks and agents dealing with information on land) can trust in this system.” (Twaroch and Muggenhuber 1997, p. F.5). Unfortunately the administrators and professionals involved in the systems of land registration, regularly get so absorbed in the legal and technical intricacies of the system that they seem to lose sight of this.

5 Final remarks

The right system of land registration for a society will be a great help and facilitator in achieving legal security of right holders and purchasers, especially when there is an active land and real estate market. Systems of land registration, however, are complex wholes of many interrelated elements. The so-called traditional aspect disciplines (like surveying or law) only see a part of the systems. If improvements are suggested from such a partial perspective, there is a serious risk that this does not affect the weakest link of the chain. Especially the (further) enhancement of technical or legal sophistication does rarely convince society, and especially the individuals that should use the system, of an improved ‘trustworthiness’ of the system. With ‘trustworthiness’ is meant: living up to the expectations the society has of the system of land registration.

These preceding remarks follow from using the ‘systems approach’ with regard to land registration. This approach prescribes that we start by looking at the whole, before going into the details of the parts. This approach also points to the emergent properties of a system; properties which can only be attributed to the whole, and not to the parts. The use of this approach on systems of land registration is very enlightening, and it can be considered to be very useful for anyone who wants to study land registration from a wider perspective than any

⁵ LAS = Land Administration System; slightly wider concept than system of land registration as used here.

one of the aspect disciplines. The approach helps us to avoid the use of simplified one-dimensional classifications, and it should be inevitable in designing and implementing true improvements for systems of land registration.

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