Responsible Land Governance: Towards an Evidence Based Approach

ANNUAL WORLD BANK CONFERENCE ON LAND AND POVERTY
WASHINGTON DC, MARCH 20-24, 2017

Community-Based Crowdsourcing for a sustainable land cadastre in Mozambique - Can SiGIT be a lever?

Jose Murta

EXI Lda

jose.murta@exi.co.mz

Marisa Balas

EXI Lda

marisa.balas@exi.co.mz

Pedro Ivo

EXI Lda

pedro.ivo@exi.co.mz

João Carrilho

MB Consulting Lda

jcarrilhoster@gmail.com

Almeirim de Carvalho

National Directorate of Land

almeirim.j@gmail.com

Rossana Carimo

EXI Lda

rossana.carimo@exi.co.mz

Abstract

The document describes the experience of implementing a land information management system to support the development of the national cadaster in Mozambique as part of the programs to reform Mozambique's land administration system, making, along the description, several considerations based on current thinking on how to better approach business transformation supported by modern IS/IT technology.

In essence it argues in favor of a more rigorous business and IS planning, using appropriate instruments for that, and confirming the crucial importance of establishing appropriate business capabilities in the various land administration functions required to execute its business processes.

In response to the interest in exploring crowdsourcing based business models for field data collection, using new mobile apps, different aspects are listed that should be considered when building the business case to implement crowdsourcing as a means to accelerate data registration, lower its costs, create flexibility for data lifecycle management, and empower the communities for their land rights and sustainable economic development.

The paper ends making considerations and recommendations about sustainability, scalability and security of designed and implemented technological solutions, and about the need to accept that these transformations will take longer term to implement, and need a long term thinking mindset.

Contents

1   Motivation for the paper

The authors have been involved in the provision of technology to support the implementation of a land administration system by the Government of Mozambique.

The different stakeholders, the Government agency for land management DINAT, interested sponsoring donors, field work service providers, and IS/IT service providers have worked to implement a land management information system, and the last 4 years have been dedicated to create the basis for a computerized national cadaster and the improved processes necessary for effective registration of land parcels, its legal occupation and use.

These parties have been exchanging ideas and experimenting with technology to find innovative ways to lower costs and contribute to the sustainability of the new land administration system.

From other industries, we learn that crowdsourcing can be a powerful contribution to achieve sustainability, but again an evolving approach, sound experimenting, and an holistic/systemic approach contemplating all aspects of the problem are perceived as essential for results and impact.

Crowdsourcing is working like a challenge against which innovative thinking will be developed, experimented and implemented in a dynamic approach to validate the right business model.

This document summarizes what has been done, mainly from the perspective of technology providers who recognise the critical importance of human resource knowledge and skills and organizational capability development, and that sustainability has to be equated in terms of a broad economic and social sustainable development.

Based on the evidence from this experience, and insights from research and best practices in dealing with business transformation and technology, we end the document suggesting some recommendations for future work.

2   Context

2.1   Case context

Mozambique is a Southern Africa developing country with approximately 800,000 Km2, and an estimated population of 24 million. Mozambique has defined legislation to protect the use rights of land to the communities and poor people. At this moment, more or less 90% of land is under good-faith occupation and customary tenure arrangements, but still unregistered.

The National Directorate for Land (DINAT) is implementing a reform to modernize its land administration system using information technology.

DINAT faces various challenges, on one side it must establish a central capacity to function as a national land cadaster, and related services, and on the other it must ensure an efficient capacity to register, process and legalize the current usage of land at national level, in the Provinces, Districts and Municipalities although the latter are autonomous.

To achieve its goals DINAT has acquired a custom-built application to support its land administration business, the SiGIT. SiGIT was built in 2012-2013, adopting the ISO 19152 LADM standards, by EXI, a local ICT firm. This endeavor was a joint effort of the Government of Mozambique and the Millennium Challenge Corporation, under the management of the Millennium Challenge Account which contracted the British firm HTSPE.

DINAT established a central repository for the national cadaster. During the design of SiGIT it was decided to implement a decentralised architecture mainly due to data communication limitations, which led to the creation of SiGIT for Provincial sites. Automatic synchronization was implemented. This same architecture was implemented for Municipalities, although these implemented some specific functionality.

The value of SiGIT is totally dependent on the availability of actual data about the occupation and usage of land, and this is done through registration processes occurring mainly at the districts and communities living in the country side and municipalities.

On one side DINAT must maintain all the SiGIT technology components and its lifecycle, and make it operational and available nationwide.

On the other side, it must transform its organization to be able to first use SiGIT to register land data and support the various land services to the various types of customers, and once data is available, to exploit it,

for land planning and to produce the governance and management reports required by the various stakeholders.

During the last two and half years DINAT concentrated in modernizing its land administration services, while counting on the specialized services from technology providers, to ensure the availability of SiGIT at national level.

The theme sustainability has become a major concern of the various stakeholders engaged in these reforms, and in response to it some new ideas about adopting crowdsourcing business models to register and maintain communities and parcel massive registration are being considered. The document compiles these ideas and what the authors consider relevant if those ideas are to be experimented.

2.2 Land trends context

Imagine a country without any basic administration of land. Imagine that tenure to land and property cannot be secured and that mortgage loans cannot be established as a basis for property improvement and business development. Imagine that the use and development of land is not controlled through overall planning policies and regulations. And imagine a slum area of 250 hectares (about 1 square mile) with more than 1 million inhabitants lacking the most basic occupation rights and without basic water and sanitary services.

(Ian Williamson and all, 2010)

Reference to the latest thinking on land administration is essential to frame and guide our thoughts, strategies and business planning.

Ian Williamson and all (2010) develop a set of powerful concepts, based on practical and academic experience by renowned experts, and it goes in line with our thoughts for organizational capability development and technology adoption.

Recently the LGAF (Land Governance Assessment Framework)[1] has been used to identify key conceptual issues and how land governance in 10 African countries compares to global good practice (Klaus Deininger

---

[1] LGAF - a diagnostic tool developed by the World Bank and partner institutions and now widely applied across the globe, aimed at helping countries compare their land governance situation in 5 areas (land rights

and all, 2014). Although being aware that LGAF is currently being applied to the Mozambique reality, even so, we believe this evaluation is in general also relevant to our particular context.

These references combined with the ones we use from our professional activity, mainly around business models, business process management, capability development and information systems technology, provide a comprehensive and safe base to think, design, negotiate and deliver solutions to support the portfolio of initiatives - programs, projects and services - that our various customers implement.

From Ian Williamson and all (2010), we recognise the value of the following arguments for our Mozambique context,

- The land cadaster is recognised as a key component of an effective land administration system,
- The land cadaster, if using spatial technologies to map locations becomes a more powerful tool,
- Appropriate processes of land administration, to record and disseminate information about ownership, value, and use of land, are crucial when implementing land management policies,
- Due care needs to be taken in relation to import/transport tools and associated solutions from more developed economies, as these embed complex practices that took centuries to implement, and may be too costly to adopt or adapt. It may be more appropriate to follow an incremental approach, taking into consideration the existing cognitive framework used by the society to understand land, current land governance practices, and the openness to new land management paradigms,
- It is critical for governments to develop internal skills and capabilities to implement appropriate land administration systems, considered to be "the overriding components of sustainable land administration system", crucial for governments to confront and respond to old and new economic, social and environmental challenges. Having information without the required organizational capabilities to act, to plan the responses and future developments, doesn't seem to make much sense,
- The organizational capabilities should also encompass the capabilities to define, design and maintain the technologies that should support these business practices,
- Business justification, project management and systematic evaluation of experience, results and impacts, should be common practice during land administration system implementation.

---

recognition, land use planning, management and taxation, expropriation, public provision of land information, and conflict resolution).

LGAF results reveal "*weak protection of rights in practice, large gaps in female land access, and limited outreach and effectiveness of institutions to record rights and adjudicate disputes*".   It is also noted that programs to improve performance along these lines had significant impact in other contexts, suggesting that efforts to *improve land governance* will be warranted and should be closely monitored and evaluated in an effort to identify models suited to African conditions and assess their interaction with other factors.

Here a robust infrastructure is recognised as key to support the implementation of the processes conducive to improve governance.

On the rural side, it is recognised the importance to register the community land and expose the communities to the new economic opportunities in terms that are acceptable for the different parties, the inhabitants of the land and interested investors.

The cost of registering these community lands is considered to be high, taking into consideration the existing poverty, and innovative means based on new technologies may help to create a more positive and constructive reality.

Again the sustainability of the registration processes has to be seen contemplating the more broad sustainability of the economic developments that it might induce and sustain.

The technology may at this level be able to enable cheaper registration, support a more rigorous and disciplined registration process and workflow, and facilitate the quality of the registered data through data entry controls and interim data correction.

Past experience has demonstrated that the registration ends up with high percentage of errors, compromising its validity and usefulness and forcing the repetition of the costly field data collection exercise.

Crowdsourcing in this context means using the available cheap technology to implement easy to use and context sensitive data collection application, together with cheap cloud storage to empower communities to register by themselves directly or indirectly, and submit for validation and legalization.

The voluntary participation of experts in the definition of the various aspects, necessary for a comprehensive and effective registration process, may also be part of this business model.

The participation of various service providers in this crowdsourcing as part of their business models should be explored in order to create economies of scale and accelerate the registration of community land.

Before embarking on the description of our experience, we do a summary refresh of some truths and trends of technology, justifying the importance of what might be less known aspects of it.

2.3   Technology trends context

In today's complex realities information technology (IT) provides very powerful tools to register and support business operations, allowing for better control on delivering the required services.

Once data populates the data repository, IT may support informed decision making, from reports about the operation and from processing the data to obtain information about market, economic or social tendencies.

We perceive IS being used worldwide to help in dealing with the complex problems of today's societies.

But technology is complex and expensive. Decision makers need comprehensive architectural descriptions so they understand from their business perspective the role and characteristics the technology must provide. Although prices of technology have lowered in comparative terms, its innovative application end up commanding high costs.

These architectural descriptions guide decision makers during the decision and project implementation, and are also effective for governance of IT during its lifecycle, when innovative changes have to be considered.

Technology alone does not improve things, it is the business side who must empower themselves to create the expected economic value once the IT resources are made available. Comprehensive architectural descriptions of the capabilities to implement the planned strategies, should be identified as well as its underlying skills, business processes and human behavior (Business Architecture Guild, 2017). The technology descriptions should demonstrate alignment with the business capabilities requirements (Spewak, 2006).

Based on these architectural artifacts business justifications should contemplate the total cost of ownership of the technological solution, contemplating not only the technology itself but the organizational changes that need to occur to implement the new business capabilities (Ward, 2012).

Project management becomes very critical, if one wants to ensure that strategic objectives, specifications, time and budget are to be achieved (Turner,2009).

After implementation, the technology must be dully operated and administrated to deliver its functionality through technology services (Hoving, 2012).

Although technology is in general user friendly, its management is quite complex and requires due attention and appropriate planning and execution (Hoving, 2012).

The technology total cost of ownership must include these operational costs.

Effective help from business and IT architects, and organizational change experts may be required by the executives in charge of implementing the land administration system.

Application management and IT services may need to be outsourced for longer term, as business functions may have to focus first in delivering their business services associated to the land administration functions.

It is our belief that for crowdsourcing the same principles apply, and well thought business models must be designed and experimented until the right ones are found to work to the various interested parties (Osterwalder, 2010).

Having make a quick visit to the land and IS/IT best practices and tendencies, we are now in a better position to describe what has been done as contributions to build a land administration system in Mozambique, and from there what doors are open to explore crowdsourcing.

3 Summary description of the implementation of SiGIT

3.1 What and how the application and IT services were contracted and delivered

The Millennium Challenge Account (USA and Mozambique Government (GoM) funding) program and its project to register 150 thousand land parcels, successfully achieved the registration target and established the basis for a modern land cadaster through the delivery of a land information management system that supports the legal workflows for land registration and mapping of the registered parcels.

The project defined the ToR for application and infrastructure and through an international tender contracted the services for development, supply, installation, configuration and training of the solution.

The ToR were defined by land specialists from a British company HTSPE, later to become part of DAI.

The solution implemented a layered software architecture, and a decentralised implementation for better response to communication issues, and allowed for scalability and openness based on market standards in all domains namely the LADM for land registration.

The solution was built following a rigorous methodology based on industry standards and the deliverables were supported by comprehensive documentation, as required by the ToR.

The application was designed to support the business processes, and in this way forcing the fulfillment of the current land legislation.

The solution was essentially delivered on time, as specified and on budget.

After the MCC program, a new program initiated, the Gesterra program, sponsored by GoM and the Dutch and Swedish Governments, and these deliverables were accomplished,

Delivery of IT Infrastructure

- Enhancing the datacenter capacity in terms of computer processing power and storage
- Enhancing up to standard of electrical and data network

Definition of the Service levels for application and IT services

- Establishment of a capability to provide application and IT services in an integrated and managed form following standard industry practices (ASL/BiSL, ITIL/ISM frameworks).
- Establishment of a managed relationship between provider and receptor of these services.
- The service levels were provided for the central site and all the provincial sites, to support the application and infrastructure.
- A service desk was implemented covering DINAT national structure with due control of incident management, and fully integrated with the technical support and maintenance.

Experience based transfer of know how

- An experience of work using the IS/IT deployed resources to support the business.
- Sharing of appropriate management practices of IS/IT to support the business requirements.

Interesting experience was the subcontracting through EXI of other IT and infrastructure service providers, and in this way engaging them in relations based on service level agreements and controlled incident management. This was a valuable experience for future developments as it allows for larger capacity and sharing of risks in a controlled environment.

At the end of the two and a half year period, the application and IT service provider got a very positive evaluation from sponsors and end customer DINAT.

One of the aspirations of DINAT is to establish an internal capacity to administer the SiGIT application and its underlying infrastructure, the database and system software, and the existing physical infrastructure of servers, storage, the HVAC[2] environment and the data and electrical grid. The assumption is that an internal capacity will give better control over costs and service levels.

---

[2] HVAC – Heating, Ventilation and Air Conditioning

From the experience, the IT providers think that it may take longer time to train a team in all the disciplines that compose a data center, and a well-planned and phased approach is required for that.

We are convinced that the priority should be for DINAT to concentrate in developing managerial skills to be able to plan the requirements for their information systems and acquire in the market the various application and IT specialized services to implement and operate the technical solution.

An IS/IT strategy based on the required capabilities and comprehensive description through architecture practices is recognised to be essential to create a common and focused language around the resource IS/IT. It provides visibility, common understanding, and appreciation of what has been done and what roadmaps are better to continue the development of the IS/IT resources (Weill and Ross, 2004).

Although the provider defined its IT infrastructure in architectural terms, this was done mainly to respond to the tender requirements, and focused in the area of registration and delimitation processes.

As the organization matures their capabilities to conceive, design and execute their core business, around the core administration functions of land administration, the common processes found in every system, the tools chosen to support their policies and functions, and the efforts to make the land administration system supportive of sustainable economic and social development, it will be able to better define what is worth doing internally in the domains of information systems and IT infrastructure.

Part of the work done at DINAT by the application providers involved the definition of land administration processes, engaging the various DINAT departments and other stakeholders and following the business rules defined on the existing law. This work was also carried out for the field work.

The following paragraphs describe the experience and comments on factors that the authors consider to be critic for success.

3.2   What and how at the business processes level

IT doesn't matter

Nicholas Carr

Over the years, IS/IT providers in general have learnt that IT alone does not create value. Value is created by the organizational structure through their people executing their business processes.

From the beginning of the service contract phase, after the acceptance and installation of the SiGIT application, some initiatives were promoted in order to create a common language among the different

service providers themselves – financial and planning services, land management technical assistance, application and IT services - and between these and DINAT.

Classes were organized to support these intentions, were system thinking, comprehensive intercultural relations and good thinking to support problem solving were studied.   International recognised expertise was responsible to deliver these insights.

At a later stage intensive support was organized to provide project management training and program management following well established frameworks.

One other project was established to describe the land registration process area, and help the implementation of a process oriented management structure, to improve performance in alignment with the implemented information system.

The professional development of these essential managerial capabilities to make the organization more pro results oriented and in this way better apt to generate value, in this case value related to land administration and management services for the different interested parties, continue to be fundamental.

As part of the experience to build the DINAT capabilities in creating the land administration system, experiences framed by well-defined projects were done to explore the use of mobile technologies, to facilitate the collection of data in the field and crowdsourcing came as an idea to value the initiatives.

4   The opportunity for Crowdsourcing

4.1   Definition

From Google we get this simple definition for crowdsourcing, "*the practice of obtaining information or input into a task or project by enlisting the services of a large number of people, either paid or unpaid, typically via the Internet*".   Although Wikipedia provides a more comprehensive description of its possibilities, we think this one spells its core meaning with simplicity.

4.2   The motivation for crowdsourcing

The SiGIT application is worth little without data.

Existing practices demonstrated to be slow, expensive and not flexible enough to register and maintain data, against the targets defined for the next 5 years of 5 million parcel registrations and 4 thousand delimitations of communities.

The MCA program registered 200 thousand registrations in 3 years, and Terra Segura program registered another 220 thousand parcels since its start one year ago.

The fact that mobile operators are becoming data communication providers and expanding their network to cover all the territory, that people in the country side have expressively adopted smartphones, and cloud computing has lowered the cost of computing and storage, enables entrepreneurs to develop sophisticated applications to register land occupation and usage using cheap smartphones.

EXI, the developer of SiGIT, over the last 18 months developed an "app" named *SiGIT Mobile* to support the field work of land demarcation and registration service providers.   These providers participated in the definition and testing of this tool.

DINAT, also gave total support to define the requirements and afterwards to test the functionality.

Apart from supporting the registration process, covering text and geospatial data, this tool also provides,

- control of work done by the team members operating in the field,

- data quality control, facilitating the data entry process,

- data error correction after collection and prior to deliver to the final SiGIT repository,

- full and seamless integration with SiGIT national cadaster.

At present this tool is being used by several service providers to do their field work, and a price structure has been negotiated to pay for cloud services and for each legal registration made at the central cadaster. Professional services for training and support were also defined and made available.

The development of SiGIT Mobile was possible through the sourcing of knowledge and skilled resources made available as a result of the MCA and Gesterra programs.

Crowdsourcing is envisaged through a business model were local territory administration and community structures can by themselves engage in the process of registering the occupation and usage of land using these mobile technologies, contracting residents of their territory as para-technicians to do the registrations.

This possibility is still a novel idea that needs to be matured in face of its different stakeholders and piloted to evaluate its value and find which business model to adopt.

14

4.3   Possible benefits

Illuminated by the thinking formulated in LGAF literature (Deininger, 2014), the possible benefits are,

- More efficient registration of data as prepared community land agents could work in parallel;

- Flexibility in maintaining the land data, as local residents would be able to update the data almost real time without additional contracting, preparation and dislocation costs;

- Lowering the costs of registration, as local residents, paid by the community, should do this job, expected to be less intensive after the first registration;

- Allow better control from the community themselves on their land occupation rights, as registration should be easily accessible for consultation;

- Less conflict and easier conflict resolution due to comprehensiveness and readiness of land data;

- More effective control of corrupt practices be it by service provider or government agents;

- Better land planning and control by government and consequent sustainable economic development as a result of good, complete and updated data;

- Communities better empowered do explore business opportunities together with investors;

4.4   Readiness of enabling factors for crowdsourcing

The type of activity in question is repetitive and should benefit from business process approaches and techniques. Any business process needs appropriate enablers (Sharp, 2009) to work as required.

Here we present the key ones and current status.

Enabling on technology: The technology exists, is has demonstrated its fit for purpose, supports an end to end registration process, as SiGIT mobile is fully integrated into SiGIT central cadaster. The creators of all the SiGIT components ensure its lifecycle management, modernizing as requirements evolve.

Workflow design: A carefully revised method was used to describe the workflow, engaging the participation of the various interested parties in all of its phases, to ensure ownership of decisions. Performance indicators were defined, and the final evaluation stages for approval are under way.

Motivation and measurement: Progress has demonstrated great motivation from all parties, as seen during the work to develop and test the workflow and the tool.   Fit for purpose approaches are gaining acceptance and provide strong reasons to motivate these approaches. We perceive similar motivation from experiences

in other geographies as reported on the subject. The performance of the work supported by this tool has been systematically measured, and results are promising.

Human resources: Training technical operators and field managers is a major investment still to be done.

Policies and rules: New legislation may have to be introduced. The adopted business model will define which policies and rules are imperative for effective and sustainable results. New legislation may be required to implement this approach, and policies and rules should reflect it.

Facilities: In this case this refers to the mobile devices, the cloud repository, energy to charge the devices, data communication services, which are things that are available in most of the country.

Crowdsourcing coordination and operation management: the crowdsourcing needs appropriate organizational structures to organize, plan and execute the envisioned local land administration services. These structures need appropriate legislation and governance from land cadaster government authorities.

This structure and how it should work should be defined iteratively with the various interested parties.

4.5   Risks of this business model

These innovative ideas are proven valuable only after the results and impact prove positive.

The crowdsourcing coordination and control, and the human resources development are difficult to achieve, mainly due to difficulties in establishing a capable business system for that.

Interested parties need to commit to experiment and build on what is found to work, and then commit to expand as appropriate. This will cost money and sponsors need to be found to pay for these experiments and afterwards to establish more permanent structures.

Training the community agents may be easy to achieve, but as time passes these may decide to move to other jobs.

A major constraint may also be the need to alter the land law to allow for such organizational arrangements.

Mechanisms to certify the data quality and legality of the registration need to be established, although local authorities may also receive training to do that.

Another risk derives from difficulties in keeping alive the required technical support to maintain the tool and the cloud environment, as well the support to seamless transfer of data to SiGIT. This risk should become reduced if SiGIT itself is dully supported and maintained, as economies of scope may help in financing the mobile environment.

4.6 The essential role of SiGIT

Having described in general terms the applicability of the crowdsourcing ideas, we should be in a better position to respond to the formulated question "Crowdsourcing for a sustainable land cadaster – can SiGIT be a lever?".

Evidence from our experience and from other quadrants shows that for these ideas to work a number of critical factors must be in place.

This extract from a recent paper produced by experts associated with the innovative fit for purpose (FFP) approach is quite powerful to understand the response to the title question,

Adopting an effective, scalable supporting ICT infrastructure is considered to be crucial for the implementation of the FFP approach. Although the ultimate ICT solution will be sophisticated and support features such as e-signatures, e-conveyancing and cloud based services, for example, it should be emphasised that the initial ICT solutions will have to be rather simple to accommodate limitations in the telecommunications infrastructure and ICT skills in many less developed countries. However, over time, the ICT solution can be enhanced to embed new technology and create greater functionality when more effective ICT resources are available. This incremental approach is much more sustainable than more ambitious, faster implementations (Lemmen et. al, 2016; McLaren et. al, 2016)

We conclude that for the crowdsourcing arrangement to be effective and sustainable, it must work as another valuable component to build an effective land administration system.

Based on these experiences, and inspired by industry trends and knowledge from the business management field, we make some conclusions and produce some recommendations that we consider valuable for the successfully implementation of the land administration system in Mozambique.

5   Conclusions

The experience of DINAT in implementing a national cadaster has been very positive, and although all the financial difficulties, it implemented a computer based solution to support the data entry, based on business processes fully compliant with the existing land law.

The technology implemented LADM land administration standard, and is capable of processing geo special data, with its database fully capable to support that functionality.

Extensive training was done on the use of the application and parcel registration was done covering the national territory.

As an extension to this centralised base solution, a mobile application was done to facilitate the collection of data in the country side to support massive registration of land and community demarcation data.

The building of this mobile application was preceded by innovative design of the process and its workflow in order to take advantage of the existing common process steps (community delimitation and massive parcel registration).

The design of this solution engaged the different interested parties, DINAT and service providers, from the conceptual and design phase to the training and field testing.

It is generally recognised that major efforts need to be concentrated by DINAT to continue its building of their organizational capabilities, to implement the land administration system core functions, and take control of its technological solutions.

It is also recognised that crowdsourcing arrangements, to be successful, also need appropriate organizational and management structures to ensure that effective operation and required results are attained. Crowdsourcing requires the existence of a well-designed, robust and reliable central cadaster.

Sustainability is a persistent comment from all quadrants and must drive all development initiatives.

From the literature it is also recognised that scalability and security are also critical requirements for the IS/IT solutions.

The following paragraphs suggest some recommendations that may be of great help to empower DINAT in dealing with these essential requirements for their information technology infrastructures.

We end up the paper recognizing that these transformations are difficult and should take long time to implement.

6   Recommendations

6.1   Sustainability

Sustainability must always be considered in face of the purpose and goals that the organisation is willing to pursue.

6.1.1   Business motivation, strategy and architecture

So it makes sense to initiate things by evaluating how well the business motivation (OMG, 2010, Business Motivation Model) is being managed. This should be valid for the interested parties, internal and external, that are supposed to be part of the desired realization.

Part of the business motivation is the strategy to be adopted and this should include strategies for the technology if it plays a key role for goals to be achieved.

Through strategy and architecture approaches the various capabilities that need to be in place for the realization to occur should be defined.

After these definitions are made, specific efforts should be dedicated to plan and execute to establish the listed capabilities.

Capabilities are a powerful concept as it refers all that needs to be implemented to make the organization capable of doing something. It means human skills, business process, organizational culture, technology.

Each of these initiatives imply initial investments and operational costs once the capability becomes productive.

It is good practice to develop comprehensive business justification, or business cases, to have a complete account of costs and possible contribution to value creation by the established capability. The business case should constitute a reference to be used and updated whenever assumptions change.

To implement all these practices, one should establish capable project management. Although project managers may be contracted from outside, the existing management needs to be prepared to deal with this management approach and practices.

Some of these capabilities for one reason or another will be delivered by external providers through contracting of services.

The concept of service and service levels is very important to better manage the relationships between the providers and receptors of such services (IT service management Global best practices, 2008).

This practice is still not well recognised particularly within the public sector, but as organizations struggle to improve their mission accomplishment, it is better to learn the best practices associated with service management.

Its application is also valuable for public sector internal department's exchanges of services.

A key part of the service management is the contractual agreement that need to be established and respected by the parties.

As the operations mature, some parts of it should become candidates for outsourcing, where the contractual arrangements and service management become even more important.

The following paragraphs make considerations in relation to the cost side of sustainability.

6.1.2 Economies of scale

Economies of scale and economies of scope are effective approaches to lower the overall costs of a certain technology solution.

In our particular case we have seen economies of scope happening through the development of the various specialized versions of SiGIT, central, provincial, municipal, and now the SiGIT mobile.

These economies of scope derive from fundamental knowledge around the data architecture, the business process management structuring and description based on the existing law, and the training of experts from different stakeholders on these practices.

This was possible due to fantastic collaboration between DINAT, its current IS/IT service provider and the various providers of services for land registration.

Economies of scale happened when the SiGIT and related IT services were being provided to all the government entities at central and provincial level, including some municipalities.

The standardization of SiGIT would constitute an opportunity to lower its total cost of ownership.

There has been various efforts from other quadrants, mainly international, to promote other products on the grounds that SiGIT is expensive, difficult to use, and does not provide other functionalities that some global products of the market offer.

Although one should be always aware and investigate about innovative technology, we believe we also need from time to time review how we arrived at where we are, in building the national land cadaster and

land administration system, with the technology solution, what are the weaknesses, if current third party sales arguments are indeed valid, and what to do about it.

The fact that there is a local team capable of maintaining the SiGIT application should be seen as a valuable resource, as response time and cost are for sure fast and highly competitive.

Some critics don't follow a comprehensive and rigorous analysis, and although one may consider it normal from a sales point of view, decision makers should arm themselves for better evaluation and decision.

6.2   Scalability and security

Scalability has to do with the properties of installed systems to respond flexibly, fast and economically to increases in processing, data storage and communication demands. This implies a careful design and appropriate compromises for the chosen technology to be able to respond satisfactorily to this aim.

The existing design for the application and for the infrastructure does cater for scalability.

In this regard one must take into consideration that these infrastructures need competent people to be duly configured, supported and maintained, assuming that it will be easier to establish competence for its daily operation.

Security is a major concern nowadays, and it requires good understanding and definition for each specific computing environment. Competent analysis should support the business executives in security related decisions. Appropriate education and training, infrastructure choice, professional systems operation and informed human behavior should maintain the computing environment secure.

6.3   Long term thinking

Organizations cross mature stages before they achieve excellence in what they want to do.

Many organizations, from private and public sector, define as their goals, to achieve advanced levels of maturity in very short periods of time. One of the problems of this approach is that learning by the organization members do not occur as required and, and if new level is achieved, it may become precarious and not sustainable. This means that planning a comprehensive and well-paced business transformation, is fundamental as one needs to ensure that, in each phase of the maturity growth process, appropriate learning occurs. Several studies may help in this navigation (Ross and Weill, chap 4, 2006).

The LGAF framework defines the domains and principles that should guide the governance of the organizational development efforts towards establishing an effective and country wide land administration and management system for Mozambique.

From practice, literature review, and learning from other cases, we came across architecture concepts that are being applied to describe the complexities of an organization to the various interested parties.

Governance ensures that the purposes, goals and strategies defined at the higher levels of the organization are being respected in all the domains that a certain organization perform to execute its business processes and achieve the expected results.

Inspired by the LGAF principles, guidelines and evaluation scheme, architectural approaches applied to business and information technology should help in governing the alignment of the design of the organizational structures and capabilities and the required information technology.

Architecture approaches should ensure that the various stakeholders do have comprehensive and understandable descriptions of what needs to be done.

Architectural artifacts, if done appropriately should be critical to preserve the value of the investments made in building the organizational capabilities which encompass from skills, business process and cultural, to application and technology developments.

Due to the complexity of the context, were different actors and interested parties have to intervene to produce the required results, it is fundamental that at the higher echelons of the decision making process there is a clear and comprehensive understanding of the objectives, adopted strategies and various capabilities that need to be established to implement those strategies to achieve the expected results.

As governments change and new leadership takes over, these efforts and resulting artifacts constitute valuable devices to facilitate the continuation of the efforts to build the national capacity, aligning future efforts with past developments, and aligning the different stakeholder's engagement efforts.

We argue that business architecture and its derived information systems architecture and information technology architecture are essential to support the complex reforms that governments need to do, in this case to support the land administration system reform, and align the engagement of different stakeholders and executors.

All these recommendations should be part of the long term thinking approach necessary to make this land administration modernization a successful endeavor.

7   Literature References

A Guide to the Business Architecture Body of Knowledge, 2017, Business Architecture Guild

Armson, R., Growing wings on the way – systems thinking for messy situations, 2011, Triarchy press

Bon, J. and all, IT Service Management Global Best Practices – Volume 1, 2008, Van haren Publishing

Bullen, C., Lefave, R., Selig, G., Implementing Strategic Sourcing – manager's guide to world class best practices, 2010, Van Haren Publishing

Deininger, K. and all, Identifying and addressing land governance constraints to support intensification and land market operation: evidence from 10 African countries, 2014, World Bank

Goldratt, E., Theory of Constraints and how it should be implemented, 1990, North River Press,

Harrison R., TOGAF 9 Certified Study Guide, 2009, The Open Group/ Van Haren Publishing

Hoving W., Bon, J., The ISM Method – past, present and future of IT service management – Version 3, 2012, The Stationary Office

Humphrey, W., Winning with Software – an executive strategy, 2002, Pearson Education Inc

Lemmen, C.H.J., Enemark, S., McLaren, R., Antonio, D., Gitau. J., Dijkstra, P. and De Zeeuw, C.J. (2016) Guiding Principles for Building Fit-For-Purpose Land Administration Systems in Less Developed Countries: Providing Secure Tenure for All. 2016 World Bank Conference on Land and Poverty, TheWorld Bank – Washington DC, March 14-18, 2016

McLaren, R., Enemark, S. and Lemmen, C.H.J. (2016): Guiding Principles For Building Fit-For-Purpose Land Administration Systems in Developing Countries: Capacity Development, Change Management and Project Delivery. 2016 World Bank Conference on Land and Poverty, TheWorld Bank – Washington DC, March 14-18, 2016

OMG, Business Motivation Model version 1.1, 2010, Object Management Group

Osterwalder, A., Pigneur, Y, and all, Business Model Generation – handbook for visionaries, game changers and challengers, 2010, John Wiley & Sons

Pols, R., ASL 2 – a framework for application management, 2012, Van Haren Publishing

Pols, R., Backer, Y., BiSL – a management guide, 2007, Van Haren Publishing

Rummler, G., Brache, A., Improving performance, How to manage the white space on the organization chart, 3rd Ed, 2013, Jossey-Bass

Rummler, G., Ramias A., Rummler, R., White Space Revisited – creating value through process, 2010, Jossey-Bass

Schein, E., Schein, P., Organizational Culture and Leadership, 5th Ed, 2017, John Wiley & Sons

Sharp A., McDermott P., Workflow modeling – tools for process improvement and application development, 2nd Ed, 2009, Artech house

Sheen R., Gallo, A., Building your business case, 2013, Harvard Business School Press

Sowden, R. and all, Managing Successful Programmes, 2011, London TSO

Spewak, S., Updating the Enterprise Architecture Planning Model, 2006/May, Journal of Enterprise Architecture

Turner R., The Handbook of Project-Based management, 3rd Ed, 2009, McGraw Hill

Ward, J., Daniel, E., Benefits management – how to increase the business value of your IT projects, 2nd Ed, 2012, John Wiley & Sons

Weill, P., Ross, J., Enterprise architecture as strategy – creating a foundation for business execution, 2006, Harvard Business School Press

Weill, P., Ross, J., IT Governance – how Top performers manage IT decision rights for superior results, 2000, Harvard Business School Press

Williamson, I. and all, Land Administration for Sustainable Development, 2010, ESRI Press Academic

Zachman, J., A Framework for information systems architecture, 1999, IBM Systems Journal

Zevenbergen, J., Vries, W., Bennett, R., Advances in Responsible Land Administration, 2016, CRC Press