Digital Transformation of Land Administration: Stages, Status, and Solutions

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Key words: Armenia, Indonesia, UN-GGIM, FELA

SUMMARY

Land administration systems are embracing digital transformation. Data, processes, transactions, practitioners, and users move towards full digitalisation. The tasks of land surveying and mapping, land marketing and sales, contracting and conveyancing/notary work, lodgement and registration all are being digitally transformed. However, most systems still operate in a parallel or hybrid fashion: a combination of manual processing, paper documentation, automation, and digital systems is evident. This paper explores the results of recent digital transformation projects undertaken collaboratively between Kadaster International (The Netherlands) and project partners in Indonesia and Armenia. Whilst there are significant differences at the country level with regards to legal approaches, finances, partnerships, legacy IT systems (if any), and available capacity – all of the countries face common challenges when dealing with archive digitisation and storage, spatial/textual data quality, standards, digital transaction design, system maintenance, and building public awareness and trust. The UN-GGIM Framework for Effective Land Administration (FELA) provides a means for understanding and undertaking digital transformation at both organisational and sector level: it can help to unpack the stages and status of digital transformation within land administration system. It also reveals potential solutions to speed up responsibly moving towards fully digital systems. The cases reveal the importance of linking local knowledge with international expertise and standardisation.

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1. INTRODUCTION

Digital technologies have long influenced land administration, land registration and cadastral design and development. The influence continues to accelerate, with many land administration agencies embracing holistic whole-of-organisation digital transformation initiatives, often linked to broader government digital agendas. Initiatives are observed across more developed contexts, for example The Netherlands (Hagemans et al, 2022; Oukes et al, 2021; Rowland et al, 2022), and equally rapidly developing contexts alike including India (Pandurangi, G., and Misra, 2018) and Indonesia (Kusmiarto, 2021).

Data, processes, transactions, practitioners, and users are moving towards full digitalisation. The tasks of land surveying and mapping, land marketing and sales, contracting and conveyancing/notary work, lodgement and registration all are being digitally transformed. Application of new data acquisition tools (including HRSI, VHRSI, UAVs, GNSS, mobile mapping tools, and even AI approaches), data modelling techniques (e.g., leveraging off ISO 19152 LADM, and including 3D), process re-design (e.g., utilising smart contract), new data storage technologies (e.g., new exchange formats, blockchain), and way of interacting and providing services to clients and stakeholders (e.g., online approaches, e-services), are all observed (*c.f.*, Bennett et al, 2022a; Bennett et al, 2022b).

That said, most systems still operate in a parallel or hybrid fashion: a combination of manual processing, paper documentation, automation, and digital systems is evident. This paper explores the interim results of recent digital transformation projects undertaken collaboratively between Kadaster International (KI, The Netherlands) and project partners in Indonesia (Ministry of Agrarian Affairs and Spatial Planning/National Land Agency, ATR/BPN) and Armenia (Cadastre Committee, CC). Whilst there are significant differences at the country level with regards to legal approaches, finances, partnerships, legacy IT systems (if any), and available capacity – both countries face common challenges when dealing with archive digitisation and storage, spatial/textual data quality, standards, digital transaction design, system maintenance, and building public awareness and trust.
The aim of the paper is therefore to share these stories with the broader land administration community. It also reveals potential solutions to speed up responsibly moving towards fully

digital systems. The cases reveal the importance of linking local knowledge with international expertise and standardisation. The remainder of the paper is structured as follows. A brief overview of the applied methodology is provided, and then an overview of the case contexts, and digital transformation agenda, progress, successes and challenges is presented. The paper concludes with a summary of key lessons and recommendations.

2. METHOD AND APPROACH

The work here uses a simple case study approach, taking in lessons, experiences, and documentation co-created between KI and project partners including CC and ATR/BPN. Inputs have included dialogue and content generated through meetings, shared activities such webinars and workshops, report production, and specific technical undertakings. Where necessary, specific documents are referenced and readers are invited to request these more detailed reports. Most activities were completed between 2020 and 2022, and remain ongoing. The UN-GGIM Framework for Effective Land Administration (FELA) (Figure 1) (UNGGIM, 2020), endorsed by Member States in August 2020, provides a framework for understanding and presenting the results, although not all nine (9) strategic pathways (Figure 2) are specifically mentioned in either case. That said, it can be used to assist in undertaking digital transformation at both organisational and sector level, and can help to unpack the stages and status of digital transformation within land administration system.

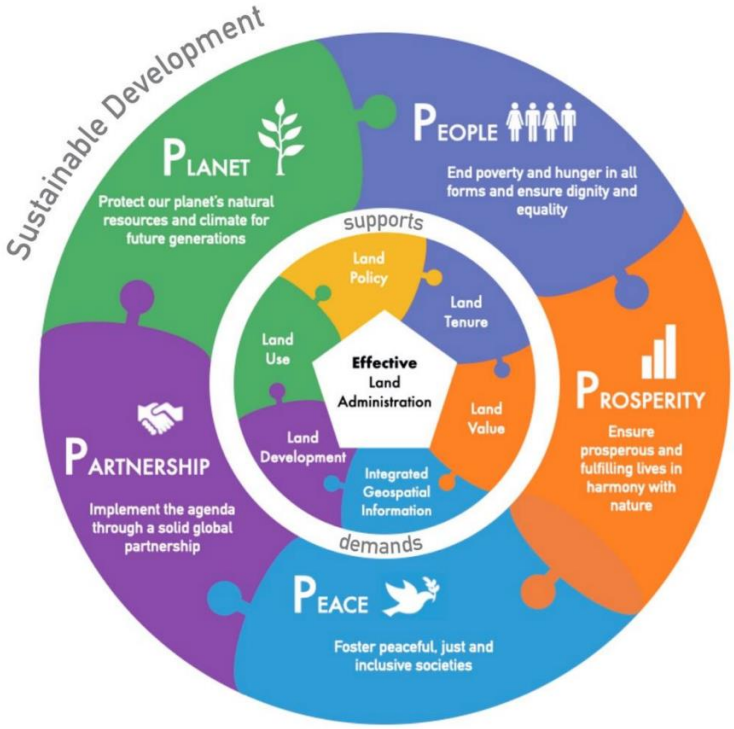

Figure 1. UN-GGIM's FELA directly considers digitalisation and the role of land administration in supporting sustainable development (source: UN-GGIM, 2022)

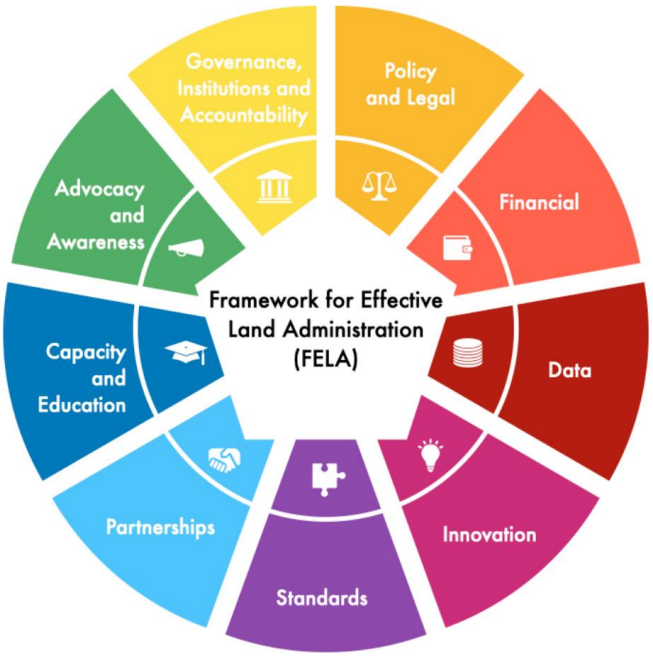

Figure 2. UN-GGIM FELA is structured around nine (9) strategic pathways (Source: UN-GGIM, 2020)

3. ARMENIA

In Armenia[1], the Cadastre Committee (CC) is a subordinate body of the Government of the Republic of Armenia with responsibility for topographic mapping, cadastre and land registration. Products and services for the country's 2.9M population encompass address management, cadastre, land registration, land information, topographic maps and historical maps. CC has approximately 893 employees and annual costs are approved by separate annex of the State Budget of Armenia. CC maintains around 2,4 million cadastral files consisting of approximately 123 million individual documents, kept in 4 territorial subdivisions, located in 2 different buildings in Yerevan.

Until recently, in Armenia there has been no unified or standardised approach to archiving cadastral and land registry records. CC was therefore undermined in its' ability to support management and assessment of lands and real estate, and the registration of natural, economic and the legal status of those lands. In addition, its ability to support land management activities such as land allocation, land appropriation, and the management of other types of property rights on land was challenged.

[1] The content in this section is extracted from: *Bennett, R.M., and Verheij, V., (2022a) Interim Report on CDC-A (D2.1), Digitalisation of Cadastral Data – Armenia, V1.0, Apeldoorn, January 5th 2022*. The report is available on request from the authors.

Digitisation of the cadastral archives is part of the broader land administration reform agenda to improve land registration. The 5-year reform plan (now into the 4th year) has been developed by the CC. The 5-year plan takes a broad FELA-like perspective, involving legislative, administrative, institutional, and technological activities, seeking to create a more transparent, secure, unified and citizen-oriented cadastral system. The reforms aim to deliver tangible progress in different priority fields such as the creation of a unified national geoinformation system, general improvement of the land administration system, the digitalization of archives, maintenance and update of electronic services, and the establishment of a spatial data infrastructure.

CC plans to achieve the reform by introducing and implementing an advanced self-service and paperless system, based on electronic registration and information processes. This digital archive will be one of the main pillars of an online and self-service paperless real estate cadastre. The idea is that the digitised archives will be online accessible, while the paper archive will be stored in a special protected building that is being planned at the moment.

A pre-existing software system to enable and support the digital archiving system is in place (ARPIS), but it is not yet complete – although, in recent times has been upgraded with a new web portal front-end, modernised physical one-stop-shop service centres, and more digital services and transaction functionality added during the 2020-21 pandemic years. CC's envisions to create a core team of digitalisation specialists (8-10) who master all the procedures, relevant standards, cutting-edge technologies and methodologies of creating and maintaining digital archives. These specialists will later be able to share their knowledge and experience with peers or work as team leaders with groups who deal immediately with the digital cadastral files.

Digitalisation of cadastral archives is having a positive influence on the functioning of the Armenian government and the private sector. Databases for e-Governance serve as a foundation for the modernisation of the service provision of the Government of Armenia, which in turn will have a positive effect on reduction of corruption and accountability of the Government. For example, citizens and external professional users will be able to access the data remotely, improving availability and transparency. Also, improvement of transaction handling, data quality checking, and maintenance will be easier to organise in a complete digital environment.

Specifically, the creation of digital archives is providing for: i) integration of the archive's scanned documents and readability enhancement; ii) simplification of ARPIS user's work, reduced working time, increased effectiveness, resource savings; iii) reduction of the existing corruption risks, significantly simplifying information acquisition procedures, submitting land dealing applications, obtaining outcome documents without visiting the cadastral offices physically, reducing information provision terms with an opportunity to get information immediately after inquiry; iv) reducing workloads of employees of territorial subdivisions and

service offices; v) significantly reducing system maintenance costs and increasing CC's revenues; and vi) facilitating updates on the database.

That said, currently CC is operating with a parallel or hybrid paper-digital environment, and local circumstances and customer needs mean this will continue for the short to medium term. However, with the support of Kadaster Netherlands, CC is developing scenarios to support movement towards an almost fully digital operational environment in the subsequent 10-year period (Figure 3).

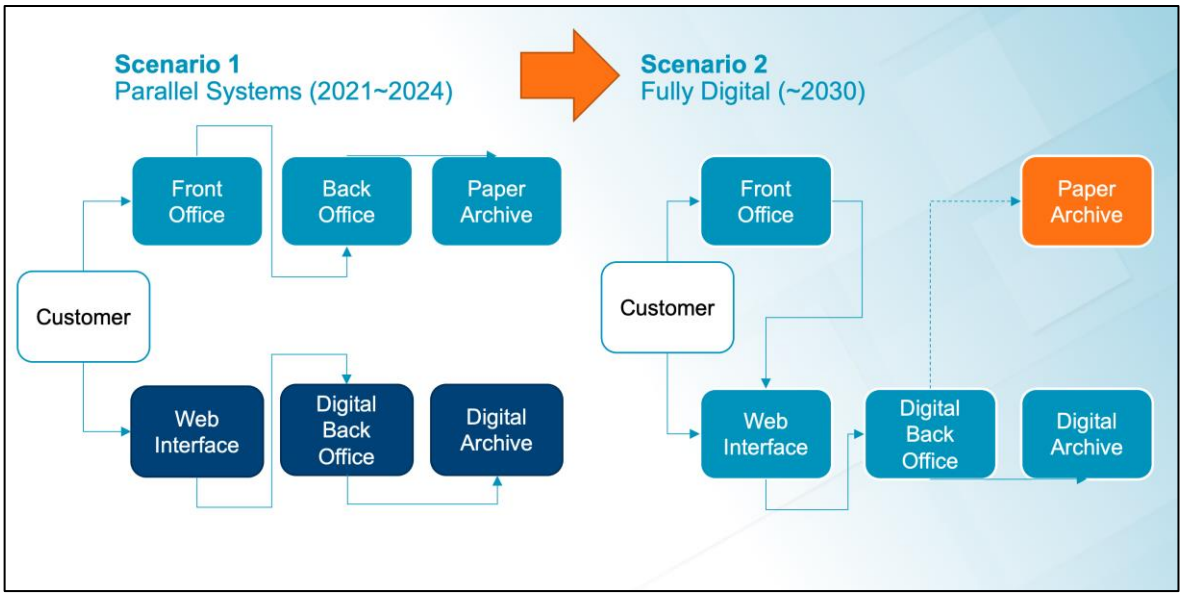

Figure 3. Armenia plans to transition from a paper to fully digital operating environment

Overall, the digital availability of cadastral information will enable better management of lands, documented land and property rights, and tenure security for Armenia. This in turn is a condition for improving the investment climate and enabling economic development in the country.

4. INDONESIA

Indonesia's ATR/BPN[2] is a key agency in the creation, management, and dissemination of land and spatial information in Indonesia. It's mandate primarily relates to land registration, land surveying, and related mapping and land management tasks. With upwards of 200M people, 125M land parcels, a complex historical background, and topographically spread across the diverse archipelago of ~17,000 islands, ATR/BPN is tasked with a challenging land

[2] The content in this section is extracted from: *Bennett, R.M., Unger, E.M., and Vedgt, H.v.d., (2022b) Improving Modern Land Registration in Indonesia (IMLRI), Result 3.1 – Digital Transformation Report, March 2022, Apeldoorn, The Netherlands.* The report is available on request from the authors.

administration mandate. To support delivery of its mandate, the agency has been undertaking continuous improvement initiatives, particularly relating to increasing map coverage and digitalisation, often with donor support, over recent decades. On this, ATR/BPN and KI have previously collaborated, variously over multiple decades, on technical aspects relating to data capture, mapping, and spatial data management. The present project concentrates on organisation development, services improvement, and furthering fit-for-purpose approaches to land administration. These three areas were co-identified by the project partners and a subsequent 4-year work plan was developed.

Part of the work in this collaboration involved performing a state-of-play assessment on ATR/BPN with regards to digital transformation, utilising FELA as a basis. Through this analysis it was show that the organisation, and broader land sector (notwithstanding the huge diversity in access to services depending on geographic and urban/rural/remote location), is clearly on a trajectory towards embracing and enacting digital transformation. It has in place processes to sense and seize digitalisation opportunities, and to undergo the necessary changes to become digitally transformed.

Moreover, against the FELA framework, it could be seen that ATR/BPN is putting in place fundamental aspects that will improve the sustainability of these digital transformation interventions. For example, relevant policies and laws are being enacted or revisited to support digital initiatives. Financially, the organisation is in good shape to support further digitalisation developments. It is also supporting on renewing and re-skilling the workforce to work in a digital environment.

That said, in the more immediate term, there are challenges with regards to dealing with both legacy digital and paper-based systems, and quality of data issues around those. The evenness of access with regards to digital services is also a concern – both for staff and citizens. Other opportunity areas relating to opening the organisation up further to better collaborate between levels, with other Ministries, and collaboration with private and actors in the international sector. Perhaps most pressing is the need to formalise approaches to standards and partnerships.

At a more specific level, Table 1 and Figure 4 summarize the key opportunities and challenges relating to each IGIF/FELA strategic pathway. Even limiting the number of aspects to approximately three per pathway results in 33 separate areas for action (noting there may be some overlap here). To narrow focus, it is suggested that those initiatives relating to data, standards, and partnerships should receive immediate attention. Alongside this an ongoing monitoring and evaluation plan, taking into account all pillars, appears worthy.

Table 1. Digital Transformation opportunities and challenges

Pathway	Opportunities and Challenges
Governance, Institutions and Accountability	**Vision** for ATR/BPN digital transformation that is holistic Digital transformation **champions** at multiple levels **Alignment** of digital strategies withi ATR/BPN and with external stakeholders
Law and Policy	Legislative and regulatory **harmonisation** Assessment of a **positive system** of land registration Ensuring workable, enforceable, and are adequately **resourced** law
Finance	**Sustainable business model** post-2025 **Government business enterprise** model exploration Audit and assessment of **PPP** service models **Performance metrics** redesign around benefits realisation and SDGs
Data	**Vision** for data governance across ATR/BPN, post-2025 **R&D** audit and review on cadastral and land registration data **Fast-tracking** mapping 126M parcels by 2025 (keep going!) Developing and implementing better **quality assurance** standards Ensuring a robust federated **database infrastructure** is developed
Innovation	Formalised innovation **bench making** program across ATR/BPN **Incentive schemes** at all levels Formalise **R&D** collaborations across sector **Digital divide** audit
Standards	Audit **governance** of standards in ATR/BPN Assess range of **technology** and data initiatives in terms good practices Development of both internal and industry-wide **certification** protocols Fostering of a **community of practice** to support awareness raising
Partnerships	Reviewing partnership and establishment new partnership **ecosystem** (NGOs) Assess PR 38/2015 with regards to land sector **PPPs** **PaLaR** (i.e., FFPLA) review on embeddedness into PTSL **Donor-working group** creation for optimisation
Capacity and Education	Plan for **keeping capacity** in ATR/BPN **Fast-tracking skill areas** for maintaining the data Support professional bodies and encourage **self-accreditation**
Communications and Awareness	Revisit key **stakeholder** lists and related communications plans Ensure **World Bank project** comms are institutionalised Examining the current **monitoring and evaluation** mechanisms

Figure 4. Summary SWOT for Digital Transformation in ATR/BPN

5. CONCLUSION

This paper began from the premise that land administration systems are embracing digital transformation: data, processes, transactions, practitioners, and users are moving towards full digitalisation. The tasks of land surveying and mapping, land marketing and sales, contracting and conveyancing/notary work, lodgement and registration all are being digitally transformed. That said, it is acknowledged that most systems still operate in a parallel or hybrid fashion: a combination of manual processing, paper documentation, automation, and digital systems is evident.

This paper explored the interim results of recent and ongoing digital transformation projects – focusing on assessment and design - undertaken collaboratively between KI (The Netherlands) and ATR/BPN and CC project partners, in Indonesia and Armenia respectively. The UN-GGIM Framework for Effective Land Administration (FELA) provided a means for understanding and undertaking digital transformation at both organisational and sector level: it helped to unpack the stages and status of digital transformation within land administration system. It also revealed potential solutions to speed up responsibly moving towards fully digital systems.

Both countries are making significant progress in terms of unified policies for digitalisation transformation, realised through IT infrastructure implementations, digitalisation of data and

internal processes, and development of e-services for citizens. Whilst there are significant differences at the country level with regards to legal approaches, finances, partnerships, legacy IT systems (if any), and available capacity – both countries face common challenges when dealing with archive digitisation and storage, spatial/textual data quality, standards inactment, digital transaction design, system maintenance, and building public awareness and trust. The cases reveal the importance of linking local knowledge with international expertise and standardisation.

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BIOGRAPHICAL NOTES

Rohan Bennett is in-coming Chair of FIG Commission 7 (2023-26). He holds degrees in Geomatic Engineering, Information Systems, and a PhD in Land Administration, from the University of Melbourne. He has held academic and professional consulting roles with the University of Melbourne, University of Twente, Swinburne University of Technology and Kadaster Netherlands. He is widely published in the areas of land administration, cadastre and land management, with specific focus areas being application of emerging technologies and developing contexts. Recent country-level experiences include engagements with Armenia Cadastre Committee, Indonesia's ATR/BPN, NLA in Rwanda, and key government agencies in Chad.

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