Technology as a problem in Southern African land tenure reform.

Coming to terms with De Soto's criticism of "technicians".

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Summary

Hernando de Soto is an influential economist who argues that the use of formal land rights by the poor in third world societies would have large benefits both within third world countries and in their relations to the wealthy countries. However De Soto sees surveyors as part of the problem in achieving this goal, not the solution. This presentation tries to understand this criticism . I submit that De Soto is mistaken in thinking that technicians can enter a titling process after the problems have been solved at higher level. Rather, the titling system is intrinsically technical and a successful system needs to invent itself by an interleaving of technical, social and political components. The exposition of the development of the English land registry by its Chief Registrar, in 1931, is used to support this view.

Five elements of a technical system that could support De Soto's vision are outlined, in the context of an urban low-level register. The recording office should be moved into the field. The information system should have a dumbbell shape with a field worker at end and a first world data-manager at the other, each working autonomously but hawking his view of the data to separate client communities. The system should implement an authentic register that has value because it is used, rather than a rights-declarative register. Maps and social surveys should be banished from the field, where all information should be in the form of signed and witnessed text documents. This would include position-dependent information played out to owners. Lastly the system should not concern itself with defining boundaries at first, but make use of single-point or centroid positions.

Although these elements might be poorly identified and separated in this presentation, I submit that they cluster around an ideal technical system that once understood, might burgeon naturally in Southern Africa, in an analogous way to the original growth of the colonial land registries.

1. Introduction.
Hernando de Soto is probably the only author who champions the function of Surveyors-General and Deeds Offices as holding the key to economic growth in third world countries, whose works can be found in a general bookstore. His recent book *The Mystery of Capital* carries endorsements from two Nobel Laureates in economics (Ronald Coase and Milton Friedman) and from such political heavyweights as Jeanne Kirkpatrick and Margaret Thatcher. Evidently de Soto is an influential figure in the realms of power as well as in the public mind. And yet, any state official wishing to bring De Soto's views to the attention of his political boss, would be advised to first cut out those pages in his book that refer specifically to surveyors and lawyers. De Soto is critical of the role played by them. He evidently regards surveyors as part of the problem, not the solution.

Although De Soto sees formal land rights as the key to economic prosperity in the third world and although he has worked on this vision for many years and with good contacts, he cannot point to a major success for his vision. In this sense De Soto himself is failing just as much as the lawyers and surveyors he finds so frustrating. There is an urgent need to understand how this failure can be turned around. The poverty of third world countries and the terrible inequalities of access within them are universally understood to be the most urgent problems facing our societies. The purpose of this presentation is to try to respond to De Soto's criticism of spatial information specialists or as he calls them, "technicians" in a novel way. Instead of broadening our perspective, I will argue that surveyors should seek radical but technical solutions to the problems of formal land rights. To develop this argument I will first summarise De Soto's views on the importance of formal land rights and then summarise why in his view, they have failed to function as needed outside of their original context. Then the specific accusation de Soto makes of surveyors will be set against the historical success of surveying in the limited semi-colonial context of South Africa. Then five technical suggestions will be discussed, for solutions that would satisfy De Soto's criteria.

2. De Soto's vision.
Hernando de Soto is a Peruvian economist and President of a think tank named the Institute for Liberty and Democracy (ILD) in Lima. From the early 1980s, researchers for the ILD carried out a series of dramatic experiments that demonstrated the ludicrous time wastage a poor Peruvian would need to invest to register a small factory as a legal enterprise, or to legally acquire his property. From this De Soto developed methods for galvanising poor people around issues of economic reform. He presented his ideas to the global audience in *The Other Path*, originally subtitled "*The invisible Revolution in the Third World*." The latest edition is subtitled instead "*The Economic Answer to Terrorism*". It seems that De Soto wishes to appeal to conservatives on the world stage while promoting the interests of the very poor. His position is difficult to locate along the classical or Cold War- era Left/Right spectrum.

De Soto's thesis in *The Other Path* was that the poor in Third World countries suffer economically by lack of access to fair and accessible law. The strong entrepreneurial

spirit amongst the poor creates a growing informal sector that is however hobbled by inability to accumulate or borrow capital or enforce contracts with distant partners. Instead of creating laws to enhance the efficient working of the nation, De Soto saw South American governments as creating laws aimed more at redistributing unearned (i.e. tax) income amongst special interest groups.

De Soto's second book *The Mystery of Capital* (2000) takes a more international view of the problem, at the same time focusing on lack of access to formal property law as the primary failure of third world economies. Large amounts of capital he says, is locked up in informal housing stocks that cannot be traded and is thereby "dead". De Soto sees property as having a parallel existence in the economic sphere, quite independent from its material life as bricks and mortar.

"Property is not a primary quality of *assets but the legal expression of an economically meaningful censuses* about *assets"*(ibid, p157)

To express the problems of unequal access to capital and other resources of the formal economy, De Soto makes frequent reference to the French historian Fernand Braudel's concept of the *Bell Jar*. This is a closed domain within a third world society, containing the elite and those who service the instruments they use. The glass walls of the jar are only visible to those who live outside it. To give one example, legal advisers (inside the jar) advise De Soto that it is simple and easy to establish a legal factory in Peru and so it is, with their help. But a poor person (outside the jar) finds it practically impossible to establish a formal enterprise.

One of the most interesting features of De Soto's approach is his recourse to the economic history primarily of the United States, to explain why its economy works so well. With regard to land law, he recounts how customary practices, some of them illegal, came to be incorporated into the formal systems through court decisions, legislation that incorporated informal practices and the growth of powerful claim associations that mutually protected claims and encouraged trade in them. Crucially, according to De Soto, formal property systems can only succeed if they incorporate local informal practices.

De Soto maintains that people in the undercapitalised sector have *"strong, clear and detailed understandings amongst themselves of who owns what today"* (ibid, p182). Often understandings are maintained through documents. He notes that "*after an extensive survey of Haiti's urban areas, we did not find a single extralegal plot of land, shack, or building whose owner did not have at least one document to defend his right-even his 'squatting rights' "*(2000, p183). De Soto sees a web-like social contract binding people to property, and the task of formalisation as the centralised recording of this web.

3. De Soto's view on surveyors.
As an experienced reformer, De Soto's views on the role of the technologists who maintain the spatially linked aspects of land records, is important and sobering. In the

first place, he classifies them as "technicians". Since he must know that surveyors and other spatial information experts hate being called technicians, De Soto clearly intends emphasising their supposedly limited blinkered understanding. However De Soto also seems to see something intrinsically inappropriate in the application of spatial information technology (ibid., p203):

"The propensity in some countries to squeezes the issues related to property into the departments of mapping and information technology has obscured the real nature of property. Property is not really part of the physical world: its natural habitat is legal and economic. Property is about invisible things, whereas maps are resemblances of physical things on the ground. Maps capture the physical information of assets but miss the big picture. Without the pertinent institutional and economic information about extralegal arrangements, they cannot capture the reality outside the bell jar. They are thus unable to do their real job, which is to help anchor the property aspects of assets in physical reality so as to keep virtuality and physicality in sync."

It seems from this that De Soto would prefer to see the Surveyor-General's Office absorbed into the Deeds Office. However he also sees lawyers as problematic. *"No group"* he suggests *"–aside from terrorists- is better positioned to sabotage capitalist expansion. And unlike terrorists, the lawyers know how to do it legally."* However de Soto believes that reformist lawyers can be recruited whereas the technicians can be brought in *" only after the legal and political problems in the extralegal sector are solved"* (ibid., p204)

4. The proper role of spatial technology.
De Soto evidently sees a lowly and inflexible role for spatial information technology. This is naturally galling to all those workers who have come to see spatial information as central in development. I will try to show that De Soto is quite mistaken on this point, that historically, changes in technology have driven massive social changes. Technology is far from being some background activity that can handle any problem once it has been clearly defined by non-technical "thinkers" higher up the social order. Rather, technology constantly redefines the possible.

Unfortunately, to make this argument in South Africa is to point to successes for technology that many of us would rather forget. It can be claimed that the land registry system played a pivotal role in the "successful" administration of the apartheid system. In a few decades of the nineteenth century and with a minimum of oversight by politicians, lawyers and administrative planners, land surveyors and the various colonial and Boer-republican Surveyors-General and Deeds offices, paved the entire colonial-settled areas of South Africa with abutting farms and urban erven. From the time of the Land Act of 1913, this framework proved an unequivocal and complete administrative information system to maintain the dispossession created by the initial settlements. Much later the infamous urban Group Areas were defined on index sheets using the matrix of existing property boundaries. The completeness and integrity of this spatial information system allowed the colonial settlers to build legislative means of maintaining their initial

mastery. The Land Act of 1913 specifically excluded black people from participating economically in the system of farms created by the settlers. Arguably, if this resource of surveyed farms had not been available to the settlers, different, perhaps non-legislative means might have been found by the settlers for maintaining preferential access to resources. That would have taken South African society down a different path.

Since the end of colonial rule, it might be said that the Surveyors-General and Deeds offices have passed their heyday in several Southern African countries. Although they still form an important information important system for the state and although state policy is executed using them, they do not seem to be part of a new renaissance. This is unacceptable. Why should technology intrinsically support the elite in one age and then form a colourless bureaucracy for a reformist administration in the next? There has to be some modality for technology that will serve the interests of a new more fair dispensation. And it is only the technologist who will find that modality out: It seems that non-technologists even such as De Soto, do not realise that such a perfectly appropriate or ideal technology might exist, let alone discover it. .

An interesting perspective on De Soto's view of the role of technology comes from comparing them to those of Sir J. S. Stewart-Wallace, then Chief Land Registrar for England, as reported to the Empire Survey officer's Conference in 1931 p317: *"Lawyers or surveyors by their administration may wreck [a registry]. And lawyers are the greater danger: their activities spread over a wider field"*. This coincides with De Soto's view. But whereas De Soto is speaking from an *á priori* position, Stewart Wallace was announcing the triumph of implementation of the 1925 Land Registries Act, at least for London. An idea of the administrative struggle he had won is given in this passage:

"It is not too much to say that the great experiment of compulsory registration in England was thus commenced under difficulties as to mapping which well nigh wrecked it. The poor Registry was between the devil and the deep sea. The whole of the revision of the Ordnance map in London had to be done day by day, on hand to mouth methods, by the Land Registry out of income often inadequate, with a fiercely antagonistic legal profession, and with a public demanding that their individual cases should be completed out of hand whether it rained, hailed or snowed. But, as surveyors you know that, if it rains or snows (not to mention if London is blotted out by weeks of fog), Ordnance Maps cannot be revised on the ground. Our poor surveyors were driven out by the act of man and driven backward by the Act of God.

Nevertheless, in the compulsory areas the battle has been won. We have now for the London compulsory area a beautifully constructed General Map, kept up to date day by day by our own surveyors, working on a definite plan, throughout the compulsory county. It is all paid for and we have a balance in the bank".

Stewart-Wallace's address might be best remembered for his defence of the principle of General Boundaries, which after this long period of successful implementation, we might as well accept as part of the ideal system for England. The general boundary is a technical concept, used in argument as a counter to the belief amongst surveyors of that

time, in the intrinsic value of accuracy, represented by triangulation. Stewart-Wallace evidently did not believe that technologists should be left to do their stuff after the larger issues were solved. Rather that technology should be strongly guided along administratively fruitful paths in the registration context, instead of along the path surveyors might like to follow according to the technology in vogue at the time.

I would like to propose five ways in which modern technology can support De Soto's vision, taking on-board his criteria that the system should discover the social contract used in customary practice. These proposals are that the office should be placed in the field, this office should form one end of a *dumbbell* information structure with a first-world data manager at the other end. The information should support an authentic register used in administration and commerce rather than one that declares rights. Fourthly that maps and social surveys should be banished from the field and finally that the system should not at first concern itself with boundaries but with place at which a right is established.

An urban context is imagined for these suggestions for several reasons. The municipality is the lowest level of administration with capacity to set up the envisaged system. The urban informal resident is the citizen with perhaps the greatest interest in being connected to the first-world information system. Lastly, some municipalities already have the information systems to which the proposed system would appear as an interface.

5.1 Place the office in the field
De Soto envisages the technician's intervention as a kind of aid-package feeding frenzy that takes place after the real problems have been solved. "*Engineering, systems integration, information technology companies, equipment vendors, registry advisers and all the others who provide property documentation services specialising in the surveying, mapping and the modernisation of registries… will consume most of the money spent on property reform, but only after the legal and political problems of bringing in the extralegal sector are solved*" (ibid. p204). It is difficult to square this with the need for the system to earn the trust of rights holders as a replacement for their existing customary practices. The registry system cannot be primarily something that exists in offices; it has to be mainly manifested in the field and right from the beginning. This experience was described by Stewart-Wallace(1931, p 314) when he recounted the long struggle for successful implementation of the registry system in London: After admitting the importance of up to date cadastral maps, he notes that London experience has taught "*the wisdom of making these maps the servant not the master; of using them only to assist in the identification of land; of making inspection of the actual site and enquiry on the spot the final and determining factor in the precise delimitation of the land*".

In past technologies field workers needed to return frequently from the field to record the information they had gathered. Their offices were their working bases. Modern technology presents an exciting opportunity to keep the field worker permanently in the field and without him even having to learn in detail, what happens in the centralised office. The basic peripheral devices for communication of rights information both ways

between a central registry and the place where a right exists can all be carried into the field in a single package. By placing registry office functions literally at the door of the rights-holder, an ideal integrity of cross-referencing is automatically established between people and their assets, with the added elements of ceremony, transparency and visibility of process. A door-to-door system would be more convenient to the client than some arrangement that requires him to present himself at an office. It would emphasise that registration is a service provided to owners, not a supposedly obligatory exercise in bureaucracy in which the owner needs to invest faith that the system will benefit him in the end.

5.2 Use a dumb-bell shaped information system.

Southern African societies are already deeply divided by the invisible divide De Soto refers to as Braudell's Bell-Jar. Capital is controlled from within the jar using information structures such as deeds records and credit assessments, that are first-world digital. Let as call a technologist who is at home in this environment, the *data manager*. On the other extreme of society, the social contracts that De Soto would have us uncover and reflect, are expressed in local languages and may never have been documented. We are lucky to have legal experts and social scientists who know a something about customary practices but an administered documentary system cannot be designed by them in the abstract. Rather it needs to be worked out through practice by workers who will create the experiential data on which jurists, legislators and scientists might work to codify and universalise.
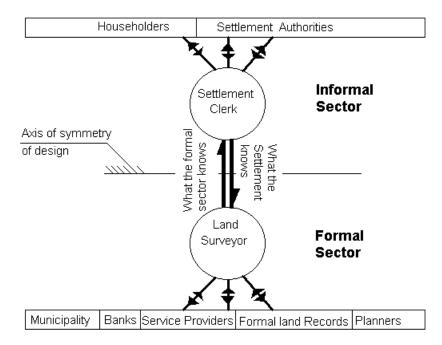

Figure 1: A dumb-bell shaped information system with two complementary workers, one inside and the other outside the formal economy.

Whereas in the relatively shallow settler societies an owner had ready access to the local attorney, land surveyor and bank manager, this is far from the case for an informal owner today. To pass information between the economic extremes that exist in Africa today, we need two different kinds of workers; a first-world digital data manager and a field worker. Such a system is often implemented in a form where the field worker is paid by and answerable to the data manager. However if the field worker is to learn from the community, he needs to be as autonomous as possible from the digital manager. Therefore we should consider the total information system as a symmetrical dumb bell as shown in figure 1.

The "handle" of this dumbbell structure represents information flow between the two workers. What form should it take? There is an argument for making this information flow entirely digital in the form of scanned documents, database fields and position information. De Soto uses the term "fungible" to describe property that has become economically active. Similarly, information that mirrors property needs to be fungible, to flow into different forms that suits a variety of users. This is supremely the property of digital information while information contained for example, on orthophotos in a filing cabinet, is the opposite of fungible. For the information to be useful at community level, it needs to be realised into hard-copy form. We should therefore visualise the field worker as making use of the basic peripherals of a battery-powered scanner and printer.

It is easy to picture such a worker, loaded with digital paraphernalia in a dusty African township, cursing the crazy technologist's scheme she has become involved in. The equipment is sure to break anyway. But this visualisation implies that the masses in Africa are locked forever on the other side of the digital divide In fact, along many a dusty street one may see mobile phone hirers operating digital equipment that internally, is highly sophisticated These entrepreneurs are not at all intimidated by Western magic, nor do they collapse their livelihood when something breaks. Africa understands everything about hawking and that is what a land-rights registry system basically is from the perspective of those who maintain it; they hawk information and skim off a small proportion of the money that flows in trust of that information.

5.3 Implement an Authentic register rather than a rights-declarative register.

De Soto witnesses to the failure of titling schemes as follows (ibid. p204)*"Technically driven titling projects tend to degenerate into identification systems for physical stock, outdated Domesday Books, or historical relics. The mapping and computer industries suffer as a result. Their project budgets are approved by politicians who expect that these new methods will incorporate the poor Once they realise they do not, the mapping projects get scaled down or terminated. My tram and I have found this happening time and again"*

Here De Soto is describing an information system that, once created at great expense, is then not used. A Householder receives a title document that at best serves as a token of ownership when the property changes hands. The banks are not interested in it. Even if the system does reflect local practices, what are its prospects of growing into a robust active system such one sees at work in a Deeds office? The technical concept of an authentic register is most interesting in this context. Kok and van Loenen(2002) define the concept as follows:

"The Dutch model for Authentic Registers is simple: government guarantees the creation and maintenance of data for use by many organisations. The data is regulated, certified as accurate and current, and the producer assumes all liability for its use by others".

This Dutch implementation comes from a society with a wealthy and effective administration. African administrations are generally not able to create informational models so accurate they can be used for all administration. However the context is not totally inappropriate, in the case of city municipalities. Some do maintain administrative maps, for example the MetGIS project for mapping existing informal dwellings around Durban. The fact that municipal information is used by it for its administration is of great significance to householders. To simply be in the municipality's books is the first step along the tenure track. It means that when the municipality deals with that dwelling, it will deal *as if* the recorded householder were the owner

The principles of the Authentic register find echoes in the existing South African formal land registry. In terms of Section 16 of the Deeds Registries Act of 1937, all conveyance of ownership and other real rights in land must be registered. So, in case of a dispute over land, non-registered agreements are invisible to the courts.

The South African State has not in the past guaranteed the correctness of its negative deeds and survey-diagram system. Individual conveyancers and land surveyors take this responsibility. Thus the essential property of responsibility is preserved.

The very fact that an authentic register is used in administration helps to keep its data clean. Whenever consequences flow, someone has an interest in having the information it reflects made current. In this respect, an authentic register is related to a fiscal cadastre.

We can contrast the authentic register, that has value because it is used, with the declarative register envisaged by De Soto, that has value because the State has declared what the ownership is. One practical problem with a declarative register is that it cannot be applied in the majority of informal settlements before the ambiguity of rights has been removed, otherwise the state will undermine its own authority by acceding rights in conflict with other rights it has declared. Declarative title then becomes associated with a final stage of redevelopment, which may happen decades later than an authentic register could have been put to work in a community.

The concept of an authentic register seems to be related to the *multi-purpose cadastre*, which is a title information system used for other administrative purposes as well. But

instead of other administrative functions piggybacking on the cadastral information, in an authentic register the land holding information would gain authority from being used in administration.

If an information system gains value from being used then the more it is used the healthier it will be. The data manager envisaged in the dumb bell structure needs to be able to hawk his information as widely as possible; to financial institutions and retailers as well as to the city, provincial and national administrations. The municipality would need to bring more of its own records into use by the financial sector to enhance the healthy growth of the information system. This raises privacy issues but that itself is a sign that the authentic register is socially and economically significant.

De Soto lays great emphasis on the importance of political will and direction in land rights registration. In Peru he galvanised the urban poor in overtly political campaigns for the registration of businesses and properties. An obligation rests on politicians to understand the importance and potential of technology and to direct it fruitfully, as Thomas Jefferson did when he designed the revolutionary rectangular survey system used in Westward expansion of the United States. But that does not mean the documents created under political direction need to carry the stamp of state authority. An authentic register can be regarded as an ostensibly commercial or administrative device created from political strategic motives. It is difficult for the state to engage in a novel approach to declarative land rights because it has to stand by its declarations. This makes for inflexibility where a learning process is called for and for large expensive implementations that waste money. Much money might be saved by supporting the creation of a non-declarative register and putting the state's name to it so to speak, only once the information has become worthy of that office.

By building up an authentic register the system designers could avoid the premature opposition of land surveyors and lawyers that is bound to occur if a supposedly rival system were mooted as a replacement of some of the functions of both conveyancer and land surveyor, with a low-paid field worker. Once the system is running the issue of granting declarative rights can then be discussed on the basis of real experience and a clearer understanding of the consequences for the custodians of the present system (that I submit would be very positive).

5.4 Banish maps and social surveys from the field.

Again and again De Soto emphasises that a land titling system is not a map. In South Africa it has long been recognised that the map (in form of a survey diagram) only supports the Deed and when information on these two conflicts, it is the Deed that is definitive (Simpson and Sweeney 1973, p714). Stewart-Wallace (1931) implicated maps in the failure of the 1862 Act in England:

"The first devastating but illuminating precisely because devastating fact we must face is that, when land registration was first introduced in England in I862, it was a failure so

complete that, like murdered Caesar, none so poor to do it reverence could be found. And maps were a principal villain in the piece!

Stewart-Wallace's point was that property rights, including boundaries, could not be economically mapped at least in England and that maps confused a necessary distinction between surveying and the law. In the modern Southern-African context, a different set of problems can be associated with maps. When map-making becomes the task of a field worker, that has several bad effects on development of a titling system. First, map making is a difficult task, demanding close attention from the maker. The source of training for this map making is the technologist. Therefore the field worker inevitably becomes a servant of the technologist whereas by De Soto's reckoning, the field worker should be paying attention to the community and social agreements, which are verbally expressed things.

Second, maps at least in the form of the base map, tend to appear only fleetingly before the householder, and therefore have relatively little lasting impact in relations within a community. A surveyor may show an aerial photograph or orthophoto to owners and discuss boundary positions using it, but that is the last the owners get to see of it. The owner is not given a copy; the base map is physically too big for that.

Third, in order to make sense of rights through the medium of a map, an owner has to abstract his understanding from the particularity he uses in discourse with neighbours, into its equivalent as seen by an eagle. The natural and human way of delineating a boundary is to walk along it or drive from beacon to beacon, if possible in company with the neighbours, not to carry out this exercise in the abstract on a photograph.

These characteristics of map use can be summarised as an intrusion into the mind of the field worker and the owner, of distracting and debilitating concerns. A similar distraction is provided by social survey information, which differs fundamentally from land rights information. Land rights information is recorded in signed and witnessed deeds that reflect human agreements or at least statements an individual is prepared to stand behind. This is also true of the graphic documents produced by surveyors; each graphic records an act of survey at a particular time by a particular responsible individual. Social surveys on the other hand are used for summarising information. They suck up information at the community level for expression at a more central administrative level. Although land rights information can be used for social statistical purposes, at the gathering point in the field social information is almost the opposite of land rights information.

The need to exclude base maps and social survey gathering from land rights adjudication, can be expressed in the principle that every document passing though the system should be primarily a text statement, signed, witnessed and dated. In other words the system should be constructed as a deeds system rather than as a map-based cadastre. Why then discuss it amongst surveyors at all? It is because surveyors are familiar with the management of systems for gathering information in the field. Further, a surveyor is a natural person to act as data manger.

In saying that maps should not appear at the community level, this does not mean that spatial information should be excluded. With the use of navigational-quality GPS attached to a palm-top computer, the spatial data gathering and representation in the field can be hidden from the concerns of those in the field. First, the place at which each statement or agreement is made, can be attached to the agreement. Second, spatial information allows spatially associated administrative statements to be conveyed from the administration to the individual owner. For example software can determine which formal land parcel a particular dwelling lies on and trigger the printout of a notice to the dwelling owner. Similarly for position in relation to flood lines, unstable geological area, a planned road or service point. Spatial position can therefore be used to convey from administration to the individual owner, all the implications of occupation. This can be done in the owner's own language and without the apparent use of maps.

5.5 Don't worry about boundaries at first.

I have argued that poor rights owners and high-tech mapping procedures do not mix well in that the demands of mapping draws the field worker's attention away from the paramount social aspects of his work. Obviously this interference can be greatly reduced if the field worker uses navigational-accuracy GPS integrated with a Palm computer that is used for other mainly text functions of registration. However especially in the case of urban parcels, the mapping of the centroid of each parcel rather than delineation of its boundaries, presents interesting opportunities. In the first place the field worker does not need to worry about topology, which is the major technical problem in defining abutting parcels. In some respects the centroid or *single point* information might actually be superior to parcel delineation as pointed out by Home and Jackson(1997) and Jackson (2000). Where dwellings are scattered over an underlying existing formal parcel layout, single point information can depict the situation clearly in contrast to the visual confusion produced by superimposing two unconformable parcel layouts. It is feasible to use single-point information while a settlement is densifying or if some properties need to be left out of out of the register for the moment as in sporadic adjudication.

There is a question mark though, over whether single- point information that says nothing at all about boundaries is any use in a cadastre that has traditionally been all about boundaries. The information provided by single points is essentially *where* a property right exists. This address information can be used to verify the correctness of information and to relate the right to other spatially defined opportunities (e.g. closeness to services) and restrictions (e.g. lying in an area that is not to be developed). Single point information can be supplemented by boundary information given in text form that can be interpreted by someone on the ground, as implemented by PADCO (undated). The use of single points would allow low-level rights to be recorded according to an indigenous recording system tied to authorities below National Government level, leaving boundary delineation and freehold title for the final stage along a tenure track. In the mean time single-point mapping can support most of the functions of a land registry, with the exception of subdivision.

6. Conclusions.

Behind this discussion of five technical strategies for low-level land registries has been the notion that there is an ideal technical form for land rights registration for the poor in Southern Africa. "Ideal" in the same sense that the original system built by the colonial settlers appeared to them as the natural and progressive way forward. The technologists and lawyers of the 19th century who built this system had only to recognise their ideal and codify it as a set of best practices in the field and office for them to construct a system that would work well throughout the 20th century and still serve as a guide in the 21st. This colonial ideal system attracted sufficient workers, training systems and state funding for it to prosper without the issue of capacity ever becoming an insurmountable problem that demanded outside aid.

The ideal technical system for the Southern African system might well not actually break down into the five strategies set out here. A neater and clearer analysis is surely possible. However I submit that the innovative heart of the ideal system so vaguely perceived, is a lowly field worker, equipped with digital peripherals to a communication system that connects the urban poor to the administrative and commercial heart of the city. The basic hypothesis, inspired by De Soto is that there is economic value and social benefit in this connection. If that is true then a technical system will grow in capacity without straining the resources of the society it serves.

In De Soto's vision there is no such technologically ideal system. For him, the principles can be worked out first at a political and legal level. Then throw enough money at the technicians and they will perform the mechanical implementation. I have tried to show that this part of De Soto's vision is mistaken. But he speaks with the authority of having worked with some of the leaders of land information management in the West, in large projects. It may be that the briefs presented to technologists forced them to focus on the problem at National scale: hence large mapping projects with much hype. These carried the seeds of their own failure in distance from the people served, inflexibility and lack of sustainability. I am suggesting that low level land registries can be worked out first in one city and then spread to others; nurtured as commercial and administrative information systems that are useful from the start. The workers who would develop this part of the system can be visualised as information-hawkers in the same tradition and style as 16th century Hurdy-Gurdy men hawking mechanically produced music through the towns of Europe.

The land registration system of Southern Africa was not developed from scratch, but from existing European cosmopolitan practices. The current cosmopolitan practices in land registration, that inform our perception of the way forward, are focused on data integration involving GIS systems that are serviced by highly qualified technologists. This is the world of central administrations everywhere. The romantic picture of a township data-hawker presented in the last paragraph, does fit into the cosmopolitan model but as a new primary data source and a new market. A data sensor does not need to be built in Japan from computer chips, but can be built in Southern Africa from human

beings, with some help from computer chips. Land registration systems have always been complicated social machines. To implement De Soto's vision all we need is a new tool-bit in the form of a worker who is immersed in that part of the broader society that we now have to serve.

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