

A practical guide to preparing,
implementing and ensuring
sustainability of reforms to property
rights registration systems.

Real Estate Registration and Cadastre

Practical Lessons and
Experiences - Chapter 8. IT
Systems for Cadastre and
Property Registration

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Introduction

It is often challenging to implement an information technology (IT) system for property registration and cadastre and there are many lessons which have been learned. The World Bank investments in IT for property registration and cadastre in their Europe and Central Asia region exceeded US\$ 900 million over the past 20-25 years (56 per cent of the overall investments in land projects in that period - US\$ 1.6 billion). In 2019, nearly all the countries in the region had IT systems for property registration and cadastre (with different levels of complexity), apart from one or two, where the systems are still under development. The World Bank *Doing Business* report in 2018 stated that one of the most effective improvements in registering property around the world had been through using electronic services. The same report indicated that in 2018 property registries used electronic files in 61 per cent of the 190 economies, as measured by *Doing Business* (Digital submission of files could be done both via e-services or at the local offices). Innovative technology contributes to better governance of land tenure through improved services from efficiency, effectiveness, transparency, limiting opportunities for corruption, accountability, accessibility, equity and cost perspective, making those services more affordable for all. Innovative technology applied to land records and geospatial information improves knowledge-based decision-making and widens the means for data dissemination and access to land records. E-governance in geospatial data management is an area of rapid innovation in developed economies, and emerging economies have the opportunity to leap-frog ahead in this area. It is potentially game-changing for supporting development as it allows governments to integrate planning, taxation, disaster risk management and climate change monitoring, mitigation and adaptation in new ways with great savings in time and funds, while improving overall service and governance.

Computing capacity and cloud technology are increasing, connectivity is improving and now more than 7 billion mobile SIM cards are registered globally. High and very high resolution (VHR) satellite imagery with a resolution up to 30 cm/pixel can be obtained in a few weeks, days or even in several hours. Drones can be used to produce cadastre maps, when needed, with a very high resolution and in a short period of time. Machine learning, artificial intelligence (AI) and cloud computing are now being used to process the VHR imagery and extract the building footprints, using the new imagery together with the historical imagery for shadow and cloud recovery. These technologies can be used also for surveying property boundaries for the registration process, including first time registration, subdivisions and automatic change detection. Nowadays, the available technology can generate huge amounts of data in a short period of time, which previously would have taken a year or longer.

However, establishing a well-functioning IT system has never been an easy and straightforward process. There have been tears and unhappy people following the very frequent failures in system development. This is something that happens in all sectors, not just land registration and cadastre. In 2017, Geneca published a study "*Why up to 75% of Software Projects Will Fail*",¹ showing that 75 per cent of business and IT executives surveyed admitted that their projects were either "always" or "usually" "doomed right from the start".

Related: 2018 Software Development Trends That You Can Count on Continuing Into 2019.²

There are various classical reasons for IT systems failure, such as poor communication, unclear requirements or often changes of the requirements, unrealistic expectations, poor project and contract management, lack of senior management support and several others. One additional reason to consider,

¹ <https://www.geneca.com/why-up-to-75-of-software-projects-will-fail/>

² See also reference: **Related:** [2018 Software Development Trends That You Can Count on Continuing Into 2019](#). This link addresses some of the latest trends in computing that are currently accruing, including blockchain and Artificial Intelligence (AI).

when planning the implementation of an IT system for property registration and cadastre is that the increasing transparency, which is often a result of implementing electronic systems, can affect the interests of powerful groups who have been benefitting from the way that the old systems are working. In my experience, big IT companies normally fail to deliver the systems on time, or within the initial scope and budget, as some of them underestimate the complexity of the system and come up with low cost and unprepared teams. Those companies that offered a realistic price often did not get the contract because the tender procedures and the selection criteria were not well defined and, sometimes, corruption was involved. It proved also during my many years of experience in implementing complex IT systems for property registration and cadastre that Big Bang is not Better. In many countries, using a modular, incremental approach worked better than implementing huge IT systems in one single contract. Another serious issue we are facing is the limited institutional capacity to manage complex IT systems development, implementation and maintenance. The uncompetitive government salaries compared with the private sector for highly qualified experts, the lack of training or access to the new technology in the government agencies are additional reasons for failures to successfully implement systems.

This chapter provides some tips to consider at the time of a new project's preparation, which may include:

- software development, things not to forget at the time of development of the technical specifications;
- how to manage the system development and its implementation, and plan for system sustainability;
- the use of emerging technology, which now allows you to do things differently from ten years ago.

These are grouped in the following main sections:

1. Initial Considerations
2. How to Make it Happen!
3. New Technology to Consider.

Initial Considerations

The IT System is just a Tool

Building a complex IT system with a modern architecture will often take years and a lot of money and the existing services may not improve at all. The IT system is just a tool, like a pen, for doing something. It is a very advanced pen, but a pen, nonetheless. If the processes are complicated, the IT system will not simplify them automatically, unless you change the legal framework to introduce simplified procedures and allow access to data and e-services, using the advantages of the automation. If the data are poor, missing or inaccurate then the system development does not fix that unless specific additional interventions are made to correct and improve the data quality. If corruption is a problem and the office staff do not want to deal with that then they will find ways to retain their bad practices. You may consequently continue to have backlogs, long waiting time at the offices, unclear rules, mistakes in data, people in the coffee bars near the offices 'helping' citizens to get their properties registered, etc. You need to think about what benefits the IT system could bring, how you could improve transparency, simplify the procedures, staff and offices' performance monitoring, etc. Think about something simple, relatively quick and visible, which helps to resolve some of the most critical issues, makes the government look good and at the same time provides better services to citizens. What would be the improvements for the staff at the offices, the clients, the management, the government and municipal authorities, the private sector and the general public?

Setting and maintaining property registration and cadastral systems is technically complex, time consuming and requires political support, strong leadership, a legal framework that supports the use of

technology and allows for simplification of business processes, and continual investments in institutional and human capacity. Remember that the IT system is just one of the tools to achieve something.

Political will is critical

You need a champion³ at a high-level. Leadership, management skills and capacity follow on from that.

I was visiting one of the cadastre offices in Belgrade, Serbia at the end of 2018 and I asked a woman, who was waiting in line: “Why are you visiting the office?” She was not a happy customer as it was her fourth visit to the same office to register a mortgage and she was not sure if this would be her last visit. She started to blame the office for corruption. The head of the office was next to me and explained to the woman that this was the official procedure.

Changes occurred and six months later, in early 2019, I found out that no one visits the cadastre office anymore for registering a mortgage. A new notary law was passed in Parliament, making it mandatory for notaries to operate only digitally and that mortgages should be registered only by notaries. The operational procedure for mortgage registration was changed, the existing IT system was modified, notaries were already using digital signatures and they had access to various government registers. The staff at the registration offices got digital signatures and were trained – all in six months! Digital transformation is high on the Serbian government's agenda, aiming to provide more transparent and accountable digital services by 2020 that meet the expectations of citizens and the needs of the economy. Various changes of the legal framework have also been initiated by the government and adopted by the parliament to support the digital transformation in Serbia.

The Federal Service for State Registration, Cadastre and Cartography of the Russian Federation (Rosreestr) is the largest property registration and cadastral authority in the world. One of their first big achievements was to start accepting applications for the issuing of extracts (copies of property registration and cadastre certificates) by any office for the entire territory of Russia. You don't need a perfect IT system to do that, but you do need a legal framework, allowing one local office to issue a certificate for the property under the jurisdiction of another local office. Rosreestr introduced a **Trust Line** for direct reporting on corruption and other irregular cases and a **Single Help Line**, ‘*Call toll-free within Russia*’, for legal advice offering a 24/7 help desk, covering nine time zones! This is what the clients need. If you put yourself in the shoes of another person (the customer), who is not familiar with the property registration procedures and who has never dealt with any property issues before, then what would you need? It is similar to what you would expect when you go to a bank and ask for cash. You are not interested to know the legal base, the bank procedures or the bank IT system, you just need to get your cash. All this became possible due to the high level political support, which led to legal changes, financial support to the reforms, merging three institutions, dealing with property registration in 2008 and creating Rosreestr. This resulted in going from zero e-services in 2009 to all services available online in 2013. Huge reforms require significant investments as well as legal, institutional, technological and cultural changes. (The *Client Oriented approach is a big nationwide program for all government sectors in the Russian Federation.*)

Corruption and IT systems

As mentioned in the previous chapters, land is the third most corrupt sector globally. The IT systems increase transparency and that often negatively affects the interests of powerful people. This transparency could be achieved by putting data online or through the workflow, which can tell you at any step in the process where the documentation is and for how long it is kept at that step, or to provide information about some other blockage that may have occurred. You know who is performing well and who is not.

³ See more on the ‘Champion’ in Chapter 4.

In one of the Eastern European countries, the IT system was successfully implemented after several unsuccessful attempts to do so, and the IT team, the head of the agency and the Bank supervision team were so happy. The happiness lasted just a day or two. After that a severe, negative media campaign started against the agency and the IT system. The agency investigated and found that the journalist, who was supposed to be the author of the negative articles, did not exist. A high-level person was behind the scene trying to scupper the new IT system. There had not been a single complaint by citizens or professional organisations (notaries, surveyors, real estate agents, banks). The government organised a massive public relations campaign to explain the benefits of the new system and set up a crowdsourcing mechanism for people to check their records and report errors.

The lesson learned:

- Prepare your massive media campaign before launching the IT system and do not expect that your success is going to make everybody happy. There will be people who will try to destroy the IT system.
- Do not push too hard initially for transparency as you may scare some influential people and they can try to block in various ways the IT system development. The IT system takes a lot of time to develop and to bring the digital data to the central level. Once this is done, you can implement a new e-service every week at a very low cost. Make sure that you are ready, when the 'door is opened', and that there is a political will to do it. It could be the case that the door will be open for a very short time. Go fast, because the opportunity may disappear when management changes or corrupt officials realise that their past practices are no longer possible. Once the data have been online for several months, there is no way back. Try to survive the first several months, without killing the system, as you might need another ten years, if you start again from the beginning, before you reach the stage where you are now.

One Size Will Not Fit All – Fit-For-Purpose

The IT systems for property registration and cadastre differ from country to country, because of differences in the legal framework, institutional arrangements, policies, locally suitable technologies, local capacity, data structures and culture. Each country has its own challenges and priorities. Most of the countries in the world have digital records, maintained by IT systems with varying levels of complexity, different data structures and different technical platforms. It is not an exception to find that there are several IT systems in use in one and the same country with different data structures or even, in some cases, where only one IT system is in use, but different offices are using the system in different ways. My biggest surprise was to find recently in one of the Western Balkan countries that each employee in the same office was using a different version of the system and there were different issues with each of the different versions. There are many reasons for that, but it usually stems from weak management and a lack of experience.

Why is it so Difficult?

Is it about the complexity of the technology?

There are few limits to what technology can achieve today. I would not start planning the development of an IT system, thinking too much about the underlying technology, technical platform or licences and architectures. If the system design follows good international practices and standards, you can change and migrate the technical platform with limited cost and time. In one of the Western Balkan countries, the IT system was developed in-house, using open source licences. This was not well accepted by the government at that time, with the argument that there was no local knowledge about the open source licensed software and the IT system may not be secure enough. The key priority was to keep the system running, not to fight with the government about the platform. The technical platform was changed in 40 days by three local programmers and an international adviser. This was possible only because the IT system design was right, and we mainly only had to change the data layer.

The next government did not like the IT system because they had different priorities and wanted to use open source licences, so we explained that we could migrate it back in 40 days with a small additional cost.

However, this may not always be the case, and it depends on which elements of the architecture are changed. For example, changing a database (e.g. Oracle to Microsoft SQL or to Postgres) could be relatively easy, because for example they are all based on SQL92 standard. However, there are examples where a choice for software development tools and languages will be cumbersome to change after development/deployment.

The point here is: do not start by thinking about technologies, licenses and technical platforms, before you decide what your needs are. Technologies are changing very fast anyway.

Big Bang Does Not Mean Better

Experience has shown that systems that are developed internally or through local contractors are more successful than major contracts from big international suppliers. However, the sustainability of the system must be considered before starting the development. Sufficient local capacity to manage the software development and to continue the on-going development, modify systems as demand changes and to be affordable to maintain the software are all key considerations. If the system is developed in a modular approach, then each module can be implemented once it has been fully tested and piloted. The prioritisation of the modules is important as well as the selection of the pilot offices to test the modules. The pilot offices should be selected in a way that will allow you to cover different types of offices with different level of complexity and with different sizes. You also need to consider the existing capacity of the pilot offices and the willingness of the management of the pilot offices to invest time to test the new IT system and provide feedback. It is time consuming and requires extra effort when testing and piloting the IT system. So the selected offices should be aware of the extra volume of work and they should also be aware of the benefits of the new IT system in order to keep motivation high. Pilot results, evaluation and lessons learned from the pilots have to be analysed before starting the national roll out. There is more on this important issue in the section on software development and implementation below.

Everyone Has a Right to Make a Mistake

People learn much faster from their mistakes. Once they eventually succeed, the results are more sustainable than when someone else has done the work for them, so that when the project closes, the government is completely dependent on external support, which they cannot afford! It is always good to try new ideas or new approaches. Some may succeed, others not. If you never try, then you will never know. Therefore, my advice is to let new ideas go ahead if there are no very obvious reasons why they cannot work.

IT Project Management

IT project management has been problematic in most of the countries where I have been working. Most of the managers, and even the staff assigned to manage the software development, did not have a good understanding of even one project management methodology. The IT experts often speak a technical language, which managers do not understand, and the managers will either ignore them or blindly trust them; which is wrong in both cases. It is good practice to have an IT director as a member of the senior management team of the agency, working together with the senior business managers, who can understand the IT systems being built and identify when IT systems are not being developed appropriately or IT experts are not performing.

If the design and development of an IT system looks too abstract to you, then my suggestion is to think about the steps in building a new house and the skills and expertise needed in each of the steps. There are lots of similarities between the steps in building a house and building an IT system. (See diagram below).

If you plan to build a new house, you always start with the conceptual design, followed by the detailed design with a bill of quantities, selection of the construction company and the independent company to supervise the construction, construction and supervision, acceptance and building use certification, warranty and maintenance. The company that builds the house is never the one that develops the detailed design, and an independent supervision of construction is a must. It is similar to this in the case of an IT system: you hire a software development company and you need an independent quality assurance and control expert/team to do the supervision.

The PRINCE methodology was initially designed for managing building construction projects and later adopted by the UK government's Central Computer and Telecommunications Agency in 1989 as a mandatory project management methodology for IT project management. In 1996 PRINCE2⁴ was developed in consultation with about 150 European organisations and is a generic project management framework and widely adopted for project management.

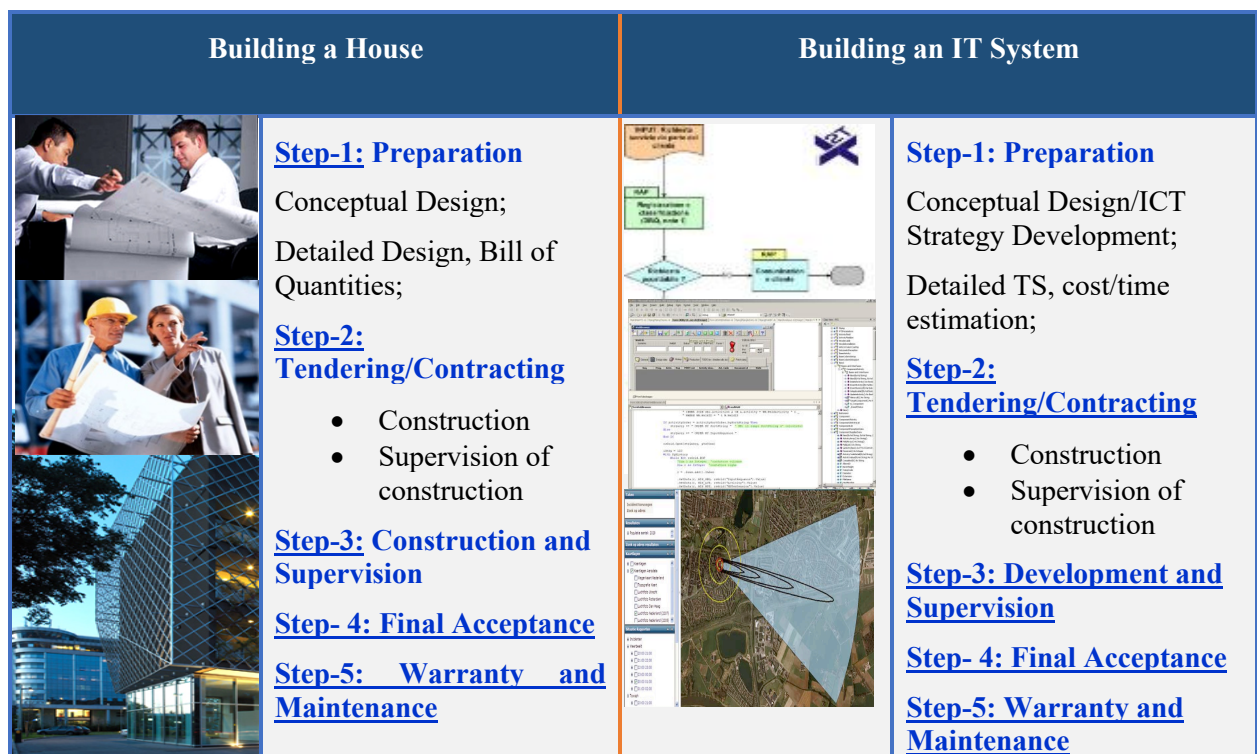


Figure 1: Steps in building a house and building an IT system

Software development has seen an explosion in the number of available *Information Systems Development Methodologies* (ISDMs). There is no independent database that describes these ISDMs and indeed it is not even clear exactly how many of these methodologies are in existence. Different types of development situations need different methodologies. What is important for the staff at the

⁴ **PRINCE2: Projects IN Controlled Environments** is a structured [project management](#) method and practitioner certification program. PRINCE2 emphasises dividing projects into manageable and controllable stages. It is adopted in many countries worldwide, including the UK, Western European countries, and Australia.

government agencies managing software development contracts is to have a good understanding of one or more software development methodologies and always to hire an independent quality assurance consultant, who is familiar with the software development methodology that is used for the software development in their specific case.

Step 1: Preparation

There are no questions or doubts as to whether you need to hire an architect to do the conceptual design of a building and later on the detailed design and bill of quantities when you have to build a new complex building. However, when you need to develop complex software, not everyone realises how important the first step is. This includes:

- a) Information Communication Technology (ICT) Strategy development – you have to decide on the priorities on the methodological approach (in-house development or outsourcing); what would be the technical solutions based on the existing communication infrastructure; and cost that could be afforded, what is the local capacity and how are you going to ensure the system sustainability in the long term;
- b) Business processes re-engineering – the IT systems provide a new opportunity to structure the services differently and to simplify the processes. You should make sure that you are not simply automating the paper-based system, as you will not get much return from the investments made. This, however, may require some legal changes. You need to ask yourself which of the legal changes could be implemented within a year and which are the long-term wishes;
- c) Data model development – this is critical for the system interoperability with other key government systems and registers in the long-term. You need to develop a national standard, based on the international standards. You need to test the new data model to make sure that you can migrate the existing digital records, if any, and interoperate with other government systems;
- d) Technical specifications development – this needs to include user and technical requirements, system integration and system interoperability with other systems, training and capacity development, data migration and data validation, quality assurance and system acceptance procedure. You need to develop an indicative plan and have a cost estimate. Step-by-step approaches have proved to work better than big complex IT systems development in one contract;
- e) Assessing data quality – the best IT system will not bring the expected changes and benefits if the data are of poor quality. You need to plan data quality improvement in parallel with the software development – this is crucial;
- f) Data digitisation – if you have a good system without digital data this is still good, but to get the benefit from the system, you need digital data. You need to plan data digitisation in parallel with the system development and ensure that it complies with the agreed data model;
- g) Project Management, Contract Management, Quality Assurance and Quality Control, Cybersecurity – you need to plan sufficient resources for technical support, as government agencies do not usually have the necessary skills and experience and it is not their core business. Independent quality assurance is a key success factor.

Step 2: Tendering/Contracting

- a) Bidding documents preparation – if you have existing technical specifications then you need to think about the selection criteria and the standard bidding documents, which are suitable for the ICT systems design, development, supply and installation. You need to think about the

approach to liquidated damages and establish clear milestones, linked to the acceptance and payment;

- b) Tender evaluation – you need to check carefully all references of the bidders. If you notice that the price is too high or too low, then you have to ask for a detailed cost breakdown and make sure that the bidder understands the scope and the complexity of the system.

Step 3: Software development and Supervision

- a) Contract management is critical - you need to establish a clear management and reporting mechanism and set up a requirements tracking system. This is an aspect of project management where many projects fail;
- b) Quality Assurance and Quality Control – you need to hire an independent quality assurance and quality control certified expert or company to help with the major phases of acceptance.

Step 4: Final Acceptance

- a) Preparation of final acceptance – you need to agree on the acceptance criteria in advance and you need both business experts and IT technical experts to participate in the final acceptance. Test cases and scenarios should be developed and agreed in advance. The best is to have a quality assurance expert to guide you during the final acceptance;
- b) Final acceptance – you need to make sure that all the user requirements and the technical requirements, as per the contract, are fully met and that the software documentation is provided and corresponds to the final version of the software. You need to ensure the transfer of the source code and the corresponding intellectual property rights, as per the contract conditions.

Step 5: Warranty and Maintenance

- a) Service Level Agreement - usually this is part of the contract, but prior to the final acceptance, you need to prepare together with the contractor a detailed Service Level Agreement. This covers the warranty period and if requested in the contract, the services covered as part of the maintenance;
- b) System sustainability - this includes many different elements: network, hardware, licences, capacity development, help desk support, system maintenance and modifications, etc. The best approach is to establish a sustainable business model and funding streams to ensure the system's operation in the long term. The business model should be simple and not rely on having high quality IT experts with government salaries. All associated costs to keep the system running and to provide further upgrades need to be justified and sources of financing identified. Some countries introduce small charges for their online services to reinvest in the IT system and keep it running. Other countries rely on state budget or donors' support, which is not well accepted by the donors and is not sustainable. Too often donors provide capital for IT investments, but do not provide on-going revenue streams to sustain the IT investments. It is important to plan as part of the project design implementation measures that ensure system operation for the long term. Those have to be in place before the project closure.

Make it Happen

This section provides various tips and details on critical elements for the successful implementation.

ICT Strategy

There are no two ICT Strategies that are the same. My advice would be to think about:

WHAT you would like to achieve? Services are the key. Think about whether the legal framework supports your goals and, if not, then move this goal to the mid-term or long-term priorities. Undertake something practical, which can be achieved within the time, money and human resources that you have.

WHO is going to manage it? Who in the government agency should be involved and what are their strong and weak points? Plan sufficient capacity development and technical support, not just on the IT matters, but on the legal; who from the permanent staff will be involved and what additional support is needed, as well as procedural issues.

HOW is it going to be managed? A clear management and reporting structure should be included, together with the roles and responsibilities of management, developers and those involved in quality control. Strong project governance arrangements, as recommended in PRINCE2, are essential.

WHEN and HOW MUCH? Do not forget to set up priorities, a project plan and prepare a cost estimation. Be realistic as to what can be achieved with the funds and time available. Include key performance indicators to measure the success. Identify the key risks and mitigation measures to completing the system. Add a chapter for business continuity and add money for this work. This should start right from the beginning, as it may require legal and institutional changes and, for sure, funding.

What?

Technical Aspects - What is your concept?

This **section** discusses the biggest challenges you are facing –what issues are you trying to resolve? What is your concept? The answer depends on who you are asking? Is it the head of the office, the Minister of Finance or the Minister of Justice? Is it the courts or the clients at the offices? The problem could be issues with backlogs, lack of information, lack of data for property taxation, the high volume of complaints, disputes, a huge number of court cases, long waiting lines at the offices, slow service provision, corruption or something else? What you would like to change in the next three to five years? Think about SERVICES and DATA availability, accessibility and data quality.

If you are a head of an office or a Minister in charge, know what the challenges are, and which ones are at the top of your priority list for the next three to five years. Look at the top government priorities, align your strategy and speak the language of the politicians. Consider what would make them look good and assess whether it can be achieved within their expected mandate. Will that make the customers' lives easier?

The IT systems for cadastre and property registration are complex because they cover many different processes; the legal framework is complex, there are issues with data quality, the old systems are not often well documented and there are issues with the intellectual property rights - just to mention some. Also, the procedures are often not unified, the data quality is not good, and historically data are usually kept on paper. Systems are often not linked, and you will find lots of mistakes in: names and addresses; changes which are done on paper (but not digitally); maps kept in one system and legal data in another system and these data do not match, etc. You can't resolve all these critical issues in a short period of time.

One of the technical questions, which usually comes at this stage is whether or not to use cloud technology, and if yes, is it secure enough? My experience is that most of the government agencies are not willing to use cloud technology, unless there is a government cloud or a government mandate for using cloud technology. In such cases, the cloud solution appears much more sustainable and it is easier to maintain the systems without the need to plan big infrastructure investments every eight to ten years.

In **Croatia**, for example, the government decided to establish government cloud services and invested in a private company to establish a government cloud. A Council of Ministers Decision was issued, making it obligatory for all government agencies to use the government cloud and stopped all further investments in the agencies' data centres. This was well accepted as the company also took over the IT specific tasks, such as cybersecurity, provision of the necessary licenses and cloud space based on the needs, and maintenance of the technical infrastructure. In **Albania**, the government established the National Agency for Information Society to coordinate the development and administration of state information systems and established a national data centre to host the government IT systems. This was a good step towards achieving systems sustainability. The same agency is in charge to decide whether the cloud services can be used and if yes, which ones.

Think Big and Act Small!

Adopt a STEP-BY-STEP and Fit for Purpose approach

We had cases when a new IT system was supposed to be ready at the end of the project, but the contract was delayed and eventually cancelled. So, after several years, the government received nothing. The government realised that they couldn't manage big IT contracts and that the contract management capability was constrained by having few people at the agency who spoke relatively good English. The development and the implementation aspects of the IT system under the next project were split into several smaller contracts, which proved to work better.

In parallel, you have to work on data digitisation and data quality improvement, which takes time and money. For example, when the Russian Federation was developing a Unified System for Cadastre and Property Registration, they worked in parallel on database integration, data digitisation, data quality improvement and modification of existing IT systems to improve service delivery nationwide. When the new IT system replaced the old ones, the change was not that noticeable from outside, as the citizens had already been receiving good services; just the technologies were different and there was a unified database.

Another simple idea, which worked very well in Russia, was to introduce an IT system for interagency exchange of information – this was a simple web portal, through which each agency could send electronic requests for data to any other government or municipal authority, and get a response in a maximum of three days (some agencies were working on paper, so they needed time to prepare the online response). This solved the problem of citizens not being obliged by law to bring any documents to the office if they were issued by any other government or municipal authority. The documents must be supplied directly by that other authority.

You need to find out where the bottlenecks are and then look for a technical and business solution. Do not go for the most expensive one, as it could be much simpler than what you would imagine. Once you know what you want to achieve, you need a good IT expert to advise. This person should be familiar with property registration and cadastre IT systems and know what has worked well in other countries. He or she will make several suggestions as to how the IT system could be designed and implemented and how much time and money it would involve.

Who?

Governance Aspects

Who is in charge of managing the design and development of the IT system?

Look at the organisational structure of the beneficiary institution and include in the ICT Strategy a temporary structure to manage, monitor and report on the progress of the system design and implementation. A typical management structure would have three levels and a quality assurance mechanism (see also PRINCE2 for project governance arrangements):

The first and highest level is a **Steering Committee** (SC) in charge of strategic decisions defining priorities, resolving risks, approval of main deliverables and budget.

The second level is the **Project Management Body** (PMB) in charge of day-to-day management.

The third level comprises working groups, contractors and individual experts.

Plan sufficient budget (about 10 per cent of the cost for the software development) for consultancies to support the IT contract management, IT project management, quality assurance and quality control, cybersecurity, help-desk, network and communication, training, business change management, and capacity development. Remember that this is a technology and know-how transfer exercise and the government agencies usually do not have sufficient knowledge on the latest technological trends. It is not their fault, as it is not their core business.

How?

Methodological Aspects

How will the IT contracts be managed and what capacity will be needed?

Adopt a methodology for managing the design, development, implementation and maintenance of the system. The two basic, most popular methodologies are: 1) *Waterfall*: which might be more properly called the ‘traditional’ approach, and 2) *AGILE*⁵: a specific type of Rapid Application Development and newer than Waterfall. Both of these are usable, mature methodologies and each has strengths and weaknesses. Although, AGILE is becoming the preferred methodology that delivers what the business needs and involved end users in the development process.

Waterfall is a linear approach to software development. In this methodology the sequence of events is gather and document requirements; design; code and unit test, etc. Each of the events represents a distinct stage of software development, and each stage generally finishes before the next one can begin. There is also typically a stage gate between each; for example, requirements must be reviewed and approved by the customer before design can begin. The danger of this methodology is that the business doesn’t know their business requirements in sufficient detail at the start of the project and what is eventually delivered doesn’t meet their needs.

AGILE is an iterative, team-based approach to development. This approach emphasises the rapid delivery of an application in complete functional components. Rather than creating tasks and schedules, all time is “time-boxed” into phases called “sprints”. Each sprint has a defined duration (usually in weeks) with a running list of deliverables, planned at the start of the sprint. Deliverables are prioritised by business value as determined by the customer. If all planned work for the sprint cannot be completed, work is reprioritised, and the information is used for future sprint planning. The PRINCE2 project management methodology has recently been extended to include PRINCE2 AGILE.

You need to define the standards to be respected. Decide on the development approach: in-house or outsourcing? Set up standards for managing different types of IT related contracts: software development, hardware supply, communications, maintenance contracts, user training, help desk support. Set up standards and guidelines for unification of working procedures. Establish monitoring and reporting mechanism. Plan staff training.

⁵ <https://www.agilealliance.org/agile101/>

When and How Much?

Define priorities, cost estimation, deadlines, key performance indicators and risks.

Ownership of the ICT Strategy

I remember a case when I found a good ICT Strategy developed by a consultant, but it was never accepted by the government. The government decided to develop their own ICT strategy, which was detailed and like a university book, but they owned it, they understood it, and this is what they wanted. I did not like the new strategy, but I just suggested some tips, only where some very important elements were completely missing. Then we said: let's do an action plan. The whole scientific book was condensed into a one page Excel table with specific activities for improving the network, upgrading the existing IT systems, design of new services, training and other simple tasks. The agency was then leading the work, going to international events and presenting their story and gaining confidence that they could do it! It was the government's success story ultimately.

Give the government a chance to do it in their own way, if it is not too wrong. There are often better ways to do the work, but it is important to have ownership. Help them to lead and take responsibilities. The biggest failures in IT systems globally have come from decisions that were not made rather than the wrong technical decisions. Remember that it is the services that are important, not the technology!

Data Model and Data Migration

The data model is as important as the foundation of your house. Once you have the general scope of the system, you can start with the design of the data model. As the ISO 19152:2012 - Geographic Information - Land Administration Domain Model (LADM) is a relatively new standard (November 2012), most probably the existing digital data are not in line with this standard. you will therefore need a senior expert with experience in LADM to assess the existing data models and design a new one to cover the scope of the IT system. You will also need a local expert to work with the senior expert to test the new data model in order to make sure that the existing digital data can be migrated into the new one. You may have an ideal data model, but you still need to migrate the data from the old data model into the new one. This will require some modifications of the new data model. For example, the addresses in the new data model will be structured to include the country code, country name, town code, town name, etc. However, the old data model could have just one field for the address and it may not be easy to extract all the fields that you have in the new data model. Therefore, testing the data model with the migrated old data is important. Once the new data model is developed and tested, you may start upgrading the old IT systems to the new data model.

<p>In Vietnam, for example, several IT systems are in use in different provinces and the government decided to implement a unified system nationwide. This would take several years. The advice was to develop a national data model and set it as a standard, and then to provide a transitional period for all provinces to upgrade their systems to the new data model. It should be a core data model. This will speed up data migration when the new IT system is ready, will also allow establishment of an integrated central database and will support the data exchange, data sharing and e-services provision.</p>

Business Processes Re-engineering

One of the most common mistakes made in developing an IT system is to just automate the processes used in the paper-based system. It is essential that the processes are redesigned based on the advantages that are possible with computerisation, while making sure that the business of registration is fully catered for. Technical Specifications (TS) were problematic in almost every country. The systems are complex, technologies are complex, and the legal framework is complex and sometimes not clear enough. Often the concept of the scope of the IT system is not clear. The suggestion is to plan a small

contract for six to eight months to look at the existing business processes and discuss the optimisation and business process reengineering within the existing laws. Laws can change, but it will take time. The team should comprise of mainly business experts (mainly lawyers/registrars and surveyors within the agency concerned) along with an IT expert, who can advise the business experts on what is possible with the locally suitable technology.

Bidding Documents

You need to prepare TS covering the data model, the business process, non-functional requirements, such as cybersecurity, system performance, system interoperability, quality assurance requirements, system integration (hardware, application software and licenses), type of training and number of staff to be trained, data migration and validation, piloting and roll out, system acceptance criteria and indicative plan. Always include details about the system integration in the TS and describe what this means and who is in charge of putting together the application software, licences, hardware and communications. You will have several contracts on which the system performance depends, like hardware and licenses supply and installation, application software and network connections, so you need to clearly define who is the system integrator and what this includes. The best solution is for the software developer to be the system integrator, providing the minimum hardware and communication requirements, the necessary licences and being responsible for leading the process of integration and putting the system into operation. This responsibility should also include a certain period of system operation.

The bidding documents have to include clauses for intellectual property rights and liquidated damages (the risk to encounter severe delays or to fail to provide some functionality when developing software is often quite high). A budget for change requests (primarily for small changes that are not envisaged in the TS) should be set aside. Make it clear when the warranty period starts and what is included. The same applies for the maintenance. If available, use the standard bidding documents, including general conditions for IT systems development and implementation.

Tendering and Contracting

No matter if you decide to develop the IT system in-house or to outsource the development, you need to have clear Technical Specifications (TS) and well defined selection criteria. Quality requirements should be included in the selection criteria, such as the key experts and references for completed systems with similar size and complexity. Request CVs of the key business experts, the senior project manager and the senior quality assurance expert. If you are going to outsource the development then include in the selection criteria the cost for the maintenance per year, including licenses, even if the maintenance will not be part of the contract. Use General Conditions for ICT Systems supply and installation, if available. The World Bank has standard bidding documents for International Competitive Bidding for supply and installation of IT systems. The selection criteria are very important.

Check all references by calling and checking whether an IT system with similar complexity has been developed by bidders with similar contract duration, cost and scope. If you feel that the bidders are underbidding then you can ask for a detailed cost estimation, including the number of days per type of expert and unit cost. If the case is the opposite, when you believe the cost is too high, then you still have to ask for detailed cost estimation and proof of the experts' fees from the company records. The best is to ask advice from a senior procurement expert, specialised in IT systems tendering and contracting at the time of preparation of the bidding documents and the selection criteria, as well as during the tendering and the tender evaluation.

Big contracts appear to be risky and we found that most of the big and well-known companies failed to deliver on time, within the initial scope and with good quality. In most cases, they were using smaller local companies to do the job or were hiring junior experts, who were left to manage the software development without senior experts. At the end of most of the big contracts, the big companies lost

money and the scope of the system was significantly changed. The contracts were extended multiple times.

You need to have clear phases in the TS and have deliverables that are usable at the end of each phase in case the contract fails before completion. For example, a new data model with tested data migration can be phase 1; Document Management System in use for the front offices initially could be phase 2; interoperability with the old systems in use – phase 3; e-services, which are most needed – phase 4, etc. Split the TS into smaller contracts or incorporate smaller phases with liquidated damages in each phase of one contract.

Software Development and Implementation

Local Capacity to Manage the Complex IT Systems Design and Implementation

In most of the countries where I have been working, the government capacity to manage the development and implementation of complex IT systems was low. The implementation was usually problematic. In several cases, the contractors underestimated the complexity of the system and they came up with a low bid price. In other cases, key experts were replaced after the start of the contract with experts who did not have the same level of experience. In one such case, the contract was cancelled after several years of not delivering the expected results. In other cases, the contracts were extended several times; new changes of the key experts were requested by the purchaser, which led to further delays, reduced scope of the contracts, and in all cases the companies lost money. The contract management from the purchaser side is very important and there should be an independent quality assurance and quality control expert/company separately contracted.

Once you have the contract signed, you need a senior IT contract manager with previous experience in cadastre and property registration systems development and implementation. You will need to plan funds for a quality assurance and quality control expert, IT contract management expert, cybersecurity expert and several others. It is not necessary to have any full-time international experts as you will create dependencies. It is better to get full time local experts, who are eager to learn and work on a big project with innovative solutions. Often the local experts move on to better jobs for higher pay after learning to develop or manage complex IT systems. There are cases where the government agency has managed to find and keep motivated staff to work on the IT system implementation, but those are exceptions.

Plan a sufficient budget for IT specific training, and also for basic IT training of the local office staff and for procedural and legal training. The workflow and the way the office operates change as IT systems are developed and the staff at the local offices may not understand why the change is happening. There is no point in training them on the use of the IT system before the legal and procedural training is done, and it is better to have both carried out together. Plan funds for training of key professional users – notaries and other legal professionals, surveyors, banks, real estate agents, tax authorities and also high level government officials.

Technical Quality Audit

If you plan to extend the existing IT system, you will need to complete a quality audit of this existing IT system. Even if you intend to build up a completely new system then it will take several years, and the existing IT systems will be in use as temporary solutions. The quality audit will identify the key bottlenecks and provide recommendations for improvements. Some will be needed urgently while others may wait or not be considered. You will better understand whether the system is suitable as a long-term solution: for example, can the system handle the volume of data you are expecting in the next ten years? Can it be upgraded by another company (transferability)? Is it secure enough?

Also plan a quality audit after the first few months; when the new IT system is under development and at the end of the contract. The first audit is an investment in the future system, so there will be time to improve the system and do it right. The second audit is just before the acceptance, so you know what you are going to get. Be aware that only part of the key findings can be improved at the final stage.

Final Acceptance

The Final Acceptance is an important step and requires specific knowledge on how to prepare and how to complete it. Here you need an experienced quality assurance expert to guide you through the process and help you to prepare and complete the final testing and acceptance. The acceptance procedure should be included in the contract as well. You need to define in advance the maximum number of critical errors and non-critical errors before you can reject the system acceptance. The **acceptance criteria** have to be documented before the actual development starts. The acceptance criteria are the conditions that a software product must meet to be accepted by a user, a customer or other IT system. This includes both functional and non-functional criteria. Well-written acceptance criteria help avoid unexpected results at the end of a development stage and ensure that all stakeholders and users are satisfied with what they get. Test cases should be developed and agreed prior to the final testing. A data validation methodology has to be developed in order to cover all possible scenarios.

System Sustainability

Plan to establish a sustainable business model as part of the ICT Strategy to ensure the IT system's continued operation in the long-term. The business model should be simple and not rely on having high quality IT experts with government salaries. You can outsource all that is not typical work for the property registration and cadastre office and plan for several experts in the business model, focusing on the strategic business needs/update, the ICT Strategy and standards. Those who know the procurement procedures can help to write the terms of reference. Additionally, at least one person is required to be in charge of managing all maintenance contracts, the help desk and all supporting activities, and to keep the existing IT systems running. If you are planning to implement a new system or upgrade the existing one then you will need a temporary project manager who could get support from the technical unit dealing with the systems maintenance and help desk and from the strategic unit to draft the terms of reference and standards. All the rest could be outsourced, but you need to keep the management in house, including contracts management.

In the World Bank funded projects, they advise the governments to plan a small project sub-component for IT system sustainability and include indicators that are measuring the sustainability as part of the project's success. Sustainability could be mentioned as part of the project development objective and in some cases, we had legal covenants in the loan agreement requiring the establishment of a sustainable business model by the mid-term of the project. It is not a good practice to use project funds for system maintenance. There are various models to ensure the sustainability of IT systems, including Public-Private-Partnership; legal provisions, which define what percentage of incomes from services that can be reinvested for the IT system maintenance and further development; establishing data centres for all government institutions to optimise the cost for the main data centres (which could be hosted both by the private company or the government institution) and others. See chapter 9 for further information.

Data Quality and Data Availability

You will find often that the senior managers do not understand the difference between the IT system and the data. In one of the Balkan countries, when the government was changed after the elections, the first thing they intended to do was to plan the development of a new IT system for property registration, as they learned from the notaries that the existing IT system didn't work. The World Bank team investigated the complaint and realised that it was based on the lack of data. We advised that there is an IT system, which has e-services and works well, but only 10 per cent of the data was in the system. The rest was on paper. Thus, when a notary requested information online, he or she got it automatically

from the system in only ten per cent of cases. For the other properties, the data was not digital, and the system indicated that you had to wait three days to get the data. Sometimes the local offices had no time to digitise the data for the property in three days and they responded later - or never.

We explained to the new government that the IT system was good, but most of the data were not in the system. To keep the service good, you need to monitor what is happening. The IT system can produce a report, showing the response time per office and even per request separately. At the end, it is a management issue and a capacity issue, not a technical issue. You always need to plan a component for data quality improvement and data digitisation. The old data may not be of good quality, much will be still in analogue form and it takes a lot of time and money to have good data quality. Setting priorities is important. You may not need all records to be digital and not all areas are of high economic interest.

Important Systems/Sub-Systems and Modules

Document Management System (DMS)

Start with the simplest modules, for example, a DMS using off-the-shelf products, including open source (there are many available). This can start with the front office functionalities and use the DMS to enter all incoming and all outgoing documents and establish interoperability with the existing applications for the back office operations. That will allow you to have a central database of all applications and all decisions made. It will be a central web portal, where all incoming applications and all outgoing documents are registered by staff at the local offices or by online applications of external users (for example notaries and surveyors). This will require Internet access. If it happens that not all offices have Internet access, the smaller offices can be just front offices, taking and giving analogue documents to the clients and sending the analogue documents to a larger office, which has Internet access. This was successfully introduced in Russia, long before the Unified IT system was implemented. You can use different technologies to send the documents, even by car (as was the case in Romania some time ago).

A recent example is **Serbia** – they have various IT systems in use for maintaining the geospatial data and the legal data and some offices have been updating the maps on paper only. They decided to start with a DMS and after that they linked it to the existing old applications. As a result, the services improved, the management improved, and they now have information at central level for all incoming applications and decisions issued. The application processing time is visible and the funds collected from the services are also visible – all in one place. Now they are linking the DMS with the Civil Register, Address Register, Business Register, Tax Authority, the Geoportal, the central point for the notaries' access and others. It has become the main IT system with small investment and impressively in a short period of time. Despite the fact that it is a temporary solution, it provides the same services as the future integrated system will eventually provide. The new integrated system is under development, but the services are already available!

Module for Notaries and Other Legal Professionals

Notaries and other legal professionals are key users of the IT system and the development of a simple module for submission of digital requests for information and submission of applications in digital format should be considered as a priority. It could initially cover the simplest processes, which will lead to fewer visits to the offices and faster and better service provision. In Albania, the notary module was designed jointly between the chamber of notaries and the property registration agency and the software developed by a young IT expert in a very short time. In Serbia, the notary module was developed over several months by upgrading an existing IT system and notaries are now working only with digital forms and applications. However, many other countries have waited until the whole IT system was developed and after that have tried to convince the notaries to submit the applications in digital format.

You don't need to wait years, as the data submitted in digital form by notaries and legal professionals are usually of good quality; the applications can go directly to the back office for approval.

Module for Surveyors

Surveyors are key users of the IT system and the development of a module for surveyors to submit the cadastre records in standard digital format should be considered as one of the priority modules. Surveyors usually prepare their cadastral records in digital form, but submit all information in analogue form, or sometimes in both analogue and digital form, but not in a standard structured format. A surveyor's module is simple to develop but has a huge positive impact on the workload at the local offices and the quality of data. If the quality of data is good then the surveyors usually download the parcel(s) and the neighbouring parcels and split or merge those, and then upload the results. This allows you to keep the data quality, good. It is not necessary to wait until the new IT system is ready. You can use the existing regulations for a cadastral report and develop a standard for digital cadastral reporting in GML⁶ file format and develop a small module for the surveyors to generate the GML file format from the most popular applications (surveyors often use AutoCAD, ArcGIS or some other special application). You should provide this tool with some short training and ask surveyors to deliver the cadastral reports in the standard GML format. Even if the law requires paper-based reports, instead of scanning those then you get them digitally from the surveyors.

Consider the case that a highway is being built. There are many properties affected. If the cadastral plans and reports are delivered in digital form it is only necessary to upload the file. You will then have all information in digital format, including scanned documents and coordinates. The IT system will do some automatic validation for parcel overlapping and other consistency checks. It can be processed in minutes, rather than waiting weeks, or months in some cases, to check paper documents. In **Ukraine**, the time for processing an application for registration of a new parcel went down from an average of a month and a half to 21 minutes. It is not always necessary to change the law to make the submission of digital reports and plans obligatory. It is a question of training surveyors. In **Croatia**, the submission of digital reports and plans online was introduced in January 2019. In the following March, 52 per cent of all cadastral reports and plans nationwide were submitted online and by September digital submission had reached 62 per cent.

E-Government

You can start offering e-services long before your system is ready. For example, you can agree with the notaries and legal professionals to send the requests for extracts electronically or you can develop a simple e-service for digital extracts for information (not digitally signed, if this is not possible). They can check the status of the property and prepare documentation, then ask you to digitally block the property for a short period until they physically visit the office to deliver the application with all supporting documents. This saves two visits to the local office. If you don't have digital data for this property, then you can scan and send the information digitally. Albania started with this simple service and gradually developed additional services for notaries. Payment can be agreed on a monthly basis or by opening a bank account, where clients can deposit some money as credit for future services. You can then register the client and give a password, which will be valid until the credit is used up (this was used in Bulgaria until the e-payment service was implemented). If there is an e-government e-Gateway then you have to use the authentication, payment and interoperability with other systems, if available. It is always good to coordinate your IT system design and development with the office in charge of e-Government, even if they are at a very early stage of development.

⁶ GML: The GML file type is primarily associated with Geography Markup Language. It is used for modelling, transport, and storage of geographic information; it provides a variety of kinds of objects for describing geography including features, coordinate reference systems, geometry, topology, time, units of measure and generalised values.

Interoperability with Key Registers and Systems

This is very important for data quality. Mistakes are always possible if you are typing the addresses and names of citizens or businesses. If there are existing digital registers, then you need to plan the interoperability with the property register and use their structure in the data model. Key registers to consider are: Civil Register, Business Register and Address Register – you need to know their structures at the design stage of your IT system. The property registration and cadastre systems need data from the Civil Register, Business Register and Address Register, so the IT system should be interoperable with those registers, if they are digitally available. The data from the property registration and cadastre systems are needed by the tax authority and other government and municipal authorities, courts and others, which have different levels of automation or no IT systems at all.

It is common for a registration and cadastral office to receive many enquiries from the tax authority, courts, municipalities and other government agencies. They are often not paid for the service and on paper it requires a lot of manual work at the local offices. It could be much quicker and simpler, for example, if they send an e-mail or connect via e-services to get this information. Another simple idea is to have an agreement with the *Post Office* to enter all the requests in the front office web-based system. You can print the extracts from your IT system, put on the stamp, dispatch the documents with return receipt, and then enter the number of the receipt into the IT system. Croatia piloted this service recently in one of their largest offices and now is planning a roll out in all large offices. You should be proactive and try to convince ministries and municipalities to work digitally, but this will take time, as the legal framework may need to be changed and the procedures of many of those institutions may work on paper only. Think about a simple solution which can be implemented quickly and look for political support. The property registration and cadastre system should be interoperable with the e-Government portal and the National Spatial Data Infrastructure Geoportal, if it exists.

Cybersecurity

The e-Government agency is usually responsible to ensure the cybersecurity of the network and the e-Government data centres, and to set up the government standards for cybersecurity. However, each agency implementing an IT system should consider the government standards and develop its own cybersecurity rules/instruction, based on the government standard, if they exist. This is currently a hot topic and the involvement of high quality cybersecurity experts is a must. Each agency has its own specific processes and staff with different roles and different authorities. There is a need for development and implementation of a cybersecurity strategy/policy and action plan, covering: 1) people; 2) processes; and 3) technologies. The monitoring of the implementation of the cybersecurity action plan is very important, as well as the regular update of the cybersecurity strategy, as the technology is developing so fast; new viruses and cyber-attacks can be detected every day, not to forget people and companies who have access to the systems and data.

The Republic Geodetic Authority of **Serbia** has recently implemented a cybersecurity platform (early detection of IT incidents platform), which provides a real-time analysis of security alerts to detect user, IT system or network behaviour anomalies or potential cyber-attacks, and which correlates events and indicators by using the internal and external data sources. It is also important at the stage of designing the IT system to consider data access only through services and not direct access to the database. You also need to establish a monitoring mechanism to monitor the work of the system administrator and the companies who maintain the network and the IT system.

Gender and Youth Disaggregated Data

The IT systems for property registration should provide gender and age disaggregated reports per cadastral zone and nationwide. The best way is to link the property register with the Civil Register of individuals (if available in digital form) from where gender and age information could be obtained, and disaggregated reports produced. This is not a task for the old records, which may not be in digital form.

In cases where the Civil Register is not digitally available or cannot be linked to the property register due to lack of agreements between the institutions or legal constraints, the easiest method is to introduce into the database a gender field (1/0 or F/M) and add this information at the time of the application submission. It will be just one click. Start with the incoming documents; it will then be possible to monitor the effects of the measures taken by the government to improve gender equality for women and youth property ownership and control.

Since 2013, all **Western Balkans** countries are generating gender disaggregated reports per cadastral zone and nationwide. The policy makers were initially confident that as gender equality was supported by law, they had no issues with gender inequality, but were then surprised to find out that in some of the countries approximately only 15 per cent of records nationwide have women as owner or co-owner, going down to 3 per cent in some rural areas. Various good practices have been implemented in the last five to six years, including changes in the laws to make it mandatory to register spouses, lowering the fees for women to register and other actions that are contributing now to the achievements of the United Nations Sustainable Development Goals and the related indicators.

Digital Archives and Data Conversion

It will not be a surprise to find out that the agency you wish to support already has some digital archives. They will often ask for financial support to digitise the old records. It is easy to start building your digital archive, but it is not easy to make it work and keep and maintain it in the long-term. You need to decide which documents should be kept in the digital archive and for how long. You need to set up priorities – from which offices to start, how many years back would you like to digitise the old archive (could be just the active record or 10-15 years back), and it all depends on the funds available and the issues that you would like to resolve. Change the laws, if needed, but plan to keep digitally only the documents that are documents establishing rights, for example, contracts or decisions, if they are not digitally signed. Digitising of incoming documents should be one of the first things to plan in order to have a cut-off date and stop the paper archive growing. If you already have an IT system for property registration then you can develop a module for scanning incoming documents as part of the business processes and require digital submission of applications by the professional bodies (notaries, lawyers, surveyors) and by the individuals.

After you decide which documents to digitise and for how long to keep them in the archive, you need to think about the digital standards, including metadata, the size of the files and the digital file format, in order to ensure easy access to the huge digital archive in the future and to ensure that the digital records will be still readable in the long term with the changes of technology. Use PDF/A7 format (ISO standard), which identifies a ‘profile’ for electronic documents that ensures the documents can be reproduced exactly the same way using various software solutions in years to come. Please note that it does not define an archiving strategy or the goals of an archiving system. Avoid scanning in colours and use a sufficient number of indexes to allow searching by several parameters.

The existing data need to be properly modelled with data entities, attributes and relationships. I have seen in one of the Western Balkans countries, which had its land books scanned, that you can find the book but not a specific record in the book or the link to another book for the same property. I have also seen scanned digital records for a building, where you can find the building in the digital archive, but not the separate apartment in the building. You have to think about what information you need when you are searching for documents and develop a simple application where you can store the scanned data and enter the metadata (which describes the data). It can be part of the existing document management system or just a simple access table. Often, the indexes include the file names and folders’ names. This

⁷ PDF/A: is an [ISO \(ISO19005\)](#) standardised version of the [Portable Document Format \(PDF\)](#) specialised for use in the [archiving](#) and long-term [preservation](#) of [electronic documents](#). PDF/A differs from PDF by prohibiting features unsuitable for long-term archiving, such as [font linking](#) (as opposed to [font embedding](#)) and encryption.

is not the best choice. You need to think in the long-term, when huge volume of documents will be stored and the system performance can slow down when you are retrieving archived documents.

Digitising archive documents is a good moment to do some more data entry, for example, the object identification, the right holders names and others. In **Ukraine**, for example, more than 16 million land certificates were scanned using OCR⁸ (optical character recognition). The most critical information about the objects and the right holders was digitised and included in the database, in addition to the scanned documents. This information was included in several places in the paper certificates and the information was retrieved several times from different sections of the certificates and automatically compared, prior to the validation by the office staff. The scanning of 16 million certificates, data entry and data validation was completed in five months, working in shifts and using students for the scanning of documents and data entry and office staff for data validation.

If you are using digital signatures, then it is good practice to digitally sign the documents going to the archive to guarantee that it is the same as the original. Blockchain can also bring value here. For example, for storing the hashes⁹ of the documents to identify any unauthorised changes to the original documents.

The digital archive system should not be an isolated IT system. It has to be interoperable with the property registration and cadastre system and provide e-services. The historical documents are used by the local offices, but also by courts, notaries, general public, surveyors and other government and municipal institutions. Plan to provide access to the digital archive as soon as you start digitising the records; do not wait until all is digital.

Software Products for Field Data Collection, Systematic Registration and Customary Rights

Systematic registration has its own workflow and business processes. It can be developed as a separate module of the property registration and cadastre IT system or a separate IT system. However, it is recommended to make sure that both IT systems are interoperable and have the same core data model, to ensure that once the process is completed, the data can be migrated into the property registration and cadastre IT system for maintenance of the changes. There are several software products that can be used by communities for digitising the community rights, supported by different organisations: **OpenTenure**, supported by UN FAO; **Cadasta**, supported by DFID (UK Department for International Development); **MAST** (Mobile Applications to Secure Tenure), supported by USAID; **STDm** (Social Tenure Domain Model), supported by UN HABITAT; and **ODK**, (Open Data Kit), supported by the University of Washington.

⁸ OCR: Optical character recognition or optical character reader (OCR) is the electronic or mechanical conversion of images of typed, handwritten or printed text into machine-encoded text, whether from a scanned document or a photo of a document.

⁹ Hashes: Hashing is the process of taking an input of any length and turning it into a cryptographic fixed output through a mathematical algorithm.

There is a new government program in the Far East for free distribution of one hectare of land to people who would like to live there. Those are new data and they are recorded through blockchain at the time of the first registration. Serbia intends to use blockchain technology for storing the hashes of the right establishing documents as a preventive measure for falsifying the original right-establishing documents. Georgia is using blockchain technology in parallel to their property registration system, which adds an additional level of security, and is using smart contracts for the processing of payments, linked to the transactions: the money is kept in an escrow¹¹ account and upon a positive decision for registration, it is transferred to the seller or, in case of rejection, the money is sent back to the buyer.

The point I would like to make here is that it is important to think about the main challenges that you would like to deal with and what is the most suitable technology, which can you afford and what are the major risks? The sustainability of the IT system should be considered at the time of deciding on the technology, which is not only related to the financial resources, but also to the local capacity to respond in the short-term and to maintain the system in the long-term. Public-Private-Partnership has to be considered as an option, as the private sector is normally much faster at responding to demands and has the necessary flexibility to test and use new technologies. Also, what is the level of cybersecurity? At a minimum, is it better than the classical IT system? Smart contracts are also a good idea for registering new objects, but you need to test how many resources will be needed in 50 years from now and if it is affordable for the country. Think about security and affordability. With this technology, you can do some things better, but the risks are also there if you are not familiar with the selected architecture.

Summary

This chapter emphasises the importance of having high level political support and business experts involved at all stages of the design in the development and implementation of an IT system for property registration and cadastre. Senior IT contract managers and independent quality assurance experts should be hired to help the purchaser to manage the complex contracts. The adoption of a step-by-step approach for system development has worked well.

Technologies are available, they are changing quickly, and the cost is going down. The business and required processes and services should be driving the data and applications/software and the technology (the machinery and equipment) on which these run. Technology should be aligned with business, data and application needs, and not the other way around. The implementation of a complex IT system takes time and money and therefore it has to be planned in small steps, which allows the responsible agency to provide better and faster services. Think about quick wins, which help resolve some of the biggest challenges. The level of corruption in the land sector is high and therefore transparency is not always well accepted by those who benefit from the status quo. The old records are often in analogue form or in different formats, if digital. You need to think about data digitisation and quality improvement in parallel with the design of the new system.

A good way to start is to have a new data model and develop small modules for professional users to submit/receive information in digital form (legal professionals, surveyors, government agencies, municipalities, banks), and to plan to establish a web portal for access to information. Get an experienced team to help with the design of technical specifications and the selection criteria and later to help with the IT contracts management and also quality assurance and quality control.

¹¹ Escrow: Escrow is a legal concept describing a [financial instrument](#) whereby an asset or escrow money is held by a third party on behalf of two other parties that are in the process of completing a transaction.

Key Messages:

- Political will is critical. You need a champion at a high level.
- Technologies are available. Think about services and data first.
- Fit-For-Purpose – the most complicated IT system does not always bring the change needed.
- Think Big, Act Small. Adopt a step-by-step approach.
- Establish a clear management and reporting mechanism.
- Plan support for IT contracts management and independent quality assurance and quality control.
- Adopt a national data model standard for the property register, based on LADM.
- Adopt a modular approach – no need to wait until the whole system is ready.
- Plan sufficient funding for IT training together with legal and procedural training. The IT training alone does not bring the results, as people may not be familiar with the new workflow.
- Plan measures to deal with the cybersecurity, personal data protection and intellectual property rights in parallel with access to data.
- Plan to establish a sustainable business model before the system is fully implemented.