INTERNATIONAL FEDERATION OF SURVEYORS
FÉDÉRATION INTERNATIONALE DES GÉOMÈTRES
INTERNATIONAL VEREINIGUNG
DER VERMESSUNGSINGENIEURE

XVIII CONGRESS . XVIII CONGRÈS . XVIII KONGRESS
TORONTO CANADA JUNE 1-11, 1986

Commission 7/Commission 7/Kommission 7
Cadastre and Rural Land Management
Cadastre et Aménagement Foncier et Rural
Liegenschaftskataster und Flurbereinigung

PAPER . EXPOSÉ . BERICHT.

711.3

TITLE . TITRE . TITEL.

Comparing Registration Systems Using a Communication-Based Criterion: Uncertainty Absorption

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FIG INTERNATIONAL CONCRESS
TORONTO, CANADA, 1 - 11, JUNE 1986.

COMPARING REGISTRATION SYSTEMS USING A COMMUNICATION-BASED CRITERION: UNCERTAINTY ABSORPTION

COMPARAISON DES SYSTÈMES D'ENREGISTREMENTS À PARTIR D'UN CRITÈRE ISSU DES SCIENCES DE LA COMMUNICATION : ABSORPTION DE L'INCERTITUDE

EIN VERGLEIGH UEBER GRUNDSTUECHSEINTRAGUNGS-VERFAHREN MIT HILFE EINES KRITERIUMS AUS DEN KOMMUNIKATIONSWISSENSCHFTEN UNSICHERHEITSABSORPTION

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ABSTRACT: A conceptual framework presenting land information systems (LIS) as a communication process is introduced. The problems inherent in the nature of land data are highlighted using this framework. Such fundamental problems can be minimized by two of the most important functions of a LIS: uncertainty reduction and uncertainty absorption. This latter one, which greatly affects the very nature of land data, is finally used to compare four land conveyancing systems.

RESUMÉ : Un schéma conceptuel présentant les systèmes d'information sur le territoire (SIT) est introduit. Les problèmes inhérents à la nature des données sont mis en évidence à partir du dit schéma. Ces problèmes peuvent être minimisés à l'aide de deux des plus importantes fonctions d'un SIT : réduction et absorption de 1'incertitude. L'absorption de 1'incertitude inhérente aux données sur le territoire, et qui influence beaucoup la nature de ces dernières, est finalement utilisée pour comparer quatre systèmes d'enregistrement des droits immobiliers.

ZUSAMMENFASSUNG: Es wird ein konzeptuales Schema vorgestellt, in welchem ein LIS als Kommunikationsprozess dargestellt wird. Anhand dieses Schemas werden die inhärenten. Probleme der Dateneigenschaften im LIS beleuchtet. Solche fundamentalen Probleme lassen sich mit Hilfe von zwei wichtigen Funktionen in einem LIS auffangen Reduktion und Absorption der Unsicherheit. Letztere beeinflusst die Eigenschaften von Landdaten und wird zum Vergleich von vier verschiedenen Grundstückseintragungsverfahren beigebogen.

Land conveyancing systems, as specialized Land Information System (LIS), consist of procedures for the systematic collecting, storing, retrieving, updating, controlling, processing, and distribution of land-related data.

According to the concepts of communication and information [see Bédard 86], a LIS can also be seen as a complex communication process where the several collectors of data observe the world, create their intellectual model of it, codify and transmit this model in the form of data via the model of it, codify and transmit this model in the form of data via the technical LIS to the many users of these data. After interpretation, the users create their own mental model of

the reality, become informed, and improve their knowledge of the world, leading them to better decisionmaking.

THE COMMUNICATION PARADIGM OF LIS

Figure 1 shows the most important steps in the general communication process happening in LIS. They are divided in three phases (1) from reality to data collectors, (2) from there to the technical LIS, and (3) from the technical LIS to users.

The reality is observed by n data collectors "O" (Observers) (ex. land surveyors) who, as sources of the communication process, transform their observations of the real world's signals "s" (ex light waves reflected from a fence) into mental (s^1) and ultimately physical (s^2) models (ex subdivision plan), the latter providing raw data usable by the technical LIS.

The technical LIS decodes, stores, treats, controls, reencodes and transmits data to the users. This creates two new models of the reality. (1) the physical/mental model(s) "s^3" stored/created in the technical LIS, and (2) the physical model "s^4" (ex. cadastral compilation) which is transmitted to the destination or m users "U" (ex decisionmaker) Such an intermediary creates, as well as allows for, space/time delays between (1) the observation of the world and (2) the use of the resulting data, delays represented by the grey vertical line. It also allows for the gatekeeping role of the technical LIS.

The technical LIS is composed of men and machines involved in running the whole system. It is a subsystem of the instutional LIS which also includes the O's and the U's. This technical LIS serves as the intermediary or *gatekeper* of the institutional LIS, it is the system leader facilitating and controlling the communication between "O"s and "U"s (ex. by communication and modelisation standards). It controls where, when, how, and which data will be received, stored, retrieved, transmitted, updated retransmitted and under which controls. This gatekeeping role is very useful, particularly when the disseminated data must be commonly accepted by the m U's.

Then, the data "s^4" are transmitted by the technical LIS to be received and decoded by the "U"s. After interpretation, these data become information useful to the creation of the user's image the world "s^5". This is this fifth image which eventually will be used in the decisionnmaking process. Unfortunately, this symbolic world is the further away, among all models, from reality. This shows the importance of the ultimate goal of LIS having the best homomorphism possible (represented by "≈") between reality and users' images of the world.

Finally, this whole communication process could not be effective without feedbacks (f_a) from the technical LIS to the "O"s, (f_b) from the "U"s to the technical LIS, (f_c) from the "U"s to the "O"s, and (f_d) from the "O"s to the reality or specialized LIS providing data.

It must notice that the institutional LIS_j can collect its own data (s^2), but can also use data from other specia1ized LIS_k (s_k^2, s_k^3, s_k^4), especially when LIS_j is multipurpose.

Further, the "U"s sometimes have the choice among LISs to obtain data or they may observe themselves the signals "s" of the reality. Their choice is based on many factors including time, money, and task requirements, as well as on the commodities offered by LISs (such as accepted standards, integration, reliability, updateness, etc).

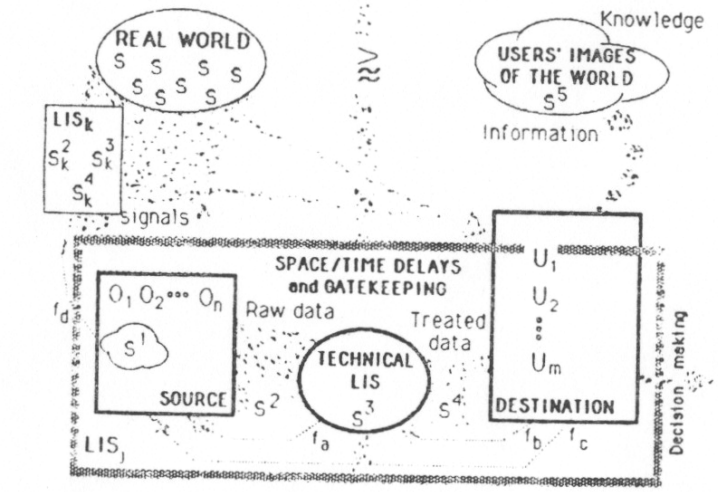

FIG 1: LIS conceptual framework [Bedard 86]

Thus, LIS, including conveyancing systems, are sequential buildings of models of parts of reality, models all different from each others and from reality. In fact, it is commonly accepted that even in the best conditions, the same reality will probably *not* be modeled the same way by different people, or by the same person at different times. Model building is goal, context, and model-maker dependent. Thus, land data are not totally objective, they often present a certain fuzziness due to (1) the definition or the identification of the represented spatial reality, (2) the description of this reality, and (3) its location.

This problem of fuzziness is due to tens of limitations inherent in communication processes. It can be related to (1) the representability of the observed phenomena, (2) the observer, (3) the channel used, (4) the receiver, and (5) the commonness between the sender and the receiver. Generally speaking, these problems are divided into three levels (1) technical, or how accurately can the symbols of communication be transmitted? (2) semantic, or how precisely do the transmitted symbols convey the desired meaning? and (3) effectiveness, or how effectively does the received meaning affects conduct in the desired way? [Weaver 1963] All these types of problems affect land data, especially with the LIS large number of models developed (s^1 to s^5 and s_k).

It must be emphasized at this point that (1) data are not the reality but only surrogates, (2) they are, at some point in the communication process, separate from both the sender and the receiver, (3) they carry no intrinsic content, and (4) they can be stored, duplicated, transported, modified and kept over a period of time. Pertaining to these aspects of the nature of data, the most important functions of the technical LIS as a gatekeeper are thus (1) to reduce the uncertainty inherent in them (ex. by precision standards), and (2) to absorb the remaining uncertainty (ex. by title guarantee with insurance fund) or to distribute it among the components of the institutional LIS, i.e. the "O"s, technical LIS, and "U"s.

UNCERTAINTY REDUCTION AND UNCERTAINTY ABSORPTION

Due to the nature of data, there is a lot of uncertainty in land conveyancing systems. We can (1) live with it, or (2) reduce it and absorb partially or completely the remaining uncertainty. The selection among these alternatives is an institutional choice within each jurisdiction.

Uncertainty reduction takes place when modelisation and communication rules are established either to insure precision in the description and location of a spatial entity or to insure precision in the description and location of a spatial entity or to decrease the fuzziness in the real meaning of data.

This can be done by appropriate technical, procedural, organizational and legal requirements such as geodetic tying of surveys, adjustments of measurements, good professional training, high precision standards, mandatory marking of boundary corners, mandatory tying of surveys to physical monuments, use of standard symbols, inclusion of lineage or metadata in digital maps, mandatory registration of all the rights to the land, etc.

Any conveyancing system reduces to a certain degree the uncertainty inherent in land data. However, this is limited by fundamental concepts as well as practical and economic conditions. Although *we can reduce the uncertainty inherent in the nature of many land data, we cannot eliminate all of it. Thus, someone somewhere in the LIS communication process has to absorb the remaining uncertainty partly or completely.*

Uncertainty absorption takes place when a model-maker guarantees his model of the reality and compensates the users who get damages due to erroneous data from the guaranteed model. Uncertainty absorption also takes place when a user of data utilizes non-guaranteed models, then it is not the provider of data who absorbs the uncertainty but the user.

The level of uncertainty absorption is defined as the level of risk in providing or using data. This risk is, for the purpose of this exercise, only monetary. Thus, when an error in data causes damages to a user, the one who will pay for these damages is the one who absorbs the uncertainty. It may be the observer because of his professional liability, or the government (technical LIS) with an indemnity fund (as in several registration systems), or the user when neither the observer nor the government pays for his damages. This absorption can also be shared among the three components of the institutional LIS: the "O"s, the gatekeeper, and the "U"s.

Uncertainty absorption is very different from uncertainty reduction. In the latter case, the uncertainty as literally reduced (ex. requiring precision of 0.1' instead of 1', asking for the opinion of two or three land surveyors instead of only one). In the former case however, there is someone who guarantees data as the "truth" and who is willing to take the inherent risk (ex guaranteed titles). This often creates an "artificial", "administrative" or "agreed upon" truth among components of the LIS, especially when models are made official by governments as in certain conveyancing systems. It must be noted that it usually is the gatekeeper who has the strongest influence on deciding where and how the uncertainty reduction and absorption take place, and how such "truth" is created.

Of the many land conveyancing systems presently existing, some reduce and/or absorb the uncertainty more than others. The higher the uncertainty reduction, the lower the uncertainty absorption needed, and the higher the absorption by the "U"s and technical LIS, the more secure the user. The right choice or balance is a cultural, political, and economic matter.

Certain land data are legitimate estimates which do not necessarily represent exactly the modeled reality, but they can be agreed upon. They usually are the official version, the "official" model of that part of reality. This official status becomes part of the nature of data. Shifting it from simple surrogates to "artificial truth" where priority is given to the model

instead of to reality. *Then, reality becomes "defined" according to a model* (ex. priority of the cadastre over the occupancy in some registration systems). Such an alternative almost eliminates the uncertainty inherent in the original nature of data, it really absorbs it, and decisionmakers can better rely on such data.

All these concepts are based on the communication paradigm of LIS introduced in [Bédard 86]. Among the applications using such concepts, one is "comparing conveyancing systems". It is presented in the following pages and it uses the concepts of uncertainty reduction and uncertainty absorption.

APPLICATION, COMPARING LAND CONVEYANCING SYSTEMS

We are used to talk about land conveyancing systems as recordation or registration systems. This apparent dichotomy, similar to deed recordation vs. title registration, is not a matter of yes/no or black/white classification, especially when are looked their real effects. In fact, a great number of systems, if not all, are not the perfect recordation nor registration systems, they instead lie somewhere on a spectrum between these two extremes. As stated by McLaughlin and Williamson [l984], "the problem with these terms is that they have grown to suggest two systems which are complete opposites and any particular system must be either one or the other. Certainly there are specific attributes that can be attached to a "pure" deeds registration or title registration system, but in reality most systems lie on a spectrum somewhere in between the two extremes".

One of the problems is now to determine what attribute(s) could serve as the basic unit(s) for this spectrum. In their paper, McLaughlin and Williamson suggest that "a better distinction would be to term such systems active or passive, primarily in recognition of the nature and extent of involvement of the state in the conveyancing process".

Instead of this active/passive scale, it is possible to base such a spectrum on a new basic unit obtained from the LIS communication paradigm the amount of uncertainty to be absorbed by the user of a system. Then, while at one end of the spectrum the user would absorb all the uncertainty, at the other end the user would have no uncertainty at all to absorb. This is a simple tool to use to characterize conveyancing systems.

The general LIS communication model can serve as the framework to illustrate the distribution of uncertainty absorption among the involved parties, i.e. the "O"s, technical LIS, and "U"s. However, no matter how these functions are distributed among the technical LIS, the observers, and the other LISs, the only point to consider here is the *remaining uncertainty to be absorbed by the user.* Such a comparison unit contains under a unique label many important criteria, but most importantly it crisply reflects the philosophy of conveyancing systems.

It must be very clear at this point that *the goal of this exercise is to show the usefulness of the concepts of uncertainty reduction and uncertainty absorption.* As such, the comparison of conveyancing systems is not a goal by itself. However, the approach presented is promising and such comparison should be further elaborated in future research projects.

Another point which must be clarified is that the results compare only the conveyancing systems of the selected jurisdictions. *This study does not compare the total effectiveness of all the institutions in these jurisdictions, both public and private, in minimizing the uncertainty to*

be absorbed by the users. For example, a specific jurisdiction may have only a deeds recordation system, but there may exist powerful laws on professional liability plus well regulated private title insurance companies. All of these contribute to minimise the uncertainly to be absorbed by the users, and the total effect may be better for them that the one from a registration system where professional liabilities laws are weak and no private title insurance companies exists. In fact, an analysis of the effectiveness of a specific jurisdiction in helping users to absorb the uncertainty cannot be done without taking into account the combination "conveyancing system-professional liability law-private title insurance reglementation". Such analysis is not done here, but it is hoped that by analysing one component of this combination, a direction for further research is given.

Finally, it must remember that this is the uncertainty absorption remaining *for the user* of the conveyancing systems which is analyzed. Then, it makes no difference for this analysis if a conveyancing system has mandatory registration or not since non-registered data are not part of the system.

The methodology used

A conveyancing system reduces the uncertainty inherent in data to a degree limited by fundamental concepts as well as practical and economic conditions. As already stated, it can be designed to reduce uncertainty but not to eliminate it. However, the uncertainty which remains can be absorbed. Of the many conveyancing systems presently existing, some reduce and/or absorb the uncertainty more than others. As the result of this unequal uncertainty reduction/absorption, users have less uncertainty to absorb or lest risk to take in certain jurisdictions than others.

This gives a way to place conveyancing systems along a "USER UNCERTAINTY ABSORPTION SPECTRUM" which goes from a *complete absorption* by the user (complete risk) up to the *absence of absorption* by him (no risk at all).

To give an example of how this can be applied, a comparison of four conveyancing systems was done: England, Massachusetts, Quebec, and Switzerland. The choice of these four systems was guided by the clarity with which they can be placed on the spectrum as well as by some interesting findings. The criteria used to measure the uncertainty to be absorbed by the user are described in the following paragraphs.

Before uncertainty absorption can take place, uncertainty must be reduced to a certain level. This can be done by appropriate technical, procedural, organizational and legal requirements (ex geodetic tying of surveys, good professional training, high precision standards, requirement of a lineage for boundary corners). This *uncertainty reduction* can be of two types (1) about the rights to the land, and (2) about their spatial location.

The first criteria to be used is the uncertainty reduction about the existence of rights to the land. The most important point to consider here is the ratio of the different types of rights to the land which are obligatorily registered versus all possible types of rights to the land. Such a ratio is usually high but not 100% since many jurisdictions do not require mandatory registration for all types of rights to the land. Another important aspect is the legal process of validating the non-registered rights and their ease of finding. For the purposes of comparison, the classes of uncertainty reduction related to easy finding of rights to the land are Very Low, Low, Medium, High, and Very High.

The second type of uncertainty reduction concerns the spatial location of rights to the land. This aspect of uncertainty reduction can be divided in two parts: (1) the identification of physical evidences of these rights and (2) their measurements. The identification part, which is the second criteria of this exercise, is based on the facility with which someone can find and identify physical features as provable evidences of the delineation of properties. This is a very important point since it represents the accuracy (as opposed to precision) of land surveys. It is when a property corner is easy to identify that the many potentially divergent opinions about its "real" location become convergent. Here, we must be aware that when boundary corners are tied to a reference network, the uncertainty is reduced about the location of the given opinion, not about the boundary itself. The important factors to consider here are (1) mandatory marking of property corners, (2) their tying to permanent physical monuments, (3) good professional training, and (4) clear legal rules of priority of evidences. The classes of uncertainty reduction related to the ease of interpretation are Low, Very Low, Medium, High, and Very High.

The measurement aspect of spatial location is also divided in two points: (1) internal precision, and (2) external precision. These two points should not be confused with the known terms of absolute and relative precisions, although they also deal with precision (as opposed to accuracy). The internal precision, which is the third criteria, is the precision, with witch an individual survey describes one property, i.e. the precision of its dimensions. It is the relative precision among corners of a same property only, not among properties. This depends heavily on the techniques used to do the survey or mapping of a property and it is independent of its accuracy. Usually, the higher the internal precision, the more reduced is the uncertainty about the delineation of a property. Factors to consider are standards of precision, techniques used (like repetitive measurements), and use of adjustments. The classes of uncertainty reduction related to internal precision are Very Low, Low, Medium, High, and Very High.

The external precision is the precision in relating many properties to each others. It is dependent on both absolute and relative precisions of properties. External precision, the fourth criteria of this exercise, is very important since even a survey with high internal precision may be of low external precision and encroach on adjoining properties. This usually is more a problem in conveyancing systems based on individual surveys than in conveyancing systems systematically covering their area with mapping or surveys. However, without proper rules, external precision can be a problem for any system during updating. But in all cases, higher external precision means reduced uncertainty. The factors to consider here are (1) the top-down (from collective map to individual properties) versus the bottom-up (from individual surveys to collective map) approaches, and (2) the mandatory tying of surveys to geodetic network. Classes of uncertainty reduction related to external precision are Very Low, Low, Medium, High, and Very High.

Based on these four criteria, a TOTAL GRADE is given to each conveyancing system for their effectiveness in REDUCING THE UNCERTAINTY. At this point, it is interesting to note that the reduction of uncertainty is above all a technical matter while uncertainty absorption is rather an institutional matter.

Uncertainty absorption, like uncertainty reduction, can be of two types (1) about the rights to the land, and (2) about their spatial location. For the first type of uncertainty absorption, the guarantee of title and of other rights is considered, this is the fifth criteria. It guarantees that someone has certain interests in a piece of land, but nothing more. This usually is all what is

guaranteed in registration systems. It is obvious that (1) if there is a guarantee of titles and/or other rights to the land, (2) if the indemnity fund is sufficient and, (3) if it completely covers the damages, than there is less uncertainty to be absorbed by the user since the conveyancing system does the absorption. The classes of uncertainty absorption are None, Very Low, Low, Medium, High, Very High, and All.

The sixth criteria to use is the guarantee of boundaries. This guarantees the delineation of rights to the land, especially of property rights. Here again, the indemnity fund must be sufficient and completely covers the damages. Classes of uncertainty absorption are the same than for guarantee of title: None, Very Low, Low, Medium, High, Very High, and All.

As it was done for uncertainty reduction, a TOTAL GRADE is given to the conveyancing systems for their effectiveness to ABSORB THE UNCERTAINTY. Then, a FINAL GRADE reflecting the UNCERTAINTY TO BE ABSORBED BY THE USER of the system is given. This grade, like the others, is a nominal measurement. It results from the analysis of the two total grades and determines the position of the different conveyancing systems on the "USER UNCERTAINTY ABORPTION SPECTRUM". As already stated, there is the possibility for conveyancing systems, as gatekeepers, to minimize users' risks by reducing the uncertainty and absorbing the remaining uncertainty. The balance between these two methods makes it possible to obtain equivalent positions on the spectrum using different ways. The classes used to place the systems on the spectrum are None, Very Low, Low, Medium, High, Very High, and All, where None and All represent the two extremes.

Before positioning the conveyancing systems of England, Massachusetts, Quebec, and Switzerland on the spectrum, their main characteristics are briefly presented in the following paragraphs. Then, a table displaying the grades of each system for the six criteria is given. This table also contains the total and final grades. This latter is finally used to place the systems on the "USER UNCERTAINTY ABSORPTION SPECTRUM".

The conveyancing systems compared

The conveyancing system of England is a compulsory title registration system similar to the Torrens system. However, contrarily to many other countries, it follows a "general boundary" concept for parcel description. There is no cadastral map in the traditional sense. Instead, registration is based on topographic maps at the scales 1/1250 or 1/2500 There is no dimension nor precise determination of the boundary lines, but in most cases it is possible to identify property limits. The general boundaries rule allows for guarantee of titles without adjudication of the ownership of boundary features or of the precise line of the boundary.

Although registration of titles is compulsory, not all the rights to the land have mandatory registration, among these are short term leases. On the other hand, the British government guarantees the title to the land and pays indemnity to anyone suffering loss as a result of a mistake in the register.

The Massachusetts system is also similar to the fundamental Torrens system except for some features. Among these peculiarities, the most important are (1) the judicial administration called the Land Court which is the primary organization responsible of land registration, and which includes an Engineering Department, (2) the mandatory registration of boundaries along with titles (but the registration of titles is not compulsory), and (3) the State centralization of the system.

The Land Court has an exclusive jurisdiction over land registration and related matters. Each time a registration process is undertaken, a registered land surveyor submits, along with other documents, the measurements and plans according to the standards of the Engineering Department of the Land Court. The surveys and plans are then examined by the department, including reconciliation with adjoining registered properties and permanent monuments. Finally, the department prepares the official plan according to the degree of the Court. It is only after the completion of this plan that the judge will give the final decree sanctioning boundaries as well as the title.

After all these procedures, the purchaser of a registered property takes a title clear and free of any and all encumbrances, interests, or claims that are not noted on the certificate. There are claims of interests to the land which may not be registered, but the possibilities are few and clearly identified in the Massachusetts Land Registration Act.

The delivered documents are State guaranteed with a specific indemnity fund. However, there are some doubts about the adequacy of the State compensatory fund and about what is really indemnified in case of errors. Furthermore, the initial registration of a parcel is not guaranteed. An additional problem is that the damages to be compensated for apparently cannot include expenses such as legal and representative fees. Uncertainties such as these probably undercut the indemnification aspect of the system, i.e. its effectiveness to completely absorb the uncertainty.

The Province of Quebec has a recordation system which is known as very effective. Implemented in its actual form between 1860 and 1900, it is actually modernized through a $100 000 000 program called “Rénovation cadastrale”. However, this is the original system which is presented in the following paragraphs.

The Quebec cadastre systematically covers the habitated areas, but often with poor original surveys. The recordation of titles (usually complete document, rarely the summary) and other rights is not compulsory, however people do have a powerful incentive to do so since it is the date of registration which determines the priority of rights to the land. The immediate result is that the system is good in reducing the uncertainty concerning the rights to the land, but it does not completely do it. However, all types of rights to the Land can be recorded.

After the original cadastre, subdivisions were made on an individual basis, i.e. individual jobs by individual surveyors for individual clients. Usually, the internal validity of these surveys is very good. Furthermore, there is mandatory tying of new subdivisions to existing cadastral lines. This should provide good external validity to cadastral data, but it has not always been the case for practical as judgemental aspects. The identification of existing cadastral lines is not always easy because no mandatory marking exists, neither are there official tyings to physical and permanent monuments.

Regarding uncertainty absorption, the Quebecois system does not guarantee either the titles nor the boundaries. But, in certain districts (where too many problems existed), certificates of titles were issued by the government. However, no indemnity fund exists for errors in these certificates.

The Swiss federal cadastre is often cited as a well developed system with numerous advantages. About seventy years ago, Swiss surveyors began the creation of a very good model of their country with precise and systematic surveying and mapping operations. The

government gave to this model priority over other evidences regarding property boundaries. In other words, they administratively created a "truth" about certain aspects of their world.

The registration of titles, as well as registration of all rights to the Land, is mandatory. Further, people are not free to register whatever they want to. The conveyancing system controls very well what can be done and how it must be done.

To insure a good internal and external validity, every survey is tied to the geodetic network and adjustment techniques are used for every property corner. Also, there is mandatory marking of property corners. On the other hand, by stating that the model of the world, i.e. the cadastre, is the truth on which decisionmaking should be done, problems may arise when the reality has changed since the model was created (ex. soil movements).

These characteristics of the Swiss conveyancing system provide a "very high" reduction of the uncertainty both for identifying and locating boundary corners. The compulsory nature of registration also reduces a lot of the uncertainty about the existence of all types of rights on a Property. This let few uncertainty to be absorbed by the user concerning what he owns and where. On the other hand, there is no guarantee (with indemnity fund) of boundaries or titles.

Comparison of the systems

Table 1 gives the grades for each conveyancing system

With these final grades for each of the four conveyancing systems, they can be placed on the "user's uncertainty absorption spectrum". This is represented in figure 2.

It can be seen that recordation systems will usually be more to the 1eft side of the spectrum than registration systems. Also, the scale of this spectrum could be enlarged to show more the difference between the systems analysed, but it would not be significant in the present context and with such an ordinal scale. However, the actual scale is large enough so it can be seen that while the original Quebec recordation system lets a high level of uncertainty to be absorbed by the user, there is only a "medium-low" level left by the English system and even less by the Swiss and Massachusetts systems.

	Quebecois	English	Mass	Swiss
Uncertainty reduction				
Internal precision	H	L	H	UH
External precision	M	H	H	UH
Easy inter-pretation	L	M	H	UH
Easy finding of rights	M	H	UH	UH
Total grade	M	M+	H	UH
Uncertainty absorption				
Guarantee of rights	N	H	UH	N
Guarantee of boundarie	N	N	UH	N
Total grade	N	M+	UH	N
Uncertainty to be absorbed by the user				
Final grade	H	L	UL	UL

Table 1: Measure of the uncertainty to be absorbed by the user

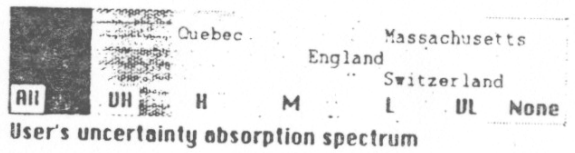

FIG 2: Comparison of conveyancing systems on the
User's uncertainty absorption spectrum

Thus, the positioning of conveyancing systems on such a spectrum has allowed for their comparison based on a specific unit of measurement.

An interesting fact can be noted concerning the Swiss as Massachusetts systems. While these two systems are practically at the same place on the spectrum, two different approaches are used. The Swiss system gives more emphasis to the technical aspects than the Massachusetts's system does. On the other hand, the Massachusetts system is more institutionalized with its Land court, real guarantee of titles and boundaries, and the indemnity fund. The Swiss system focuses on uncertainty reduction and the Massachusetts's system focuses on uncertainty absorption. This is a very interesting finding while these two jurisdictions have made these different institutional choices, both obtain about the same result concerning the user's uncertainty absorption. Thus, a jurisdiction can focus on two different ways of minimizing the uncertainty to be absorbed by the user of a system on technical means to reduce a lot the uncertainty, or on institutional means to absorb a lot of the remaining uncertainty.

CONCLUSION

It must be remembered that the primary goal of this exercise was not to compare conveyancing systems but to see the usefulness of two concepts introduced with the communication paradigm of LIS. Also, the comparison was not about the total jurisdiction effectiveness in minimizing the user's uncertainty absorption. To do such a comparison, a complete study of the combination "conveyancing system-professional liability law-private title insurances reglementation" should be done. Complete studies of each of these components and/or of their combination are research projects which should be done in a near future.

Finally, as already stated, the class of conveyancing systems is not a dichotomic matter. They 1ie on a spectrum going from no guarantee to full guarantee for the user. Such a comparison unit has only one example of the many possibilities which can be drawn from a thorough understanding of the communication paradigm of LIS.

CITED REFERENCES

Bédard, Yvan
1986 "A Study of the Nature of Data Using a Communication-Based Conceptual Framework of Land Information Systems" XVIII Congress Fédération Internationale des géomètres, Toronto, June, pp. 309 3/1-309 3/15

Bédard, Yvan
1986 A Study of the nature of Data in Land information Systems Ph.D. Dissertation, University of Maine, Orono, U.S.A.

McLaughlin, John and Ian P. Williamson
1984 Trends in Land Registration, Fredericton, N.B., The University, Department of Surveying Engineering, Manuscript unpublished

Weaver, Warren
1963 "Recent Contributions to the Mathematical Theory of Communication" In C E Shannon and W Weaver, The Mathematical Theory of Communication, Chicago, University of Illinois Press, pp 1-28

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