

United  Smart Sustainable Cities



Enhancing innovation and participation in smart sustainable cities



Empowered lives.
Resilient nations.



Foreword

This publication on “Enhancing innovation and participation in smart sustainable cities” has been developed within the framework of the United for Smart Sustainable Cities (U4SSC) initiative. This publication provides a series of case studies on smart governance, smart people and smart economy, which will catapult successful smart city practices into the global spotlight.

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The opinions expressed in this publication are those of the authors and do not necessarily represent the views of their respective organizations or members.

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INTEGRATED FUTURE
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SALES STOCK MARKET
TEAM MOTIVATION
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INNOVATION
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Introduction





Introduction

The United for Smart Sustainable Cities (U4SSC) initiative was launched by the International Telecommunication Union (ITU) and United Nations Economic Commission for Europe (UNECE) in May 2016. The first phase of this initiative, which was conducted via three Working Groups, was completed in April 2017. This flipbook brings together the work done in Working Group 3 (WG3) for Enhancing Innovation and Participation in Smart Sustainable Cities.

WG3 is formed of a group of global experts and practitioners to facilitate knowledge sharing and partnership building on smart cities, with the aim of formulating strategic guidelines and case studies for enhancing innovation and participation in smart sustainable cities. More specifically, WG3 addresses various topics on smart governance, smart economy and smart people with the aim of achieving strong and symbiotic governance, economics and society.

WG3 has explored the potential of ICT to improve public services and open data, as well as inclusive smart governance models. It has held numerous deliberations for ICT-related policy issues relevant to economic growth, smart financing, research and development (R&D) and innovation, with a focus on encouraging public-private collaboration in efforts to develop smart sustainable city projects. Various innovation ecosystems were investigated and associated initiatives capable of increasing urban societies' capacity for enhancing personal and professional skills, entrepreneurship and creativity were discussed.

After nearly ten months of intensive work and deliberation, WG3 members have prepared a series of case studies and products, which will catapult successful smart city practices into the global spotlight for consideration. The resulting case studies have been presented in this flipbook, within different sections based on their topic.

The challenges and opportunities faced by cities entail significant innovation potential. Active participation of city stakeholders in smart sustainable city initiatives will catalyse and foster innovation capacity. Within this context, WG3 members reiterated that a well coordinated, cooperating governance, society and economy will better enable a transition to smart sustainable cities. Despite differences and particular aspects in urban challenges globally, various principles and common practices apply uniformly. Case studies included in this flipbook are to a great extent transferable to different urban contexts.

At the end of the first phase, this progressively evolving initiative will build on its existing vision to incorporate growing urban sustainability needs. The initiative will also attempt to expand on its existing scope and outreach, and continue to support smart-city transitions across the world.





Smart Governance







Dubai Government Electronic Shared Services





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1 Introduction

1.1 Background

Dubai is one of the seven emirates in the federation of the United Arab Emirates. The emirate has enjoyed a strong economic growth trajectory, and has managed to establish itself as one of the leading emerging economies with a sustained record of real GDP growth rate. Dubai's Government as a whole is composed of several specialized entities (departments, authorities, committees, councils, etc.), which were independently established through legal mandates. Hence, these entities operated autonomously in fulfilling their missions over the years. A holistic government approach did not exist in terms of concrete cross-entity electronic shared services (ESS). More specifically, there was no institution established (mandated) or appointed to carry out ESS activities on a large scale and extent at the government level. There were examples of a few ad-hoc projects that were initiated in the past among a small number of government entities, resulting in limited cooperation and collaboration; however, there was no government-level strategy that formalized a "whole-of-government" approach prior to the ESS initiative.

1.2 Challenge and response

A lack of government-wide electronic shared services has compelled government entities to individually invest in various information and communication technology (ICT) solutions and electronic services capabilities, resulting in the replication of efforts and resources. Furthermore, there were no incentives to share knowledge and practices across the government entities despite potential synergies.

Despite the fact that common administrative back-office (support) activities existed among government entities, they were implemented individually within the confines of each respective government entity from a policy, people, process and technology perspective. As such, synergies were abundant in human resources management, financial management, supply-chain management, etc. All these commonalities pointed to a huge potential for horizontal cross-entity synergies. Concomitantly, advances in ICT were enabling automation as well as the centralized provisioning of such cross-entity synergies in a successful manner. Dubai Government faced the challenge of incurring significantly higher financial, human and technology resources needs, which in turn amplified expenditure at the government level due to a lack of horizontal collaboration and coordination in the early 2000s.

In view of the above, the Dubai Government launched a comprehensive electronic shared services (ESS) initiative as part of its citywide digital transformation. An extensive centralized "whole-of-government" approach was adopted for the common (synergistic) aspects of core and administrative (support) services for electronic enablement, referred to as ESS. This centralized whole-of-government approach played a critical role in facilitating and incentivizing Dubai Government entities (DGEs) to collaborate and to cooperate.

This case study pertains to the domain of smart governance within the U4SSC. More specifically, it is a case study illustrating a strong case for creating efficiencies in a city through shared services.

2 The smart project(s)

2.1 Vision and content

The Dubai Government ESS initiative was launched as part of the Dubai eGovernment initiative, which subsequently evolved into Dubai Smart Government, and more recently into the Smart Dubai initiative in 2014, all under the leadership of His Highness Sheikh Mohammed Bin Rashid Al Maktoum, Vice-President and Prime Minister of the UAE and The Ruler of Dubai. ESS forms a key pillar under Smart Dubai, which is Dubai's smart-city initiative, and implemented through an extensive programme.

Strategic goals and objectives of ESS: The overarching strategic goals of the ESS initiative were to achieve operational efficiencies and higher returns on ICT investments by providing customer-focused shared services, while capitalizing on ICT-related synergies across the city government entities. Accordingly, ESS would strike an optimal balance between operational efficiencies and enhanced customer satisfaction by simultaneously achieving high levels in both (i.e. operational efficiencies will NOT be achieved at the expense of customer satisfaction).

Customer objectives of ESS were identified as increasing customer satisfaction and trust, saving time and money for customers and increasing the adoption of ESS by customers. The customers of ESS are the government entities, the public, the businesses and other organizations in Dubai utilizing the ESS. Internal objectives of ESS were determined as:

- (i) innovating jointly with government entities to enable new ESS and to enhance the existing ones;
- (ii) rolling out ESS to achieve high levels of penetration in government entities;
- (iii) enhancing the customer relationship for ESS;
- (iv) leveraging private sector alliances and partnerships for the implementation of ESS; and
- (v) implementing and enhancing ICT infrastructure for providing reliable and high performance ESS.

The learning and growth objectives of ESS were to attract, develop and retain key skills for ESS provisioning and provide requisite skills training to local government entities in order to utilize the ESS effectively and exchange knowledge to improve ESS usage. The financial objectives of ESS were identified as achieving operational efficiencies through synergies and increasing productivity for the activities conducted by the Dubai Government.

Actual services: Smart Dubai ESS initiative has implemented and delivered more than 60 shared services utilized by more than 50 entities in Dubai. The following gives an overview of available ESS categories:

- (a) Government Resources Planning (GRP) ESS: This category of ESS enables an extensive range of back-office support functions such as human resources management, financial management, supply-chain management, projects management, self-services management (employees, suppliers), enterprise assets management, business intelligence, etc., implemented through an enterprise resources planning (ERP) system. There are more than 30 ESS in the GRP category which can be implemented individually based on actual business needs of a government entity.
- (b) eServices Enabling ESS: This category of services helps government entities to host their websites for the following functions:
 - to enable mobile messaging via SMS for their core services;
 - to enable electronic and mobile payments for their core services;
 - to enable unified digital authentication;
 - to enable electronic information exchange among government entities;
 - to have a unified repository of all the government entities' services.
- (c) Infrastructure Enabling ESS: This category of shared services includes secure government information, network connectivity, secure Internet connectivity, shared email services, shared mobile email, intranet solutions and shared collaboration across entities through portals.
- (d) Public and Businesses ESS: This category of shared services includes the one-stop-shop official government portal and mobile app of Dubai Government, recruitment portal, electronic suggestions, electronic complaints and electronic survey systems for public and businesses, and electronic procurement for suppliers.

ICT has been a key enabler for all the implemented ESS. In most cases, the latest technologies were utilized through leading edge solutions deployed as cloud-based and/or centralized shared services. Innovation was critical in all aspects of the ESS as government entities' needs and requirements were determined collaboratively and knowledge exchange and dissemination formed a major part of the implementation of ESS.

As of today, ESS have been very successful in achieving operational efficiencies in the form of cost savings of AED 4.3 billion (USD 1.2 billion) (from 2003-2015). They have also received a happiness rating of 84.3%, based on user feedback.

2.2 Implementation

Extensive engagement, participation and collaboration among Dubai Government entities were extremely important during the implementation of ESS. The ESS were implemented in waves, whereby each ESS followed an initial implementation phase through the coordinated gathering of requirements, and the development stages, which included the creation of pilot government entities.

Subsequently, ESS were rolled out gradually to all other government entities which needed these services. This was an ongoing process and each rollout time frame varied based on the service and entity (e.g. Government Resources Planning rollouts took 3-6 months, whereas electronic payment took 1-2 months depending on the entity).

ESS were also enhanced with new features to meet the customer requirements and to stay competitive with respect to advances in the industry.

ESS were implemented through well-defined core processes as listed below:

- ESS Requirements Definition
- ESS Design and Implementation
- ESS Rollout
- ESS Infrastructure Management
- ESS Customer Management (includes Account Management and Customer Incidents Management)

Streamlined and well-defined processes were critical to the success of the overall initiative. Some examples illustrating the growth and uptake of ESS over the years have been given in this case study.

GRP was launched in 2003 with 15 ESS (HR, Finance, Supply-chain, etc.) in 7 entities. By 2016, GRP had more than 30 ESS in more than 50 entities. Over the years, project management, electronic procurement and mobile supply-chain management, etc. were added as enhancements to the GRP suite of ESS.

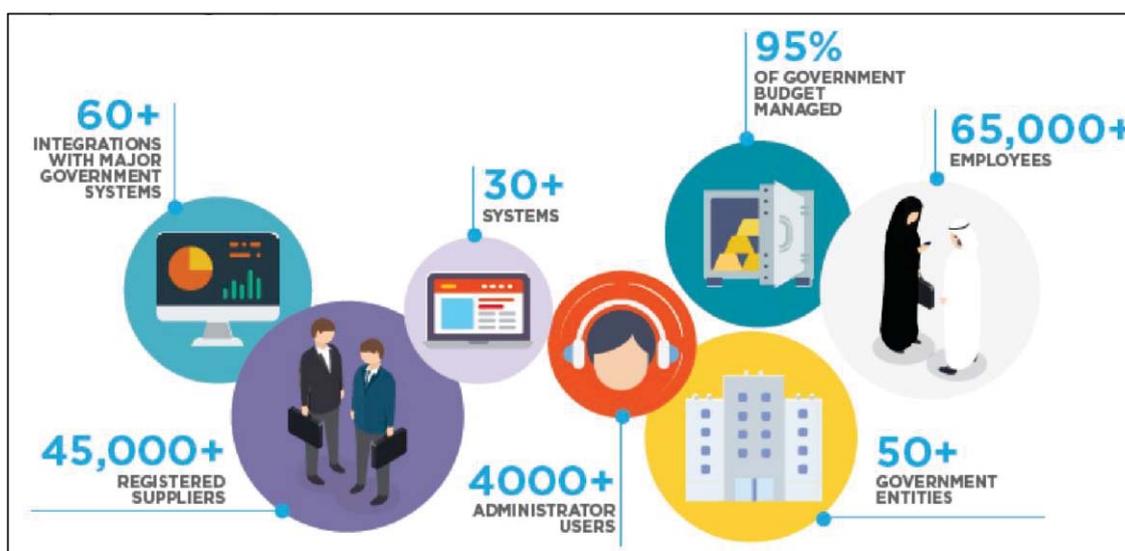


Figure 1 – GRP ESS example

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Today GRP handles a significant majority of the back-office processes of Dubai Government entities. More than 90% of all Dubai government employees and more than 95% of Dubai government budgets are managed by the GRP system as a shared service.

Electronic payment ESS (branded as DubaiPay) was launched initially with 3 entities in 2003 and reached 38 entities in 2016. Over the years, different payment options such as AMEX, prepaid cards, direct debit (account transfer), mobile payment, kiosks payment and IVR payment were added as enhancements.



Figure 2 – DubaiPay ESS providers and payment methods

DubaiPay has electronically conducted more than 7.5 million transactions in AED 11 billion (USD 3 billion) in 2016 alone.

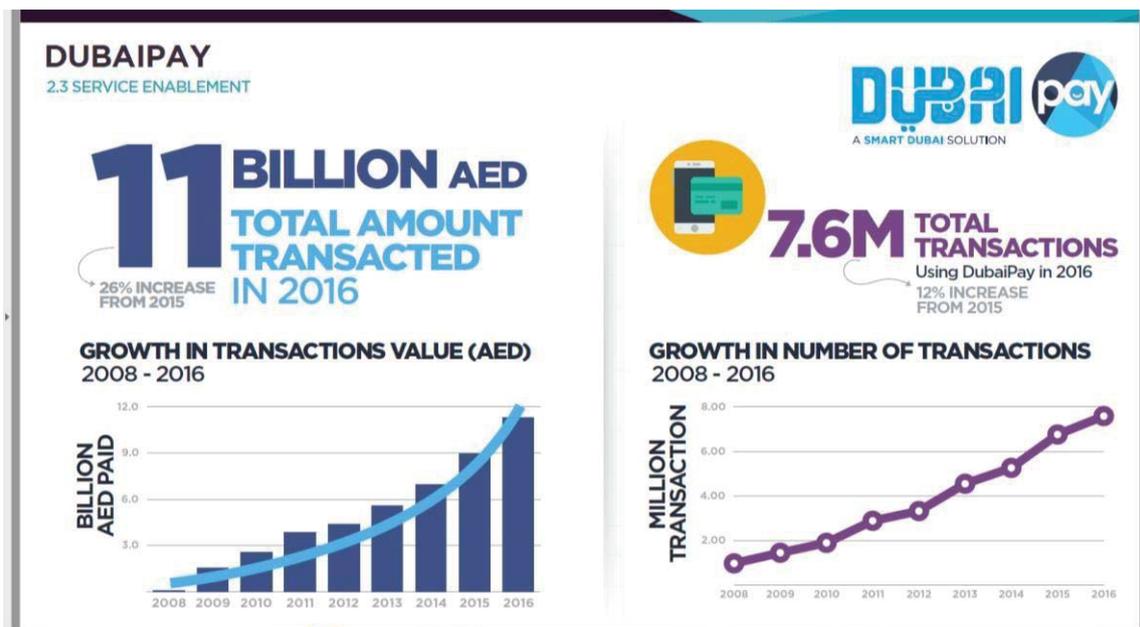


Figure 3 – DubaiPay ESS transactions

DubaiPay has significantly contributed to public sector electronic commerce in Dubai.

Similarly, SMS mobile messaging is implemented as a shared service and more than 285 million SMS messages were sent by government entities, schools and some private entities in 2016.

Key enablers of ESS in Dubai

Leadership support: Commitment at the highest levels in the government has been crucial to ensure ESS success. The ESS initiative was linked to the overall vision of digital transformation of the Dubai Government, and recently of the city itself. Due to the continued political support at the highest levels, ESS have been rigorously tracked and championed by different government entities in Dubai.

Customer engagement and participation: ESS aim to solely serve the customer. They are utilized by customers to meet their business needs. Hence, understanding, identifying and incorporating the customer needs in ESS implementations are absolutely crucial. In order to achieve this, proactive customer engagement, facilitation and participation have been essential. Customer engagement and participation has increased the buy-in and the ownership of ESS considerably.

For example, GRP ESS implementation entailed intensive engagement and facilitation of government entities' staff and required more than 100 government-level innovation workshops, which were attended by more than 300 representatives from different government entities referred to as 'business owners'. These "business owners" have streamlined, standardized and automated more than 200 back-office support and administrative processes. A majority of the innovations in ESS came directly from the users and planners of ESS.

Customer satisfaction and management: It is of the utmost importance to achieve customer satisfaction in ESS delivery. Operational efficiencies (intended cost savings) are one vital side of the coin but the other side is customer satisfaction. High customer satisfaction has enabled high adoption of ESS, which in turn, has enabled achievement of the intended operational efficiencies.

Over the years as the number of ESS rollouts and the number of customers increased, the need for formal customer management has risen almost naturally. Handling customer needs and expectations and resolving various ESS incidents related to customers were critical for the success of the initiative. In 2015 alone, there were more than 41 000 customer inquiries which needed to be resolved.

Continuous improvement through enhancements: ESS implementation is not a one-time activity but rather a continuous journey for adapting to the changing needs of customers and the environment in general through enhancements. These enhancements may take the form of new ESS features, business requirements, etc. or they may cause issues related to ESS core processes. ESS enhancements include upgrades, new releases, integrations with core systems (legacy systems), government policy changes, implementation of new government laws and amendments. Over time ESS core processes were always revised and streamlined. Some examples of this include:

- introducing formal customer management;
- streamlining service monitoring and delivery processes to achieve high availability rates;
- streamlining customer support and incident management processes;
- promoting the delivery of services through service level agreements (SLAs);
- conducting customer surveys;
- integrating customer survey results with customer management processes.

In view of these examples, it is necessary to achieve some flexibility and agility in ESS implementations and core processes to incorporate changing needs and requirements.

Boosting the skills of staff: ESS are ICT-based services in nature. Even though technology has been a very strong enabler, it also poses challenges from a management perspective. Technology tends to change frequently, and technology-related processes also need to be revised and re-implemented to manage changing customer needs and innovations.

Technology product timelines are fairly short (becoming even shorter over time) and new versions of products are released very frequently. Similarly, new technology and service management processes are formulated quite regularly. Keeping up with these changes is definitely challenging. These are very rapid cycles requiring agility and flexibility in terms of implementation and requisite skills.

This necessitates quick learning and adaptation to these changes. Hence, it is important to invest in people skills and to keep their knowledge up-to-date. Technology management and ESS operational processes are critical. Investing in training and staff development to handle these rapid changes is essential.

Hiding the operational complexity of ESS from customers: ESS delivery is a fairly complex operation; involving complicated infrastructure management processes, intricate service implementations and customer management processes, as briefly outlined in this document. It is important to hide this complexity from customers and provide simple, easy-to-use, cloud-based web applications and services, with timely and responsive customer support in a seamless manner. This approach has contributed to the high adoption of ESS by customers. Customers are intentionally kept at the user level. They are engaged to gather their ESS requirements, but are kept detached from all the technical intricacies and details of implementing and delivering services. This has helped customers to save time and money and has also contributed to increasing their loyalty.

Private sector partnerships: ESS require various disparate skills and competences. It was decided early on to acquire and develop some of these skills internally. Subsequently, several of these requisite skills and competences were acquired through partnerships established over time. In some cases, strategic outsourcing was utilized to complement the existing skills. ICT partnerships were also established with various providers of ICT services and equipment. Without these partnerships, operational challenges and skills issues might have potentially undermined the success of ESS.

2.3 Results

Benefits and the impact

The benefits and the impact of whole-of-the-government approach implemented through ESS can be summarized as follows:

- One-stop-shop for public services: ESS included several one-stop-shop services for the public and businesses. Examples include the following:
 - (i) Dubai Government main portal and DubaiNow mobile app for government services-related information and transactions;
 - (ii) eSupply, a single electronic procurement portal (esupply.dubai.gov.ae) whereby government entities post their business opportunities for suppliers;
 - (iii) eParticipation services handle electronic suggestions, electronic complaints and electronic surveys thereby greatly reducing the barriers for the public's engagement in policy making.
- Core business focus for Government entities: ESS implementations have clearly delineated the responsibilities and the accountabilities among Dubai Government entities. Smart Dubai Government has undertaken the responsibility of implementing, delivering and supporting the ESS by engaging with customers. Hence, Dubai Government entities participated heavily in defining the requirements for ESS and also utilizing them in a shared manner with other government entities to run their internal back-office processes, whereas Smart Dubai Government took the ownership of availing them as ICT-based shared services. This has allowed Dubai Government entities to focus on their core business of providing services to individuals and businesses in Dubai in line with their mandates and missions. ESS have relieved government entities from diverting their attention to non-core areas such as administrative (or support) processes related to internal administration. This is one of the main reasons why Dubai Government entities have electronically enabled their core public services in an accelerated manner.
- Operational efficiencies through cost savings: In June 2016, the Smart Dubai Government establishment published a report, quantifying the economic impact of its shared services to the Dubai Government. Smart Dubai Government announced AED 4.3 billion (USD 1.2 billion) in total savings for the Dubai Government from 2003-2015. The results were part of a comprehensive, year-long study¹ conducted by an international, third-party consultancy, to uncover the impacts and benefits of utilizing ESS. The results of this report give further evidence of Smart Dubai Government's ongoing commitment to ensuring efficiency, in line with its mandate to deliver world-class smart services and infrastructure through the technology arm of the Smart Dubai Office. The report found that the Government of Dubai has saved 5.6 dollars for every 1 dollar spent by Smart Dubai Government since its inception. The report identified that the Government of Dubai had managed to acquire annual (average) savings of AED 358 million (USD 97.4 million) for over 12 years from ESS. In 2015, Smart Dubai Government saved an average of AED 35.5

¹ Smart Dubai Government Lean Administration Support Services Project 2016 conducted by IBM

million (USD 9.7 million) every month. The report also identified savings on hardware and software installations and maintenance costs, along with savings on daily operations and personnel costs.

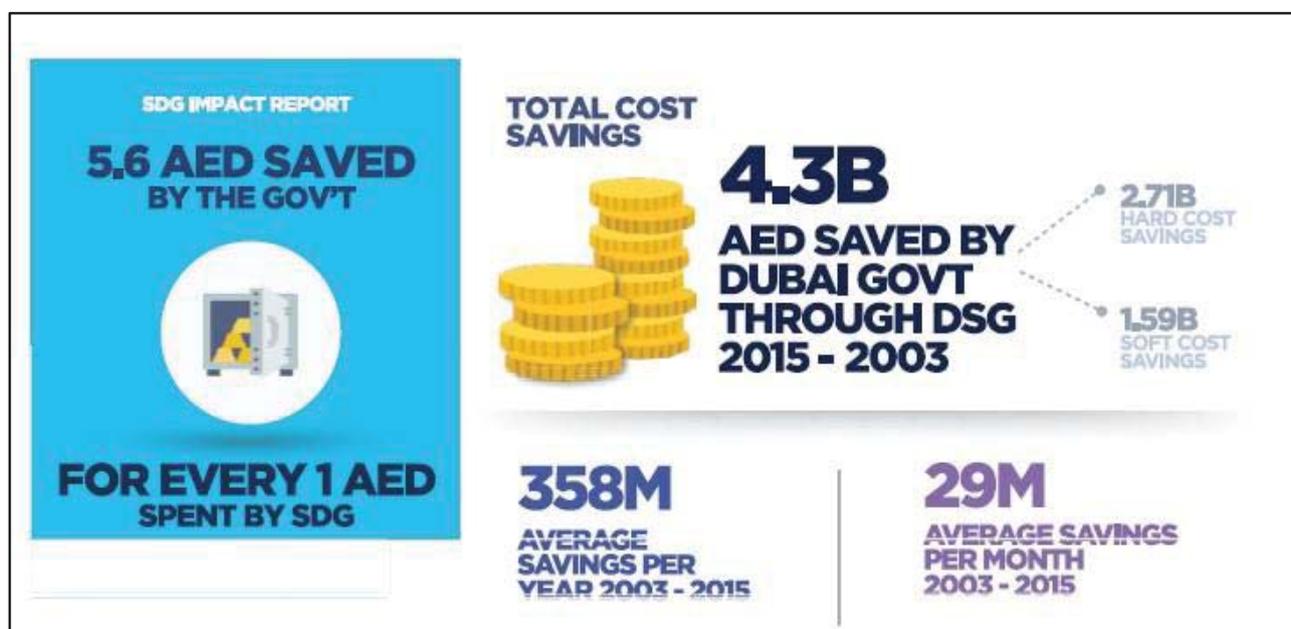


Figure 4 – ESS operational efficiencies through cost savings

- Operational efficiencies through automated processes: ESS have enabled ICT-based automation (digitization) of various business processes in government entities (e.g. human resources management, financial management, supply-chain management, payment processing, correspondences, document management, etc.) from manual paper-based systems. Such automation and digitization have improved end-to-end cycle times for business processes in government entities. Expedited timelines were observed in terms of workflows and related approvals in several business processes. These observations are supported and verified by benchmarks, which indicate an average of 10-20% reductions in operational processes cycle times in similar ERP implementations. ESS have also facilitated improved service innovation, service rollout and service delivery for government entities. Additionally, ESS have enabled government entities to reduce service rollout cycles by 30 to 40% compared to a stand-alone decentralized model for each entity.

The GRP has enabled the Department of Finance (DoF) to provide functional shared services through its Shared Services Unit, in the area of finance and HR services for 24 small size entities. This is expected to improve operational efficiencies and enable newly established entities to start operations in relatively short time frames.

- Customer satisfaction: One of the overarching goals of ESS was to attain enhanced customer satisfaction, while achieving operational efficiencies in terms of cost savings for the Dubai Government. In 2015, Smart Dubai Government handled 41 000 support calls/requests related to shared services across all participating departments. It was noted that 98% of all requests were dealt within the given SLA compliance target time, thereby achieving an 81% customer satisfaction score². In the same year, ESS received an 83% happiness rating on the Happiness Index, which captures customer happiness across ESS touch points.

² These figures have been derived from detailed annual customer surveys

- Business intelligence and decision support: One of the benefits of ESS is that its associated information has been made readily available through the data stored in government-wide centralized systems (data and information repositories). This has provided decision-making support to various central government entities responsible for policy formulation. For example, GRP ESS contain various human resources, financial resources and supply-chain management data, both at the government level and also at the entity level. This allows the generation of consolidated government-level reports, entity-level benchmarking of performance indicators, etc. Availability of such data enables informed policy making, as well as easier and faster monitoring of the implementation of such policies at the government and at the entity levels. In the absence of ESS, obtaining and aggregating such data would most definitely require more time and effort from each individual entity.
- Ease of government-level policies enforcement: ESS have also enabled easier implementation of government-level policies in certain areas such as human and financial resources management. For example, Dubai Government issued a Human Resources Management Law encompassing various areas of HR management. In the absence of ESS, each entity would have to make significant changes to their decentralized HR systems to ensure compliance.

The centralized GRP ESS has enabled unified implementation of the HR Management law, saving significant efforts and resources in terms of time and money. However, there have been amendments to the same law over the years which may necessitate further changes. GRP ESS have handled such amendments again through the unified implementation of each amendment. Similar examples apply for financial resources management (e.g. budgeting), supply-chain management, etc. ESS have certainly increased the capability of the government to implement and to enforce government-wide policies through a single unified system.

- Reduced administrative overheads: ESS are implemented to provide a single point of contact for government entities in terms of customer issues, incidents and support. If this were not the case, each entity would have to replicate such efforts to deal with ESS customer issues in a decentralized manner, thereby making the implementation process for ESS more complicated. Additionally, ESS entail forming partnerships with private sector solutions and service providers. These partnerships were formed on behalf of the entire government and all the entities leverage these partnerships by utilizing ESS. This is exemplified by electronic payments in Dubai for which Smart Dubai Government has formed alliances with the following stakeholders in UAE:
 - (i) banks: to handle credit card transactions, direct debit or account transfer transactions;
 - (ii) Ministry of Finance to utilize its eDirham prepaid payment method;
 - (iii) American Express to handle AMEX payments, etc.

It is also noted that a single service can require multiple partnerships. Entering into these partnerships would involve the handling of all related complex contractual and legal issues. In the absence of ESS, every entity would have to replicate these relationships and handle the legal agreements and contracts management processes separately. This poses significant administrative overheads when considering the number of entities involved.

- Knowledge sharing across the government: ESS provided a concrete platform for sharing and exchanging ideas across the government. Through this platform, business requirements, recommendations and use cases are shared openly across government entities. In this regard, when an innovative idea conceived by one entity is implemented, it would also become available to all the other entities. There are various such innovative ideas for services which originated in one entity and were then subsequently adopted by all the others. In fact, almost all the enhancements and subsequent releases of ESS are based on this concept of sharing ideas.

- Contribution to ICT sector development: Dubai is considered a de facto hub (cluster) for ICT companies in the Middle East region. Most multinational, as well as regional, ICT companies have established their regional headquarters in Dubai due to the high demand for ICT-based solutions and services from the public and private sectors in the Emirate. The launch of ESS has also contributed to this as many of the ESS implemented were innovative and were also considered to be path-breaking applications in the Middle East region. The large scale deployment of GRP as part of a “whole-of-government” implementation strategy was the first in the Middle East region. Similarly, electronic payment was considered a pioneering initiative when it was launched in 2003. mDubai SMS messaging service was also launched along similar lines as a public-private sector partnership (through strategic outsourcing). In some cases, the customized solutions provided by ICT companies for various ESS have been commercialized and turned into products and marketed to other private and public sector organizations (e.g. electronic payment vendor has commercialized and productized the solution for the whole region). Effectively meeting mature and sophisticated demands originating from ESS requirements, has also helped the ICT sector to boost its capabilities and competencies. This has further helped the ICT sector to contribute to the technological advancements in Dubai.
- Reduced carbon emissions: ESS are unified and centralized solutions used by several government entities. They have circumvented the need for government entities to replicate ICT infrastructures in their own premises. This has helped to considerably reduce the total number of ICT equipment (network equipment, server equipment, etc). Limiting the installation of ICT equipment (through ESS implementation) has resulted in the reduction of carbon emissions. Therefore, the implementation of ESS can also be considered to have a positive impact on the environment through emission reduction.

ESS sustainability

Given the success and the positive impacts of the ESS initiative in Dubai, Smart Dubai strongly believes that a similar ESS model would significantly benefit public sector entities in other countries too.

ESS serves as one of the key pillars of the Smart Dubai Government strategy and also forms an integral part of the overall citywide digital transformation process.

Continuous innovation through the enhancement of ESS and implementation of new e-services, which are in line with customer needs and emerging opportunities, are imperative to the sustainability of the ESS. Similarly, effective customer support and management, operational excellence in delivery, appropriate implementation of high service-levels, and business continuity measures have enhanced the sustainability of ESS in Dubai.

Cross-entity collaboration is critical for a “whole-of-government” ESS approach. Depending on the specific public sector context, a wide spectrum of options are available to implement ESS, ranging from a simple project-based organization to a formally established institution responsible for ESS deployment and maintenance (as observed in the Dubai case).

Many global public sector organizations are currently under fiscal pressure (e.g. high leverage and austerity measures) to deliver their services. Centrally implemented ESS have enabled significant cost savings in Dubai as opposed to each and every entity implementing them on their own. The cost savings achieved have been redirected to other uses, which has in turn increased the output of the government in other avenues. This enabled improved productivity in the public sector and has further sustained the ESS. The operational efficiencies attained are also an important part of ESS sustainability in Dubai.

Centralized implementation of ESS has also achieved higher capacity utilization of the underlying systems and technology infrastructure through economies of scale. It has further helped in reducing carbon emissions due to a more efficient use of the underlying information technology infrastructure. Hence, ESS are also environmentally sustainable (See Reduced carbon emissions).

3 Conclusions

Public sector electronic shared services can provide significant operational efficiencies for cities. ESS have provided a competitive edge for the Dubai Government. In financially challenging times for public sectors in cities around the world, operational efficiencies can be a strategic tool for delivering services to the public in a more sustainable

manner. In this context, ESS can serve as an ideal channel for improving operational efficiencies in public sector organizations.

Dubai saved nearly USD 1.2 billion between 2003 and 2015, indicating that there is a strong potential for value creation in public sector organizations through electronic shared services, if and when implemented carefully.

These savings allow ESS to function based on a self-financing model. In essence, ESS capture value by creating operational efficiencies through:

- economies of scale in ICT assets and human resources in various public sector organizations utilizing ESS, and
- economies of scope through a complete and wide range of solutions.

ESS can incorporate flexibility and scalability in their design to accommodate a large number of organizations. Scalable design and widespread implementation have been key for Smart Dubai to achieve economies of scale. Furthermore, this has enabled incremental efficiencies in terms of cost savings to be achieved over time as more organizations utilize ESS.

Smart Dubai has applied a coherent strategy and policy for ESS and has concretely delivered a large number of ESS with favourable uptake from the customers. Smart Dubai strongly believes that the positive ESS experience in Dubai will be beneficial for other countries too. With strong leadership and political will at the top, other cities could also implement similar ESS for their public sector entities. This can be supported by the adoption of appropriate strategies and policies, well-defined governance frameworks and robust operational processes, which take into account the specific urban requirements for each city.

The cost savings gained through the “whole-of-government” approach, have paved the way for reallocating these funds to better serve the needs of the public in Dubai. Dubai Government has been successfully able to divert and utilize these cost savings for its core public services.

The Dubai ESS approach has been taken as a model for public digital transformation for other emirates. Some Gulf Cooperation Council (GCC) countries are also following the same approach and learning from Dubai’s experience in this domain. It is important to note that the implementation approach of ESS can vary based on the actual context of the public sector (in terms of stakeholders, expectations, culture, institutional framework, etc.). However, the benefits (as outcomes) are expected to be similar, thereby advocating for the implementation of ESS.

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B List of discussion partners/interviews

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Smart City



Singapore: Smart City on the Horizon





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1 Introduction

The Smart Nation initiative was officially launched in Singapore in November 2014. This initiative aims to enrich citizens' lives by capitalizing on the potential of information and communication technologies (ICTs) to improve environment sustainability, resilience and equitable social and economic growth. After launching this ambitious Smart Nation Singapore initiative, Singapore joined a two-year pilot project to assess the smartness and sustainability of their smart-city operations using the key performance indicators developed by the International Telecommunications Union (ITU) for smart sustainable cities. This collaboration with ITU will help Singapore to measure its progress vis-à-vis its smart-city goals.

The results from this pilot project will also contribute to the international standardization process and the subsequent development of a 'Global Smart Sustainable Cities Index', derived from the existing set of ITU indicators.

Increasingly, governments across the globe are recognizing the opportunities and benefits associated with smart-city initiatives as a means to address denser, more diverse and growing urban populations. Singapore is unique as it has been engaged in what could be considered 'smart-city activities' as early as the 1980s. As such, the Smart Nation model places people at the centre of four enablers; governance, manpower, partnership and technology.³

Singapore is known to be a technology-savvy city-state, which is now implementing a plan to be the world's first Smart Nation, underpinning the use of data and analytics to improve people's lives. The country is also carrying out various other activities in this domain, which complement its Smart Nation vision.

Currently, Singapore is engaged in the following activities:

- (i) leveraging the capabilities of its leading open access fibre networks;
- (ii) expanding the intelligent urban infrastructure to improve street level coverage; and
- (iii) exploring a new heterogeneous network across fixed and mobile infrastructures.

Singapore's existing urban operating system enables the government and city service providers to quickly address urban challenges and empower citizens with data insights to improve their lives.

There are five key domains that will have a significant impact on citizens and society, as well as Singapore's overall smart-city vision. In each of these key domains, digital technologies can have "a needle moving" impact. These key domains are as follows:

- transport
- home and environment
- business productivity
- health and enabled ageing; and
- public sector services.

With the assistance of its partnership with ITU, Singapore hopes to disperse the lessons learned along with their best practices in national ICT planning. These best practices and lessons based on the ITU key performance indicators will serve as important guidelines for urban policymakers and practitioners in countries and cities around the world. This case study will examine a few aspects of the Smart Nation vision and will explore a few existing elements and initiatives which could complement this vision.⁴

³ ITU has been closely involved in a pilot project to assess the smartness and sustainability of Singapore. This model has been derived from ITU's work during the pilot project.

⁴ This case study does not intend do provide an extensive overview of Singapore's activities within the Smart Nation Singapore vision. The main features and analysis on the Smart Nation Singapore initiatives will be examined in the ITU case study on Singapore, which will be published following the pilot project in Singapore.

2 Smart city related activities in Singapore

2.1 Vision

“Therefore our vision is for Singapore to be a Smart Nation – A nation where people live meaningful and fulfilled lives, enabled seamlessly by technology, offering exciting opportunities for all. We should see it in our daily living where networks of sensors and smart devices enable us to live sustainably and comfortably. We should see it in our communities where technology will enable more people to connect to one another more easily and intensely. We should see it in our future where we can create possibilities for ourselves beyond what we imagined possible.”

-Prime Minister Lee Hsien Loong 24 Nov 2014

In order to achieve the vision of a smart city, in addition to mitigating and adapting to climate change impacts, it is necessary that government and the private sector in Singapore work together to enable and facilitate this transition. Singapore has aimed to achieve this by integrating the aspect of ‘smartness’ into its city planning and incorporating ICTs into economic and domestic sectors, to improve energy efficiency at the household and business level and to promote intelligent sustainable buildings, efficient water management, better education and awareness related to smart initiatives. The Smart Nation vision in Singapore also aims to provide healthcare for an ageing population, implement transport solutions and improve overall logistics (especially for the maritime industry).

The main overarching initiatives within the Smart Nation Singapore vision include:

- (i) Health: health hub portal, tele-health, assistive technology and robotics for ageing and healthcare;
- (ii) Living: smart homes, apps for reporting environmental issues;
- (iii) Services: smart cashless society, digital government, regulatory sandbox for innovative fintech experimentation;
- (iv) Mobility: self-driving vehicles, mobility on demand and a contactless, account-based fare payment system.

2.2 Implementation

Singapore’s notion of a Smart Nation is based on its ability to gather data, interpret it, glean insights and then translate those insights into meaningful action. The following are some important areas that Singapore focuses on, in keeping with their smart-city aspirations⁵:

- **Smart-city planning:** This is one of the key features for establishing a smart sustainable city. The Urban Redevelopment Authority (URA) develops the master and concept plans for land use, and this will guide development for the next 10 to 15 years. In 2008, an Inter-Ministerial Committee on Sustainable Development helped build a “Sustainable Development Blueprint”, outlining that Singapore should be efficient, clean and green in its development. In September 2014, Singapore’s Housing and Development Board (HDB) announced its Smart HDB Town Framework, which guides the introduction of smart initiatives into HDB towns under four dimensions: *Smart Planning*, *Smart Environment*, *Smart Estate* and *Smart Living*. Under *Smart Planning*, HDB aims to use computer simulations and data analytics to augment current planning efforts, in order to provide residents with well-designed homes in green and sustainable towns. An example is the Complex Systems Modelling tool, a decision-making tool that allows planners to choose the most effective and viable combinations of solutions to achieve their desired sustainability target.
- **ICTs in economic sectors:** This sector plays a major role in the transformation of Singapore into a smart city. The "[Infocomm Media 2025 \(ICM2025\) plan](#)" is a 10-year master plan which sets out to create a globally competitive and infocomm media ecosystem that:
 - (a) enables and complements Singapore’s Smart Nation vision;

⁵ These areas do not represent the scope or fields of the Smart Nation vision. These key areas have been explored with the intention of highlighting key strategies adopted by Singapore which will support the country’s transition to a smart sustainable city. For detailed analysis of the Smart Nation vision and related activities, please refer to the report on the ITU pilot project in Singapore.

- (b) affects economic and social transformation; and
- (c) creates enriching and compelling content.

This masterplan is developed by the Infocomm Media Development Authority (IMDA). Projects in the economic sector focus on data analytics, artificial intelligence, cybersecurity, Internet of Things and immersive media.

- **Smart-city management:** In the future, most of the data collected from the sensors and cameras will be embedded in Singapore's public infrastructure, and will be fed to repositories known as Virtual Singapore (for 3D data) and the Smart Nation Platform (for other sensor data). These repositories will be controlled by the government. The data from these repositories can be used to analyse and predict different behaviours people exhibit in reaction to different occurrences. It would also be possible to estimate the spread of a disease by analysing data collected through these sensors.

These platforms are expected to help public agencies with the following:

- (a) satisfying sensor deployment needs;
- (b) sharing of collected data;
- (c) conducting data analytics;
- (d) supporting needs like urban planning and incident responses.

The development of the Smart Nation Platform is being led by the Government Technology Agency (GovTech), which will play the role of the lead central agency in collecting the data from across the government that would have otherwise been managed by individual agencies.

- **Energy efficiency at the household and business level:** Singapore's energy policy is to diversify its energy sources and reduce the demand for energy. Possible sources that are being explored are waste-to-energy, biofuels, solar energy and possibly nuclear energy. Singapore also focuses on the research and development (R&D) of renewable energy options and presents itself as an R&D Centre and 'living lab' for new energy technology in Asia. One key example is Singapore's first large-scale electric vehicle (EV) car-sharing programme, which will see the deployment of an island-wide fleet of 1 000 shared EVs and the installation of 2 000 charging points across Singapore, and lay the foundation for a national EV charging network to support the greater use of EVs.
- **Green buildings:** HDB plans and design towns, precincts and buildings using smart technologies to meet sustainability goals. These include smart planning tools that stimulate wind flows, shading effects of buildings and solar irradiance. These simulations help planners to harness breezes that cool and improve air quality and to locate greenery in the right places for reducing the urban heat island effect. In addition, the Building Energy Efficiency Master Plan (BEEMP) also contains programmes and measures that span the whole life cycle of a building.
- **Water challenges:** Over the last 50 years, Singapore has built a robust and diversified supply of water known as the "Four National Taps". Singapore has tackled its water scarcity through the application of advanced membrane technologies to purify treated waste water for reuse and desalinate seawater for drinking. In addition, two-thirds of Singapore is water catchment, capturing rainwater and channelling them into 17 reservoirs. One of these, the Marina Reservoir, showcases Singapore's ability to capture and treat urban storm water for drinking purposes. Despite the use of unconventional water sources, Singapore's tap water is well within the World Health Organization (WHO) drinking water guidelines and is suitable for drinking without any further filtration.
- **Smart education:** Education plays an important role in preparing its citizens to contribute and thrive in the future workplace. Meaningful use of technology for learning can help to nurture 21st century dispositions and imbibe in students the joy and enthusiasm to collaborate and learn new skills. The Ministry of Education's (MoE) ICT Masterplan in Education continues to ensure "Quality Learning in the hands of Every Learner - Empowered with Technology". EduLab, a key initiative under MoE's ICT Masterplan, is a joint MOE-NIE ICT innovation programme seeded by the National Research Foundation (NRF) that bring together teachers, researchers, developers and MoE HQ officers to collaborate and jointly develop ICT innovations for quality learning. Through the EduLab ecosystem, successful ICT innovations in learning are adopted and adapted by different schools across the system.

- **Healthcare for an ageing population:** Due to falling birth rates and increasing ageing populations, Singapore's healthcare costs are rapidly increasing. Mobile apps to prevent chronic illness, like obesity and diabetes are being developed, while the use of tele-health tools are planned and IT solutions are being used to improve logistics in hospitals. An example will be Smart Health-Assist, which was piloted in Jurong Lake District, which involves deploying unobtrusive and easy to use sensors in the homes of the elderly or patients suffering from chronic diseases. Smart Health-Assist will enable patients to manage their conditions from the comfort of their homes, allowing them to remain independent and active in their community. Reducing the number of medical visits also frees up hospital resources and makes chronic-disease management more sustainable in the long run.
- **Smart transport solutions:** As a city state, Singapore is the second most densely populated country in the world. Roads take up about 12 per cent of total land area, and this does not include the space required for car parks. Building more roads to cater to personal cars is not a sustainable option in land-scarce Singapore. Therefore, Singapore continues to invest heavily in improving its public transport system, and has taken significant steps to improve train and bus services, as well as the first and last-mile connections between homes and transport hubs. For the occasions when there is a need for point-to-point transport, this will increasingly be met by taxis, private hire car services like Uber and Grab, and car-sharing services. Singapore is also working with partners from academia and industry to develop various self-driving vehicle technologies and mobility concepts. Trials for autonomous mobility-on-demand shared services have been ongoing since 2015, and initiatives are underway to develop self-driving buses, truck platooning technology and autonomous utility vehicles. The Land Transport Authority has jointly developed a Smart Mobility 2030 plan with the Intelligent Transport Society Singapore (ITSS) to implement innovative and sustainable solutions for smarter urban mobility. Initiatives include using predictive and pre-emptive capabilities with integrated pedestrian detection to minimize delays and eliminate unnecessary stoppages for vehicles, as well as green intelligent transport system (ITS) infrastructure and alternative energy sources to power ITS equipment. Singapore is also developing a next-generation electronic road pricing system that will tap on Global Navigation Satellite System technology not only as a means to implement congestion pricing in a smarter way, but also to enhance traffic management. Having aggregated, comprehensive and real-time data of all road traffic in Singapore through this system would, for example, allow Singapore to implement a much smarter and more optimal traffic light management system that improves traffic flow, disseminate more timely, accurate and targeted updates to motorists to help them optimize their travel routes, and enable vehicle-to-vehicle and vehicle-to-infrastructure communication.
- **Smart logistics (especially for the maritime industry):** The ease of customs clearance in Singapore has been underpinned by a set of trade improving initiatives called "Trade-FIRST", where businesses can streamline its application process for different trading schemes, resulting in more cost savings. It also has a one-stop electronic submission site for customs documentation and therefore reduces red tape for businesses. With such ease of access, the marine industry has become aware of its environmental footprint. Singapore is building a liquefied natural gas terminal and looking into electric propulsion, better energy management system for ports and biofuels as alternative fuels.

2.3 Results

Since its launch in November 2014, the Smart Nation Singapore has proceeded with leaps and bounds. The main features and results of this vision coupled with other urban interventions are as follows:

- **Towards even better Living**
Singapore serves as an example of an advanced and developed nation that tackles challenges such as ageing populations, technological disruption, and new areas of economic growth through its use of smart policy innovation. Smart initiatives such as data-driven public transport planning, smart town planning and increasing key education collaborations between universities, has led to Singapore becoming one of the most reputed and liveable cities in the world.
- **Vibrant innovation ecosystem**
Singapore hosts more than 500 start-up companies, with nearly 100 start-ups residing in close proximity in Block 71, Ayer Rajah Crescent, known as the heart of Singapore's technology start-up ecosystem. With built-in intellectual capital at the National University of Singapore (NUS), the government is helping fund

this innovation boom by creating policies that serve to ease the start-up process, as well as connecting researchers and inventors with investors, and providing matching grants. For example, for every S\$1 invested, the National Research Foundation will add S\$5, up to a maximum of S\$500 000. All of this spurs innovation, and entrepreneurs can get matching grants of up to S\$50 000. In addition, Singapore is almost the perfect laboratory for testing smart technology concepts. For example, due to its water scarcity, it is now a leader in desalination and filtration systems.

▪ **Business environment**

Singapore's business-courting apparatus, the Economic Development Board (EDB), created an enticing environment for foreign business and world-renowned companies like Texas Instruments, Hewlett-Packard and General Electric to come and set up. In more than one way, Singapore has rapidly evolved from borrowing innovation to attracting and seeding the brains to create it. Working under this expanding business environment, Singapore has integrated smart planning into its ICT and other technology and business-related areas. This is also evident in its innovation of advanced material manufacturing and green buildings among many others. For example, Sky Greens is the world's first ever low-carbon, hydraulic water-driven vertical farming system. It occupies one hectare and yields more than 10 times the amount of crops as conventional cultivation at just the fraction of the cost. This is just one example of a Singaporean success story that benefitted from government support, corporate matchmaking and diffusion of capital.

▪ **Creative communities**

Singapore's skilled workforce is a shining example that ranges from arts to sciences. With a high number of millennials running entrepreneurship enterprises, Singapore is quickly becoming a creative hot spot for young professionals. By encouraging projects and initiatives that span across sectors and not just tech-related fields, the country wants to build its workforce to inculcate the idea of smart working into its relatively diverse workforce.

BOX 1 – ITU and Singapore smart-city pilot project

ITU smart-city pilot project in Singapore

The city of Singapore has entered into a unique partnership with ITU, which is the United Nations specialized agency for information and communication technologies. This collaboration involves the implementation of the ITU key performance indicators (KPIs) for smart sustainable cities in Singapore, in line with its Smart Nation initiative.

This pilot project will allow Singapore to measure its progress vis-à-vis its smart-city goals and will determine the level of smartness and sustainability of the city. The results from this pilot project will be utilized by the Advisory Board for Smart Sustainable Cities, which consists of 16 United Nations Agencies, to upgrade the existing KPIs and create the first Global Smart Sustainable City Index. This index is expected to serve as the universal basis for assessing smart and sustainable city transitions worldwide, thereby allowing urban stakeholders to accurately deduce the extent to which their city can be referred to as a smart sustainable city.

3 Conclusions

Within 50 years, Singapore has not only evolved into one of the world's wealthiest nations, but also one of the most business-friendly countries, with a government that fosters growth and innovation. The city has done so by using and capitalizing on its well-integrated, well-educated and forward-looking population. It has also brought and invested in talent (local and international) from various fields to help grow its industries. Keeping the citizens and stakeholders in mind is an important factor for the building of any smart city or nation. Accordingly, Singapore has invested in the liveability of a nation and created world-renowned living standards for its citizens. This has not only improved local economic and social growth, but has also attracted top talent from around the world.

A Smart Nation is about fostering an innovation environment and overcoming challenges such as connectivity or working in silos, which are faced by most governments around the world. Overcoming these challenges will subsequently lead to an ecosystem that is supportive of innovation, sustainable economic growth and environmental protection/conservation. Singapore also has various national-level coordinating agencies that

become a link between the innovators and investors. Having this public-private connect is important as it facilitates a coordination and efficient use of available resources.

Singapore has embraced the Smart Nation vision, in order to test and evaluate various technologies that can potentially be of commercial or social use. The government not only matches capital and creates policies that can help these technologies or ideas take root, but it also invests in the scale-up and dispersion of the product/idea.

With advanced communications, efficient living conditions, a well-planned transportation system, strong infrastructure and its mutually beneficial partnership with ITU, Singapore serves as an example to the world, which will effectively set the basis for smart cities in the future.

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Fit for Purpose Land Register: The case of Africa





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1 Introduction

1.1 Background

A system for recording land ownership, land values, land use and other land-related data is an indispensable tool for the market economy to work properly for sustainable management of land resources and secure land tenure. All industrialized nations with a market economy maintain some sort of land register system that fulfils the above requirements. In general one uses the term “land” to refer to the objects to which mortgages and other data are to be connected. In practice a land registration system can incorporate various basic objects or units, with land parcels being the most common. Many countries also allow buildings or parts of buildings to be registered as separate real estates, as well as structures under or above the surface. The latter are referred to as properties in strata. Defining the basic units is a major element in the design of any land information system.

1.2 Challenge and response

Many publications support the fact that a land registry is integral to the basic infrastructure of a country. The book by Hernando de Soto “The mystery of capital” is well-known in this respect. In this book the author explains the role of land tenure and security of land title (including ownership, use rights, usufruct). Based on the findings in this book, a good land registry system will:

- guarantee ownership and security of tenure;
- support land and property taxation;
- provide security for credit;
- develop and monitor land markets;
- protect State lands;
- reduce land disputes;
- facilitate land reform and land reallocation;
- improve urban planning and infrastructure development;
- support environmental management; and
- produce statistical data.

In view of the above, this case study aims to further explore the vision on land tenure in certain African countries. It will also explore how to implement cadastre and land register projects.

1.3 Countries involved

The Fit for Purpose land register system examined in this case study, is a key component of the land administration success in the following countries: Namibia, Rwanda and Lesotho. What these countries had in common was the strong determination to set up an optimal land register, backed up by the highest ranking authorities with limited investments in terms of time and finances.

2 The project(s)

2.1 Vision and content

The main challenge is to implement land registry and cadastral systems in an efficient way in view of the following factors:

- acceptable costs;
- reduced construction time; and
- suitability for use.

These goals can be achieved by implementing the concept of “Fit-For-Purpose”. This concept requires a simple indication of properties and boundaries, and is often adequate to meet basic land administration needs as opposed to developing and enforcing rigid regulations and demanding spatial accuracy of objects and boundaries, which are time consuming and not affordable. Therefore, the approach used for building land administration systems in less developed countries should be flexible and focused on citizens’ needs, such as providing security of tenure and control of land use, rather than focusing on top-end technical solutions and high accuracy surveys.

2.2 Implementation of concept of “Fit-For-Purpose”

There is no specific design for a land registry system. Local traditions, existing infrastructure, etc. will require different solutions, especially in countries where cadastres have been in operation for many decades.

A good land information system includes textual files and maps that are closely linked to each other. The cadastral systems in the majority of west European countries contain different registers, each under a different administration, although the registers are operated partly or wholly by the Government in each case. In some of the countries field surveys are undertaken by private surveyors, in other countries by governmental or local public agencies. The requirement for geometric precision varies considerably. Some countries require precise surveying and mapping of boundaries, whilst others are far less demanding in this respect.

Most of the countries with a formal land information system in place have already computerized their systems, or are in the process of doing so. The existing manual systems frequently limit the opportunities for implementing optimal solutions.

Furthermore, the conversion of existing files and survey data requires significant resources. Countries building new land information systems from scratch, will have the benefit of not being restricted by existing systems, and will have the opportunity to implement optimal solutions from the very beginning. This should include the introduction of computer technology, both for administrative data and for the maps and graphical data.

Introducing a new land registry system, including the implementation of formal land information registers and the parcel (index) maps, is a huge, time-consuming process. The importance of investigations and thorough planning cannot be underestimated. It is important to stress that the development of related legislation, an improved organizational structure, financial mechanisms, and technical issues are closely interconnected. Experiences indicate that issues related to legislation, organization and funding are frequently more complex to solve than most technical issues.

Guidelines recommend that countries in transition apply a step-by-step approach. Data content of the registers should initially be restricted to what is actually required to satisfy high-priority user needs. Demarcation and survey of boundaries are frequently a major element of the process. High geometric precision is often unnecessary for land administration. The possibility of applying low-cost surveying and mapping techniques should be investigated.

Countries in transition are recommended to investigate the possibility of implementing integrated land information systems, where the formal registration of legal information as well as technical information is supervised, controlled and operated by one public authority, and not split between two or more ministries and authorities. This does not exclude distributed solutions with practical activities being undertaken in regional or local offices.

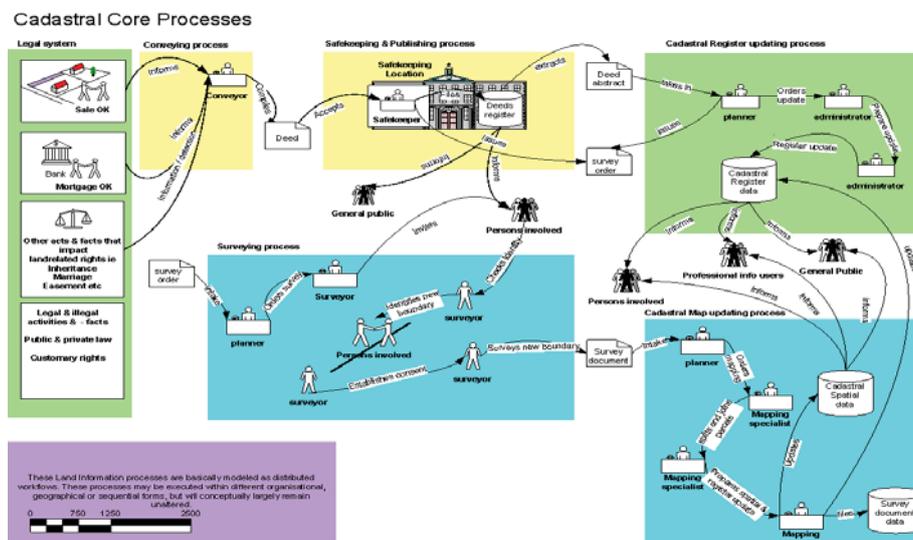


Figure 6 – Typical functions of a fully-fledged land administration system

Ways of involving the private sector should also be evaluated. Many countries apply legislation under which field surveys are undertaken by private licensed surveyors. Databases can physically be operated by private data centres, under contract with the relevant public authority.

2.3 ICT aspects of the land register

A modern land administration system is automated and digitized. The business processes should be supported by ICT systems as much as possible and all the information, whether it is records, textual data or maps should be digitized.

Developing a digital land registration system requires the re-engineering of existing processes, to enable electronic recording and submission of transactions in real estate, as well as verifying the authenticity of deeds that underlay such transactions. This requires changes at both the technical and legal levels. The governments of the countries in this case study, in their drive to establish e-government services in various public departments, have embarked on the computerization of the land registry. This computerization is also meant to improve the turnaround time for doing business in the land sector. An electronic system can be adequate prevention against fraud and unauthorized changes in registration.

Digitization can also be seen as one of the pre-cursors of achieving the goals of e-government. The benefits of a country with a land register are greatly enhanced if most of its services are automated and therefore can be quickly accessed. As government embarks on the road to e-government, there is need in the land sector to prepare infrastructure to make this achievable; the digitized land register is a crucial part of the desired infrastructure.

The digitization of land registry is eminent and an electronic information portal will ensure that land information is accessible and transparent to all citizens, institutions and businesses. The electronic systems will necessitate amendments in the law with regard to the mandate of the land registry and how land records must be submitted and what is admissible as evidence of submission, etc.

2.4 Observations

Establishing a new land registry system may be closely linked to land reform and the privatization of land. It is, however, difficult to identify mechanisms whereby the initial establishment of a land information system can be financed through user fees only. Countries should regard the initial establishment of their system as a long-term public investment in infrastructure, with user fees covering only a portion of the total costs of setting up the system. The costs of maintaining the system that result from land transactions, land subdivisions, etc. can however be fully recovered through fees.

3 Conclusions

3.1 What steps are to be taken?

Based on the experience in countries involved in the “Fit-For-Purpose” land register in Africa, it is recommended that an overall steering committee be established with representatives of the relevant ministries, agencies and users, to examine the need for information and to coordinate land information management activities and implementation projects. The following series of operations must be addressed when introducing new land administration systems:

- determination of user needs and existing land registers;
- creation of new administrative arrangements;
- preparation of (re)new(ed) legislation;
- determination of what land and property rights already exist;
- demarcation and survey of new plots of land;
- establishment of new registers and procedures for storing and retrieving land data;
- placement of new financial management procedures;
- development of public awareness on why a registration is needed and how the system works.

3.2 Flexible and pragmatic approach

In general, building a proper land administration system is very complex, expensive and time consuming. Such land administration systems may take some time to stabilize and be used by the general population. However, on a positive note, with modern techniques such as aerial photographs, standard IT-functionality, data models (LADM), and a participatory approach, in 2-3 years' time, a fully-fledged "Fit-For-Purpose" Land Registry system could be established as has been observed in Namibia, Rwanda and Lesotho.



Picture 1 – Land title programme in Rwanda

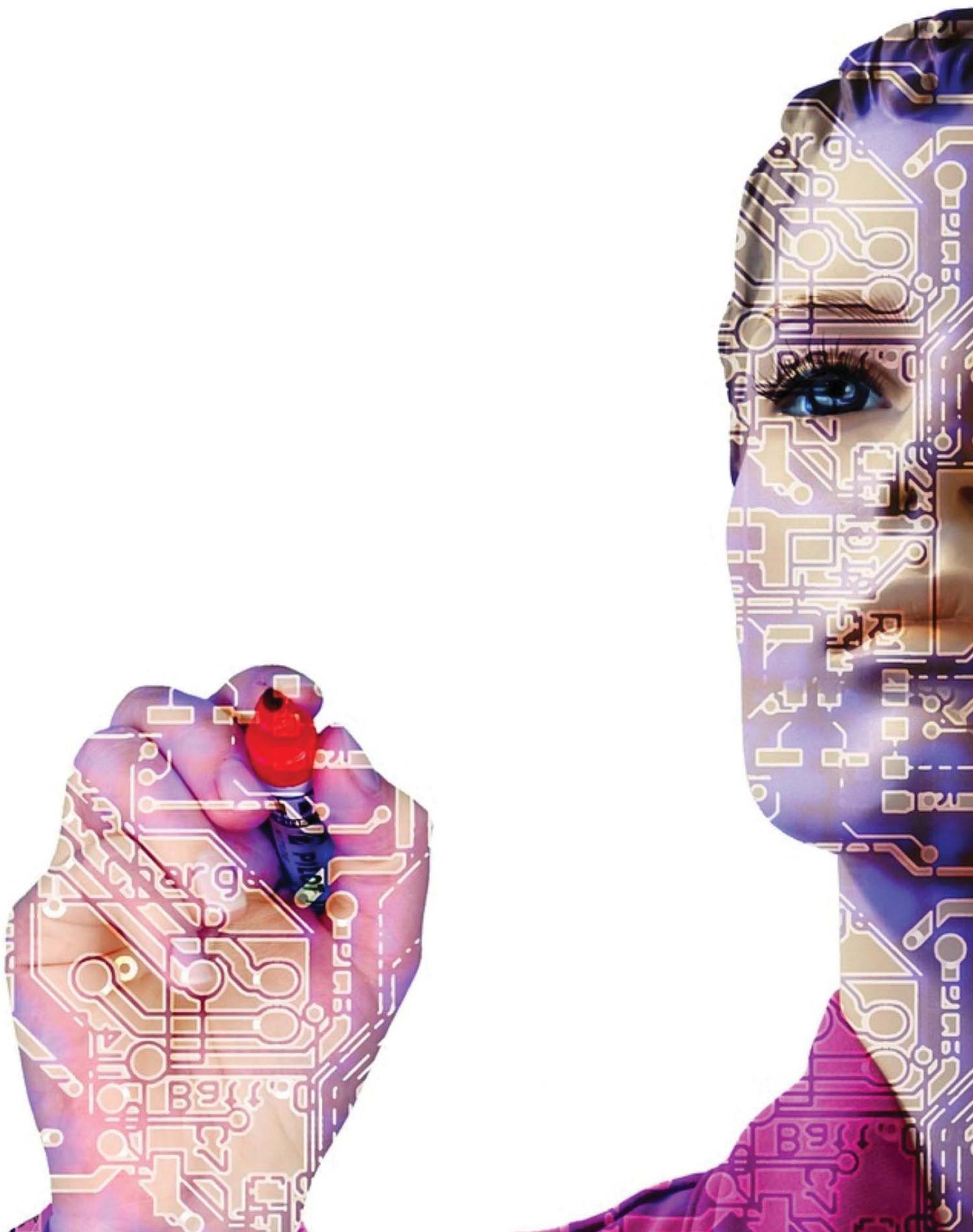
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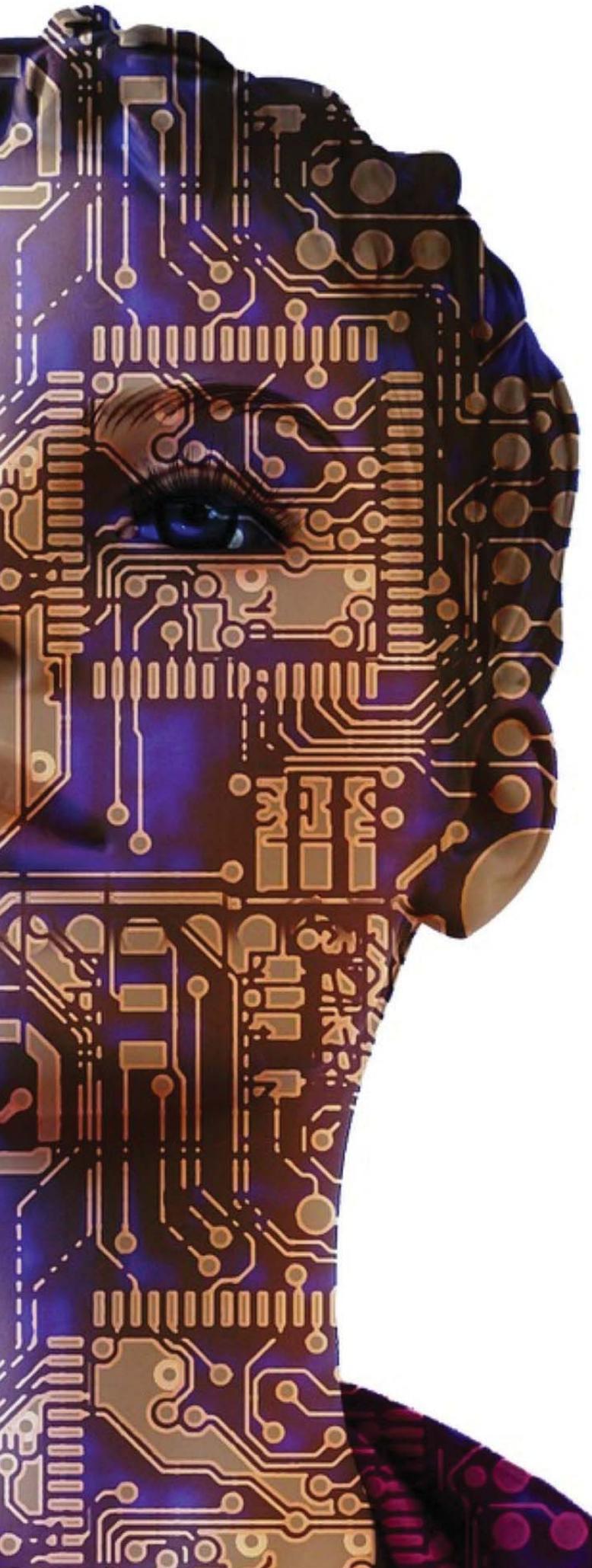
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Smart People







The Seoul Open Data Plaza



SEOUL



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1 Introduction

1.1 Background

Seoul is inhabited by 20% (10 million) of the Korean population. The city accounts for 25% of the South Korean GDP. During the process of rapid urbanization, the Seoul Metropolitan Government (SMG) has successfully built advanced IT environments, excellent urban infrastructures and solid administrative systems, in order to improve the quality of its citizens' lives. However, as society becomes more complex due to various environmental, cultural, political and economic factors, cities are faced with a wide array of urban problems that the government cannot solve on its own. To solve these problems effectively, the Seoul Metropolitan Government (SMG) has found it necessary to transform itself into a civic-led administrative body, which can ensure that citizens' opinions are reflected in policies, departing from the conventional government-led top-down policy. As such, the government started providing civic services based on participation, communication and information sharing with its citizens. Since Mayor Won-soon Park took office in October 2011, the government has launched such efforts in earnest.

Mayor Won-soon Park believes in the administrative philosophy that "*Citizens are the mayors*". He has taken the lead on creating a "citizen-participatory platform", aimed at implementing all policies based on civic participation and cooperative governance. Information technologies have served as an important means to implementing this administrative philosophy. In particular, a high penetration of smart devices (over 90%) as well as the rapid expansion of social media, have made significant contributions to improving citizen involvement in policy setting.

Due to the positive impact of such technological and social changes, citizens have requested to promote access to ICTs and guarantee more civic participation. Accordingly, SMG has put more emphasis on open administration and open public data to increase its accountability and transparency.

1.2 Challenge and response

Prior to the development of the Seoul Open Data Plaza, SMG already had a vast collection of public data on transportation, environment, education, culture and more. The general public however could not access this meaningful and useful data as by law, public organizations were only required to provide data when requested.

In December 2009, a high school student developed a Seoul bus application, which served as the first mobile application that provided real-time information on buses in Seoul. It was met with a lot of enthusiasm; however, as Seoul's data was not made available to the public, the application was missing critical information for it to properly serve its full purpose. As a result of this, many citizens who used the application started filing civil complaints to SMG and requested that public data be made readily available. This pushed for making data from public organizations available to the general public.

The Seoul Open Data Plaza (data.seoul.go.kr) was launched in May 2012 as a unified portal that provided a wide range of processed data in various formats. It was developed in response to citizens' desire to make public data available and because SMG wanted to strengthen the accountability and transparency of urban governance. Using this portal, SMG aimed to improve the quality of public services through a bottom-up approach. This was achieved by providing a platform that enables citizens, start-ups and institutions to directly develop services and create economic and social values.

The data provided on the portal is classified into 10 distinct categories: General Administration, Culture & Tourism, Environment, Health, Industry & Economy, Urban Planning, Welfare, Transportation, Safety & Education. This data has also been made available in seven different formats to help citizens choose the best way to use the data. It also provides a data visualization service which allows citizens to input public data and get visualized data.

The Seoul Open Data Plaza has enabled smart governance and empowered students, companies and regular citizens to develop services that can improve citizens' lives. Some applications that were developed through the datasets on the Open Data Plaza include a subway real-time alarm, bus application, and yellow dust alert, among others.

2 The project

2.1 Vision and content

SMG aims to increase its accountability and transparency and realize participatory governance by developing and disclosing data relevant to citizens' lives through the Seoul Open Data Plaza. This development is in line with the city's policy vision of a "Citizen-centred Seoul: where citizens are happy" and its strategy of promoting communication with citizens in order to improve their right to know. SMG has established a legal and systematic base for open data and since 2012, it has been disclosing useful data about Seoul through the portal.

Open Data	Data Service	Participation & Communication	Top
Data Set Sheet Open API Chart Map File Link LOD	Data Visualization Catalog List Catalog Service Space for API Developers Linked Open Data Open Data Plaza Services List Open Data of Districts	Use Cases Data Request User Guide Q&A Announcement My Plaza	Login Membership Information Communication Plaza Gov. 3.0 Site Map
Others	Related Sites		
Privacy Policy Homepage Terms Email Policy Terms Introduction FAQ Service	Open Data Portals Seoul Statistics Seoul GIS Seoul City Hall		

Figure 7 – Some of the key menu items of the Seoul Open Data Plaza and their descriptions

Description of the key menu Items:

- **Open data:** The data collected from SMG and related agencies are processed into seven different forms.
- **Data visualization:** This shows public, private and personal data in 21 different ways such as a word cloud, parallel coordinate and tree map, among others, and can be shared with others.
- **Catalogue service:** This provides lists of data services from SMG, other organizations, districts and citizens.
- **Use case:** This shares apps, websites and visualized content created by citizens using the data from the Seoul Open Data Plaza.
- **Data request:** Citizens can request public data that has not been shared.
- **My plaza:** This manages the authorization key for Open API and shows "My Visual Data", "My Favourite Data", etc.
- **Open data of districts:** This shows data categorized according to its relevant district.

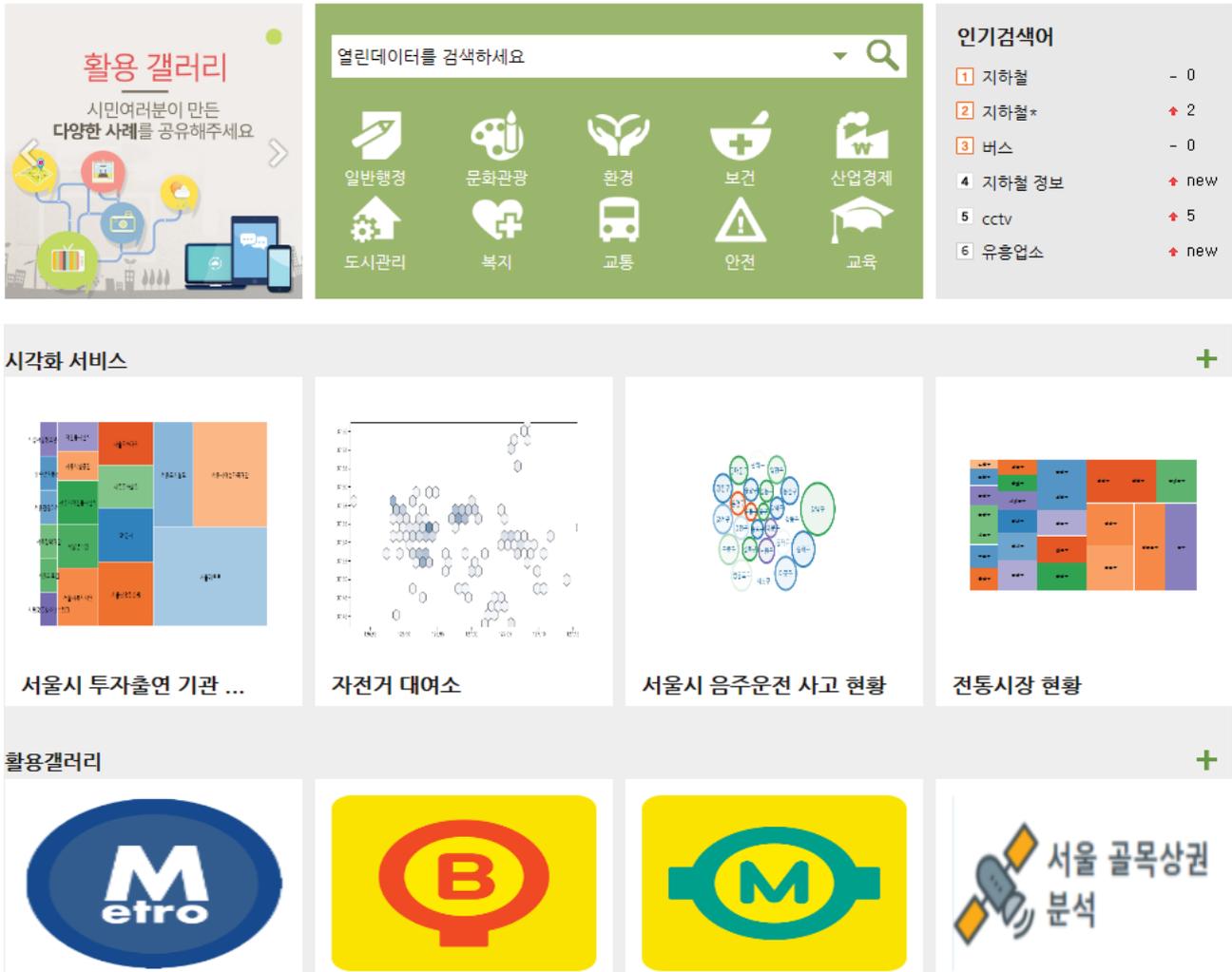


Figure 8 – Screenshot of the Seoul Open Data Plaza webpage

Utilizing the Seoul Open Data Plaza has been made more convenient, as its data can be viewed and downloaded by visitors without logging in. The portal also features a “Data Visualization Service” that allows users to transform personal and public data into an understandable and graphical form, thereby making the data less intimidating and easier to understand. Some examples of the type of data provided on the portal include real-time transportation status, air quality status, the daily financial status of Seoul, number of passengers getting on and off the subway, buses at each bus stop and information on cultural events.

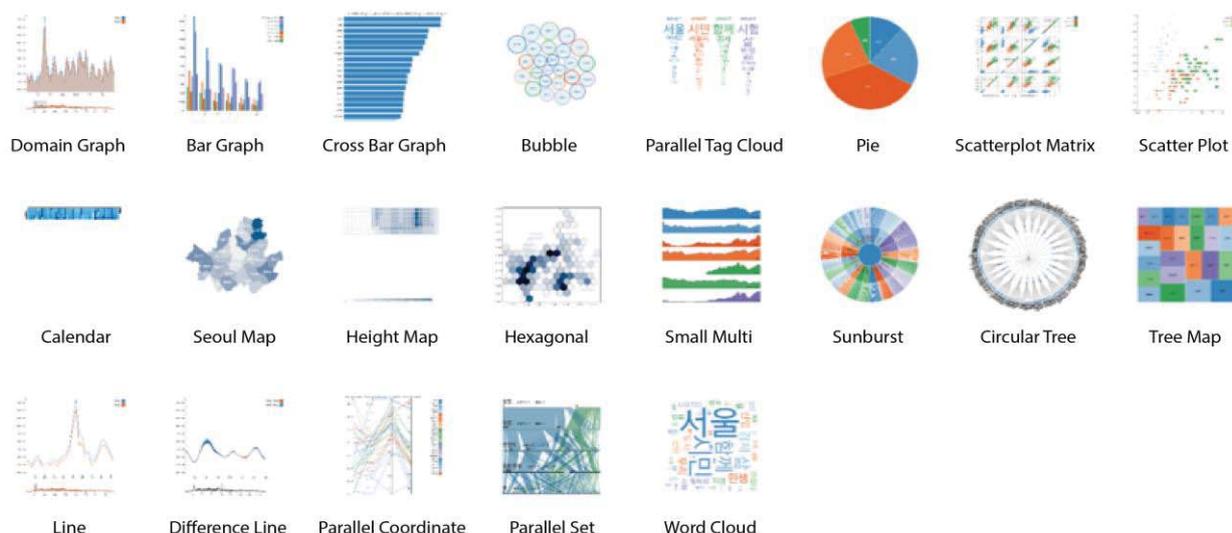


Figure 9 – Types of data visualizations available on the Seoul Open Data Plaza

2.2 Implementation

The Seoul Open Data Plaza would not have come to fruition without the dedicated involvement of various key actors, players and policies that have ensured its successful implementation.

After his election, Mayor Won-soon Park pledged to develop an open government for the city. He instructed the Information System Planning Bureau under Seoul’s Chief Information Officer (CIO) to commence open data initiatives and oversee an open government plan, which included planning budgets, conducting feasibility studies, and implementing projects related to open government, one of which is the Seoul Open Data Plaza. Mayor Won-soon Park, the Seoul CIO, the Director of the Information System Division, Open Data Divisions from the city’s 25 districts, the Korea Information Research and Development Institute, and the NGO C.O.D.E were the main stakeholders involved in the initial development of the Seoul Open Data Plaza. Currently, it is managed and improved by the Data & Statistics Division of SMG, while its maintenance and upgrade are outsourced to IT companies.

SMG planned the development of the Seoul Open Data Plaza and inaugurated the website even before the laws on open data were enacted by the Korean Government. SMG established the “Act on Public Data Provision and Use of Data” and the “Ordinance for Provision and Use of Data in Seoul Metropolitan Government” to support the setting up of the Seoul Open Data Plaza. The Korean Government’s “Government 3.0” and the “Seoul Open Government Policy”, both aimed at encouraging innovation, cooperation and communication, also promoted the utilization of the portal. Following the launch of the Seoul Open Data Plaza, the Ministry of the Interior of Korea established and started operating its Korea Public Data Portal (data.go.kr) that manages data requests and asks cities including Seoul to provide their data to the portal. In view of the advancements in this domain across the country, it is evident that Seoul has pioneered the development of open data initiatives in Korea.

SMG and all its related agencies and district governments have a specific division responsible for open data policies, with the Information System Planning Bureau taking the reins on monitoring the progress of various open data policy initiatives. SMG regularly organizes hackathons, information sessions, and expositions related to data, to encourage citizen participation and promote the use of public data. The Seoul Open Data Plaza is also regulated and kept up-to-date to ensure its stability, relevance and resilience.

It cost USD 733 000 to develop the Seoul Open Data Plaza in 2011, and since then SMG has spent around USD 1 million annually to maintain and upgrade the system and develop the data. The cost for maintenance is expected to decrease once the system is converted to an open-source-based system in 2017.

2.3 Results

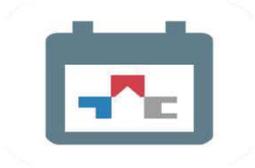
The Seoul Open Data Plaza is an initiative that Seoul is proud to share with the world. During its launch in 2012, the portal featured 921 public datasets and the number of Open API downloads were at 85 million. At present, the numbers have greatly increased and the portal now provides 4 561 datasets and the number of Open API downloads has reached 10 billion. The sharing of Seoul’s public data has resulted in increased citizen participation and the development of 132 applications and 70 infographics by individuals and companies that have made living in Seoul more convenient. The Seoul Open Data Plaza has also boosted data-related business in Korea, and its basic system has been adopted by the Gangwon Provincial Government and Ulsan City in Korea for their respective open data systems.

In October 2013, the legislation for “Public Data Open Policy” was enacted as the Seoul Open Data Plaza was gaining popularity. City administration has improved with better access to data and the facilitation of transparency in the areas of how SMG is financed and managed. Social and economic welfare were also improved as various services were developed through the Seoul Open Data Plaza.

활용갤러리 사례

활용갤러리 등록

당신이 만든 앱이나 홈페이지를 공유하세요. 담당자의 확인을 거쳐 서울시민에게 공개됩니다.

전체	앱	인포그래픽	시각화	LOD	웹사이트	기타
						
교통정보 CCTV ★★★★★ 김경태 2017-01-09	위치 알림 ★★★★★ 윤광호 2016-10-29	빌사남 - 중소형 꼬마빌딩... ★★★★★ 김윤수 2016-10-18	실시간 지하철 ★★★★★ 김성재 2016-10-03			
						
문화서울 ★★★★★ 강명식 2016-08-17	지하철 자리 찾기 앱 ★★★★★ 강지욱 2016-08-04	지하철 시간 ★★★★★ 임병철 2016-07-11	서울시 모든정보 ★★★★★ 김세원 2016-07-03			
						
과기DAY ★★★★★ 최경수 2016-06-03	지하철종결자 실시간 정보 ... ★★★★★ 도플소프트... 2016-05-24	Yellow Dust (황사) ★★★★★ Ghiwo... 2016-04-25	버스 지하철 (서울 경기 ... ★★★★★ 설도심 2016-03-28			

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Figure 10 – Some applications developed from the data provided by the Seoul Open Data Plaza

3 Conclusions

Through the Seoul Open Data Plaza, SMG has learned that public data generates more value when it is open and shared with the public. It was noted that sustaining such a portal required strong leadership, sound policy frameworks, and active engagement with citizens. Additionally, it was realized that it is not the amount of data but the *quality* of data that matters to citizens.

Some of the critical factors that contributed to the success of the Seoul Open Data Plaza are as follows:

- the consistent policy direction of the national government, SMG, and the district governments;
- the SMG-enacted ordinances and the creation of a division to implement the project;
- the development and promotion of the Seoul Open Data Plaza as an integrated open data system; to increase user efficiency, transparency and accountability of SMG;
- the disclosure and promotion of useful data which are closely related to improving the quality of citizens' lives.

In order to further improve the Seoul Open Data Plaza and promote inclusion, SMG will organize a Citizen Action Team that will be involved in the planning and evaluation of the Seoul Open Data Plaza. Together with the Citizen Action Team, which consists of civil society and data experts, SMG will change the way Seoul Open Data Plaza is operated and will make it more citizen-centric. In 2017, SMG plans to convert the commercial software-based platform into an open-source system to reduce the cost of maintenance and promote open-source culture. It will also facilitate active communication with developers through GitHub, an open source community, to help them create solutions for urban problems by using public data. Moving forward, the portal will also begin to include geospatial data and will integrate statistics into the system, which will help people utilize the system in various capacities.

A References

Seoul Open Data Plaza

<http://data.seoul.go.kr>

Korea Public Data Portal

<http://data.go.kr>

Seoul Digital 2020 (Digital Masterplan)

<http://digital.seoul.go.kr/eng>

Seoul Big Data Campus

<https://bigdata.seoul.go.kr/>





Skill development and entrepreneurship – India



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1 Introduction

1.1 Background

Skill India is an initiative of the Government of India, which has been launched to empower the youth of the country with skill sets that will make them more employable and more productive in their work environment. National Skill Mission is chaired by the Honorable Prime Minister, Shri Narendra Modi.

Today, India is a country where its youth makes up 65% of the working age group. If ever there is a way to reap this demographic advantage, it has to be through skill development of the youth so that they add not only to their personal growth, but also to the country's economic growth.

Skill India offers courses across 40 sectors in the country which are aligned to the standards recognized by both the industry and the government under the National Skills Qualification Framework. The courses help a person focus on the practical delivery of work and help enhance technical expertise so that they are ready for day one of a job, relieving companies of training the employee to match the job profile.

The Skill Mission launched by the Prime Minister on 15 July 2015, has gathered tremendous steam in the last year. The target to train more than a 10 million fresh entrants into the Indian workforce has been substantially achieved for the first time. 10.4 million Indians were trained through central government programmes and NSDC (National Skill Development Corporation) associated training partners in the private sector.

For the first time in 70 years of India's independence, a Ministry for Skill Development & Entrepreneurship (MSDE) has been formed to focus on enhancing employability of the youth through skill development. The skill ecosystem in India, is seeing some great reforms and policy interventions which are reinvigorating and re-energising the country's workforce; and is preparing the youth for job and growth opportunities in the international market. The Prime Minister's flagship scheme, Pradhan Mantri Kaushal Vikas Yojana (PMKVY) alone, has to date seen close to two million people get skilled and prepared for a new successful India.

Skill India has responsibility for ensuring the implementation of common norms across all skill development programmes in the country so that they are all standardized and aligned to one objective. The Industrial Training Institute (ITI) ecosystem has also been brought under Skill India for garnering better results in vocational education and training.

While the debate on the exact quantum of the challenge continues, there is no disputing the fact that it is indeed a challenge of five formidable proportions. On the demand side, a skill gap study was conducted by NSDC over 2010-2014, which indicated that there is an additional net incremental requirement of 109.73 million skilled workers by 2022 in 24 key sectors. On the supply side, analysis based on the results of the 66th and 68th round of NSSO (National Sample Survey Office), it is observed that the total workforce in the country is estimated at 487 million, of which approximately 57% is in the non-farming sector. If the workforce with higher education, without formal skills training are excluded, the balance workforce is estimated to be 450.4 million. Of these 256.72 million non-farming workers, a maximum of 5.4% would be formally trained and skilled. Approximately 241.86 million would either be unskilled or skilled through informal channels. Of these, it is estimated that approximately 170 million people would be in the age group 15 - 45 years. This workforce will need to be mapped through recognition of existing skills and then provided with necessary skilling, reskilling and upskilling to increase productivity and provide a livelihood pathway. Similarly, in the farming sector, this figure works out to be 128.25 million.

1.2 Challenge and response

Challenges faced that lead to design and implementation

India has a big challenge ahead as it is estimated that only 4.69% of the total workforce in India has undergone formal skills training as compared to 68% in UK, 75% in Germany, 52% in USA, 80% in Japan and 96% in South Korea.

In addition, the number of people who enter the work force age group every year is estimated to be 26.14 million. Assuming an average labour participation rate of 90% (male) and 30% (female), at least 16.16 million persons will enter the workforce and they all, except those opting for higher education, need to acquire skills. This will add another 104.62 million persons to be skilled in the next seven years. Thus, it can be seen that 104.62 million fresh entrants to the workforce over the next seven years (by 2022) will need to be skilled.

In addition, 298.25 million of existing farming and non-farming sector workforce will need to be skilled, reskilled and upskilled. Thus, appropriate infrastructure needs to be created whilst keeping in mind the sheer numbers, sectoral divisions and spatial dispersal, not only across the country but also possible requirements in other parts of the world.

Most vocational training programmes are not aligned to the requirements of the industry. As a result of the above, a piquant situation exists in the country wherein unemployment continues to coexist with a lack of requisite numbers of skilled people at functional level to build roads and bridges, lay pipelines, work in factories, engage in offshore drilling, build ships etc.

One of the biggest challenges of skill development in India is that 93% of the workforce is in informal/unorganized sectors. Consequently, it is difficult to map existing skills in the unorganized sectors and gauge the skilling requirements. On the other hand, the rate of job growth in informal sectors is estimated to be twice that of formal sectors.

Women constitute almost half of the demographic dividend. The key challenge here is to increase their participation in the country's labour force, which is directly linked to the economic growth of the country. Census data has revealed that there has been a continuing fall in the labour force participation rate of women from 33.3% to 26.5% in rural areas, and from 17.8% to 15.5% in six urban areas between 2004 and 2011. Mainstreaming gender roles by skilling women in non-traditional roles and increasing gender sensitivity in the workplace will have a catalytic effect on productivity and be a smart economic decision.

Entrepreneurship based on innovation has immense growth potential. However, the number of local entrepreneurs emerging every year in India is very low. The Global Innovation Index 2014 ranks India 76 out of 143 countries. Accelerating entrepreneurship especially those based on innovation is crucial for large-scale employment generation in India. The growth and prosperity of all economies remain highly dependent on entrepreneurial activity. Entrepreneurs are the essence of economic growth; they provide a source of income and employment for themselves, create employment for others, produce new and innovative products or services, and drive greater upstream and downstream value-chain activities. Supportive environments are increasingly essential to successful entrepreneurship and these are evolving across the world. The ideal entrepreneurial environment has five pillars: access to funding, entrepreneurial culture, supportive regulatory and tax regimes, educational systems that support entrepreneurial mindsets and a coordinated approach that links the public, private and voluntary sectors.

1.3 Area of relevance of U4SSC

This involves creating a smart work force for the country, and since more than 400 million people in India live in cities, 'Smart People' would be the relevant domain for this solution.

2 The smart project(s)

2.1 Vision and content

Vision: to create an ecosystem of empowerment by skilling on a large scale at speed, with high standards and to promote a culture of innovation-based entrepreneurship which can generate wealth and employment so as to ensure sustainable livelihoods for all citizens in the country.

Mission: create a demand for skilling across the country; correct and align skilling with required competencies; connect the supply of skilled human resources with sectoral demands; certify and assess in alignment with global and national standards; and catalyse an ecosystem wherein productive and innovative entrepreneurship germinates, sustains and grows leading to the creation of a more dynamic entrepreneurial economy and more formal wage employment.

Relevance to citywide vision and strategy and its contribution to its competitiveness

Any city has got to roll out services to its citizens. For this purpose, there is a need for having a skilled work force. A city can develop and compete with others only if it has a highly skilled workforce to meet its requirements.

Key features and design

The policy framework has been developed to accomplish the vision of Skill India by adhering to the objectives. The framework outlines eleven major paradigms and enablers to achieve these objectives of skilling India: •

1. Aspiration and advocacy •
2. Capacity •
3. Quality •
4. Synergy •
5. Mobilization and engagement •
6. Global partnerships •
7. Outreach •
8. ICT enablement •
9. Trainers and assessors •
10. Inclusivity •
11. Promotion of skilling among women

Innovative/ smartness of its content

Innovation in this case is using international collaboration, on an unprecedented scale, globally. It meets all the objectives of smartly-skilling, employment generation and entrepreneurship. The skill modules have been designed in such a way that people gain confidence in a job, and are ready to go.

Role played by ICT in enabling the project

The promotion of only brick and mortar facilities will not ensure the speed and scale desired to transform the skill development efforts. ICTs are being leveraged to scale up training facilities, enable access to remote areas and increase the cost-effectiveness of the delivery of vocational training. The Government supports innovative products, solutions and models that address critical gaps in the skill ecosystem in an effective manner. THE Use of existing available networks such as the widespread Optical fibre network are being optimized.

An open platform for e-content on skill development is being created where further curated content is being crowd sourced. Mechanisms are put in place to incentivize high quality content aggregation. This platform would provide standardized training content to be used by trainers/training institutes for the delivery of vocational training. Stakeholders are being encouraged to develop **Massive Open Online Courses (MOOC)** and **virtual classrooms** for easy access and convenience. Creation of blended learning environments to deliver high quality vocational training in the underserved regions of India is being promoted. Curriculum and teaching methodologies for online learning tools are being provided in regional languages to cater to various geographical needs.

A responsive and agile central labour market information system (LMIS) is being created for aggregating the demand and supply of skills to help align efforts towards bridging the existing and expected skills gaps. The LMIS will ensure a reliable and realistic assessment of economic trends and labour market needs (both existing and projected) that will be publicly available to reduce information asymmetry.

There are approximately one billion cell phone users in the country. Location-based services capability has added another layer in communication and value. It is thus possible to have high-end data collection and assimilation for intelligent matching. The Government aims to promote in the private domain a matching online/mobile platform for connecting the supply and demand of skilled workers. The private sector will be encouraged to develop mobile applications for aggregating informal sector workers such as plumbers, carpenters etc. for household services, through innovative commercial models.

2.2 Implementation

Implementation includes various pillars such as:

- The Directorate General of Training consists of the Directorate of Training and Directorate of Apprentice Training. This includes a network of Industrial Training Institutes (ITIs) in States; Advanced Training institutes (ATIs), Regional Vocational Training Institutes (RVTIs) and other central institutes.

- The National Skill Development Agency (NSDA), an autonomous body (registered as a Society under the Society's Registration Act 1860), was created with the mandate to coordinate and harmonize the skill development activities in the country
- The National Skill Development Corporation India (NSDC) was set up as a one of its kind, public-private partnership company with the primary mandate of catalysing the skills landscape in India. NSDC is a unique model created with a well thought through underlying philosophy based on the following objectives:
 1. Create: proactively catalyse creation of large, quality vocational training institutions.
 2. Fund: reduce risk by providing patient capital; including grants and equity.
 3. Enable: the creation and sustainability of support systems required for skill development. This includes the industry-led Sector Skill Councils.
- The National Skill Development Fund was set up for raising funds both from government and non-government sectors for skill development in the country. The fund is contributed to by various government sources, and other donors/ contributors to enhance, stimulate and develop the skills of Indian youth by various sector specific programmes. A public trust set up by the Government of India is the custodian of the fund. The fund meets its objectives through National Skill Development Corporation (NSDC)
- The Indian Institute of Entrepreneurship (IIE) was established in 1993 in Guwahati by the erstwhile Ministry of Industry (now the Ministry of Micro, Small and Medium Enterprises), Government of India, as an autonomous national institute with an aim to undertake training, research and consultancy activities in small and micro-enterprises focusing on entrepreneurship development.
- Sector Skill Councils are set up as autonomous industry-led bodies by NSDC. They create occupational standards and qualification bodies, develop competency frameworks, conduct train the trainer Programmes, conduct skills gap studies and assess and certify trainees on the curriculum aligned to national occupational standards developed by them.

To date, the NSDC Board has approved proposals for 38 Sector Skill Councils. There are approximately 450 corporate representatives in the governing councils of these SSCs.
- The National Institute for Entrepreneurship and Small Business Development is a society under the Ministry of Micro, Small and Medium Enterprises engaged in training, consultancy, research and publication, in order to promote entrepreneurship.

Country-level stakeholders from the industry side include Power Grid, NSDF and NSDC. PGCI, etc. Self-Employed Women's Association (SEWA) and NSDC provide skills training to 132 313 informal economy women workers in four priority sectors, in a span of 10 years, in the state of Gujarat and to create access to finance for 96 157 informal economy women workers of Gujarat, to procure skills and investment in livelihoods.

Collaborations with other PSUs (Public Sector Undertakings – Public Sector Enterprises in India) such as NTPC and private sector companies have been initiated.

At the International level there are number of organizations involved in the process for international best practices. The objective is to leverage the best international practices while fine tuning the whole structure based on local conditions.

Policies/strategies that made implementation possible

The Ministry of Skill Development and Entrepreneurship is committed to overall human resource development, to take advantage of the demographic profile of the country's population in the coming years. Developing a comprehensive and holistic policy document is an integral part of the process.

The objective of the National Policy on Skill Development and Entrepreneurship, 2015, is to meet the challenge of skilling at scale with speed and to standard (quality). It aims to provide an umbrella framework to all skilling activities being carried out within the country, to align them to common standards and link the skilling with demand centres.

In addition to laying down the objectives and expected outcomes, the effort has been to identify the various institutional frameworks which act as the vehicle to reach the expected outcomes. The national policy aims to

provide clarity and coherence on how skill development efforts across the country can be aligned within the existing institutional arrangements. This policy will link skills development to improved employability and productivity.

Actors involved in the process

The project is being implemented by engaging various stakeholders. The Ministry of Skill Development and Entrepreneurship has engaged in strategic partnerships with several Central Ministries/Departments, State Governments, industry and some global players to collaborate towards skills initiatives, in order to leverage the experience of the stakeholders.

At the International level, the collaborations include:

1. UK India Education & Research Initiative
2. Department for Business, Innovation and Skills on behalf of the Government and the Devolved Administrations of the United Kingdom of Great Britain and Northern Ireland
3. UKCES (UK Commission on Employment and Skills)
4. Federal Ministry for Education and Research of Federal Republic of Germany
5. IMOVE (International marketing of Vocational Education under BiBB), Germany
6. MHRSS, China
7. CNCP (Commission Nationale de la Certification Professionnelle- CNCP), France
8. European Commission
9. Ministry of Education, Singapore
10. Associate of Canadian Community Colleges, Canada
11. US-India Business Council (USIBC)
12. Australian Council for Private Education & Training (ACPET)

Enablers in the process

- **Leadership**
The Prime Minister of India is personally monitoring the progress of the project.
- **Governance** (within the city and across levels of government)
All the central ministries, state governments and local governments at the city level are fully committed to this programme.
- **Financial** (e.g. PPP, risk management)
Some of these projects are running in the PPP mode, wherein the private sector entities impart the training and also ensure that a bulk of the trained personnel are employed, and the government compensates them for the skills imparted, with incentives.
- **Organizational** (partnership; private involvement; citizen involvement; project management)
It involves partnership at all levels, local governments, state governments, central governments and educational and skilling institutions at the national and international level.
- **Communication** (internal and external, branding)
The feedback by various stakeholders ensures that demand and supply requirements are balanced.

Resilience of the solution

The programmes are based on demand and supply requirements. Based on feedback from the stakeholders, the content can be altered. Besides this, the numbers can be scaled up or down, the location challenges also can be overcome by leveraging technology. Hence the solution is resilient.

2.3 Results

The expected direct and indirect (expected) results of the project are:

- skilling people based on the requirements of city, state and country level
- employment generation at all levels.

These results are sustainable because once an infrastructure and process is created at the city, state or the country level in a developing nation with a growth rate of 7.6 to 8.0%, these types of results would be sustainable.

Contributions

As pointed out earlier, for any city and for smart cities in particular, smart people are required to make the city smart and sustainable. This project meets that objective.

3 Conclusions

The main lessons from this case study are that it is possible to make people smart by virtue of mass-scale skill development and entrepreneurship, and thus dynamically respond to the needs of the city, state and the country.

The critical success factors have been the leadership at the government level, alongside the involvement of the private sector and international players in the process.

The challenges are that in developing nations like India, there is a good section of the population, who are illiterate and could have a problem in making use of this programme. Content in local languages are to be widely developed.

It is easily possible to replicate this concept at the city level and import it to other countries where this concept has not been implemented.

With well-established processes and content in place, along with the dynamic policies of the government, this project is easily scalable.

A References

- (1) <http://www.msde.gov.in/>





Smart Economy







Dubai: The first city on the blockchain



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1 Introduction

1.1 Background

Dubai is one of the seven emirates that constitute the United Arab Emirates (UAE). It is the most populous city and emirate, with a gross domestic product of USD 82 billion.

Over the last 40 years, Dubai has succeeded in transforming itself into a global city, regional business centre and tourism hub. Dubai has successfully established its international reputation of being an economic and investment centre, attracting several international companies that have set up their regional headquarters in the Emirate's many free zones. The Emirate of Dubai has been able to achieve this success by diversifying its gross domestic product through accelerated development in sectors such as tourism, real estate, retail, travel and logistics. It has also been recognized for attracting skilled talent from around the world.

Underlying this economic growth has been a visionary, strong and productive government sector that has embraced technology and committed to excellence and digital city transformation. The city's technological journey began in 1999 with the announcement of its first ICT strategy, which was followed by the launch of Dubai Internet City, Dubai e-government, Dubai Smart Government and the Dubai Smart Office (see Figure 10).

Today, Dubai is amongst the world's leading smart cities in its adoption of new technology and pioneering of innovative smart pilots. Recognizing the potential impact of the blockchain technology on city services, coupled with a worldwide blockchain adoption trend that saw \$1.1 billion invested by the private sector in blockchain technology in 2016 alone, Dubai launched a citywide blockchain strategy in October 2016 with the objective of becoming the first blockchain powered city by 2020.

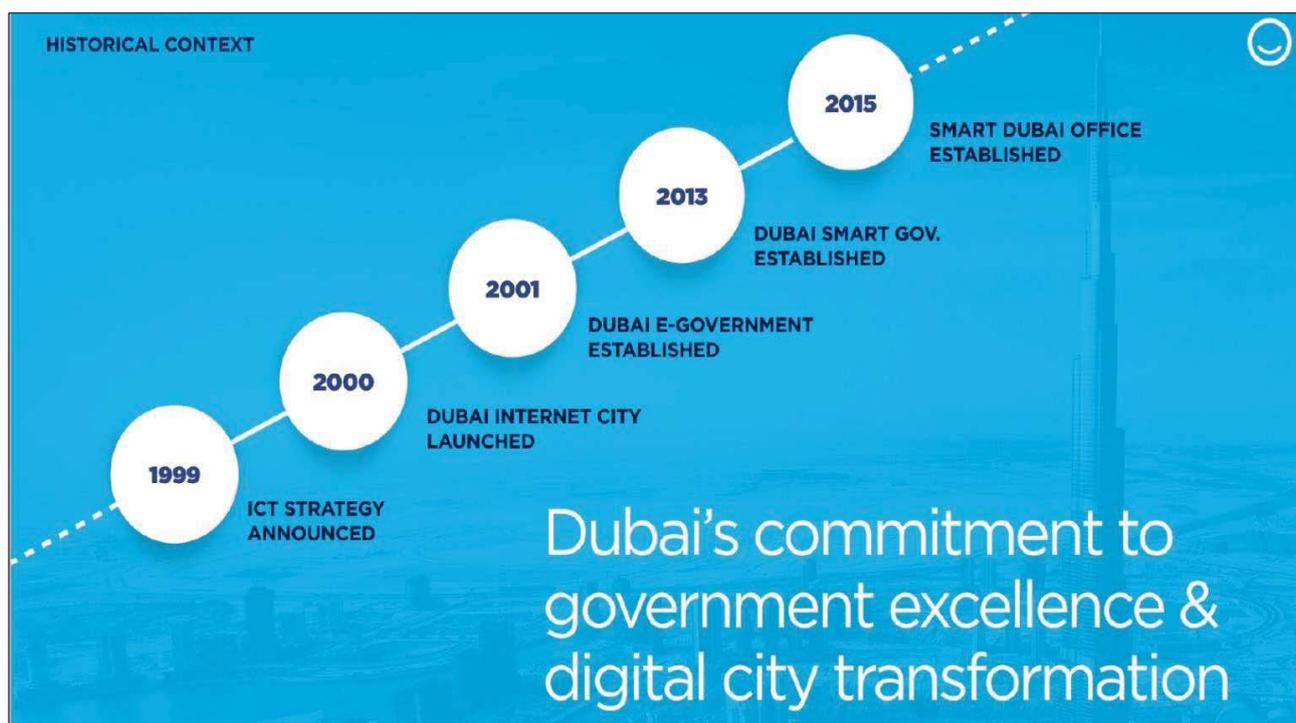


Figure 11 – Dubai's technological journey

1.2 Challenge and response

Dubai's rapid development in various economic sectors meant that traditional processes needed to be continuously enhanced to ensure efficiency and speed. Government effectiveness became increasingly important especially in Government to Consumer (G2C) and Government to Government (G2G) services.

In particular, the growth of the business, construction and tourism sectors saw the Government needing tighter controls over activities such as permissions (e.g. permits and No Objection Certificates (NoCs)) and transaction verification and tracking. Simple processes were getting ever more complicated with the addition of activities that were now in demand by the city's new businesses and residents. It was clear that Dubai needed an agile solution to streamlining its growing Government processes.

Dubai saw the potential in blockchain as the solution. Blockchain is the technology that utilizes open distributed databases of transactions involving value. Its coding method allows for secure record keeping in distributed online ledgers where members share and confirm information with no central authority (see Figure 11).

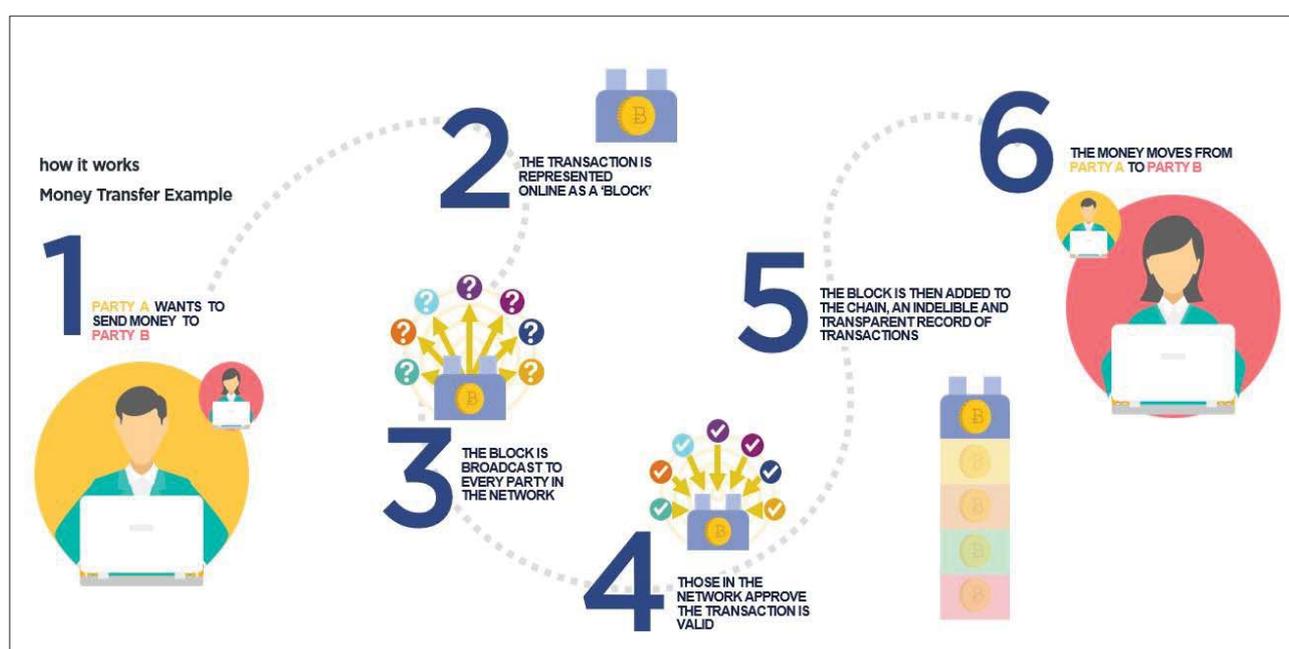


Figure 12 – How blockchain works: Money transfer example

Moreover, the blockchain economy is witnessing rapid growth with 600 new companies active in blockchain today, \$1.1 billion invested in blockchain by the private sector in 2016 alone and an expected market value of \$290 billion in 2019 (see Figure 12).

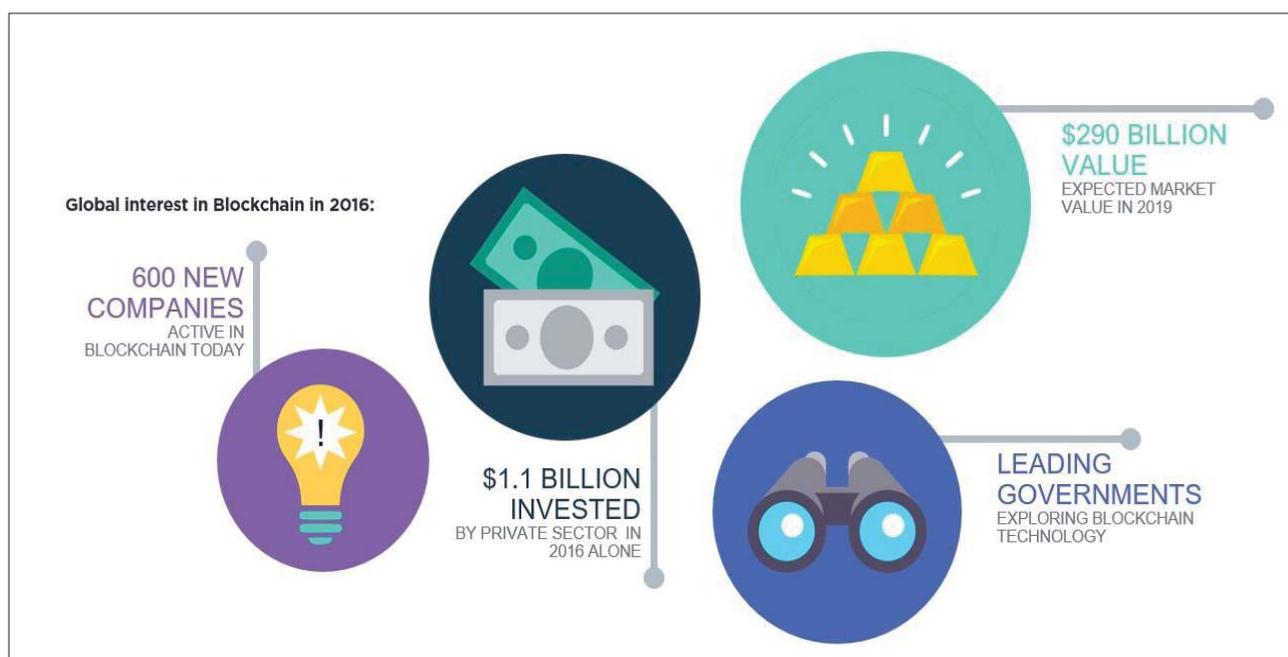


Figure 13 – Global interest in blockchain

Finally, Dubai's adoption of blockchain technology at a citywide scale comes at a time when the technology is increasingly being recognized as the ultimate trust machine. Blockchain eliminates the need for trusted third parties in transactions, an attribute which would contribute significantly to simplifying Dubai Government's evolving processes. The adoption of blockchain technology applies to the smart governance, smart economy and smart people areas of the U4SSC as the next sections will showcase.

2 The smart project(s)

2.1 Vision and content

While governments around the world are cautiously exploring a few blockchain applications of their own, Dubai is the first city that has the vision to fully explore the potential of this innovative and rapidly evolving technology on a citywide scale.

In October 2016, Dubai launched a citywide blockchain strategy with the objective of becoming the first blockchain powered city, driving the future economy by 2020. This ambition sees the Dubai Government leading innovation and building the enabling ecosystem for it to thrive in both the public and private sectors.

The blockchain strategy is based on three pillars (Figure 13):

- (i) Government efficiency: Implement blockchain technology in applicable government services.
- (ii) Industry creation: Support the creation of a blockchain industry through the provision of an enabling ecosystem that empowers start-ups and businesses.
- (iii) Local and international thought leadership: Lead the global thinking on blockchain technology and become the hub for blockchain intellectual capital and skill development.

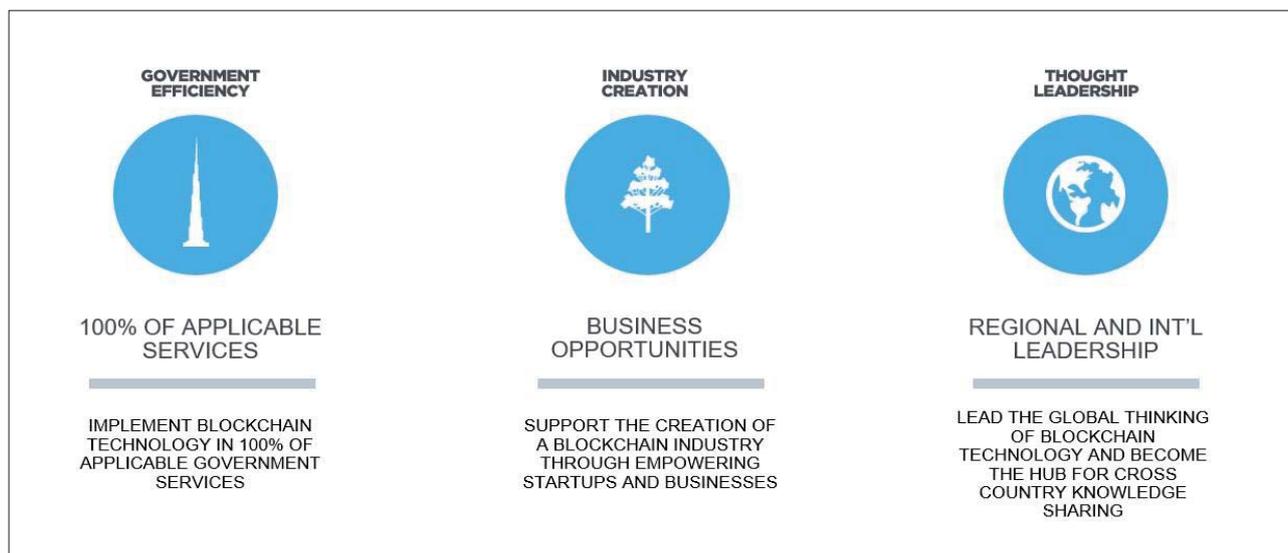


Figure 14 – Three pillars of the Dubai blockchain strategy

The adoption of blockchain technology perfectly aligns with the citywide vision of embracing technology innovation. This enables Dubai to offer the most efficient, seamless, safe and impactful experience for residents and visitors.

2.2 Implementation

The Smart Dubai Office (SDO) is leading the implementation of Dubai's Blockchain Strategy and has developed a detailed roadmap that is organized around the blockchain strategy's three pillars. This roadmap defines the way forward for Dubai's blockchain ambitions.

For each pillar in the strategy, the city has a plan with actionable initiatives.

1 Government efficiency

Dubai intends to first pilot blockchain on the most applicable government services in 2017 before it proceeds to full implementation in 2018. The most applicable services are those that would benefit the most from the implementation of blockchain technology due to their need for third party elimination, transaction ledgers, smart controls and/or automation.

The piloting of blockchain will be done across the city in several sectors such as energy, transport and logistics, tourism, health, education and employment, economic development, safety and justice, social services, municipal and land works and smart districts (see Figure 14). This process will involve the key Government champions in each sector such as the Dubai Electricity and Water Authority, the Roads and Transport Authority, the Dubai Tourism and Commerce Marketing Department, the Department of Economic Development, Dubai Police, Dubai Health Authority and many more public sector stakeholders that are key to sectoral adoption.

In order to roll out the blockchain pilots in an organized manner, Dubai recognized the importance of putting a governance framework in place that would ensure that all stakeholders are aware of their roles and are receiving the support they need. For this purpose, the Smart Dubai Office will roll out workshops with each stakeholder with an objective to identify the best potential pilots in their sector and provide them with the technical standards and unified protocols for implementing their pilots. Moreover, it will support each entity in selecting a technical partner to implement the blockchain pilots.

By opening the door to blockchain technical partners from around the world to come to Dubai and pilot use cases in each entity, Dubai is stimulating the blockchain market and its own economy. In brief, the city is creating demand for businesses to thrive through innovation.



Figure 15 – Dubai blockchain sectors

2 Industry creation

In addition to rolling out blockchain in the Government, Dubai aims to create a blockchain industry where private companies and start-ups thrive and innovate. To achieve this aim, it has set four key action areas that would support in creating an enabling ecosystem that would empower businesses as follows (Figure 6):

- Policy development: The policy implications of blockchain implementation will be continuously assessed and policy will be developed in a number of areas such as security, consumer rights, start-up support and enablement, and financial technology.
- Blockchain accelerator: A blockchain accelerator will be launched to engage start-ups in exploring creative opportunities for blockchain implementation. The accelerator is also meant to operate as a knowledge hub that would raise the awareness and understanding of blockchain technology, its global adoption and Dubai's plans for it.
- Global blockchain start-up competitions: Dubai will roll out a number of global competitions in order to open a channel for start-ups to participate from all over the world in the ideation process for blockchain implementation across the city.
- Private sector engagement: Dubai has set up the first Global Blockchain Council which is comprised of 46 members from the private sector and aims to enable a thriving blockchain ecosystem. A local private sector working group will also be set up to engage closely with the Government on enabling the potential of blockchain locally.

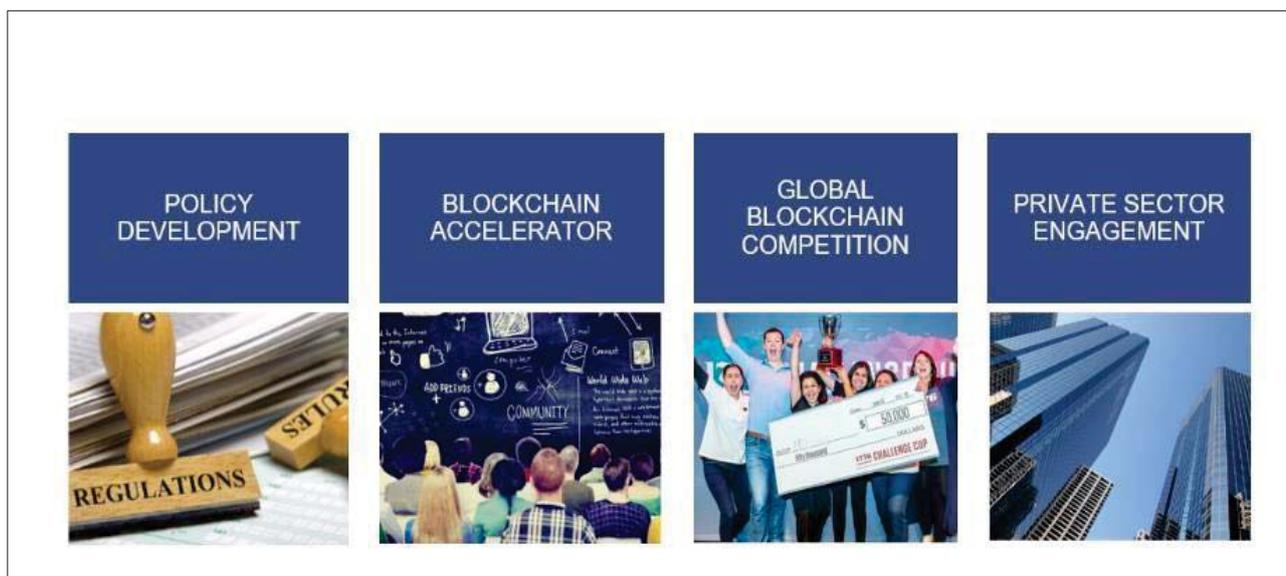


Figure 16 – Industry creation action areas

3 Thought leadership

In this pillar, Dubai aims to lead the global thinking on blockchain technology and become the hub for blockchain intellectual capital and skill development. For this purpose, it has set five key action areas as follows (Figure 16):

- Skill development: Dubai aims to become the regional and global hub for blockchain skill development by offering the most comprehensive and frequent training programmes aimed at blockchain coders, policy makers and strategists and project managers.
- Intellectual capital: Dubai will create and share intellectual capital related to its blockchain adoption through the development of case studies for each of its city pilots. It will also commission cutting edge research that would support the evolution of the technology.
- Blockchain speaker series: Dubai will host blockchain experts and speakers on a regular basis in order to stimulate debate and discussions around the most pressing and controversial issues surrounding the adoption of blockchain technology on a city level.
- International Blockchain Award: Dubai will recognize the best global city applications of blockchain and reward those cities for taking the initiative and pushing the innovation boundaries.
- Academic sector activation: Dubai will heavily engage schools and universities in all blockchain activities such as pilot development, training, speaker events and intellectual capital building.

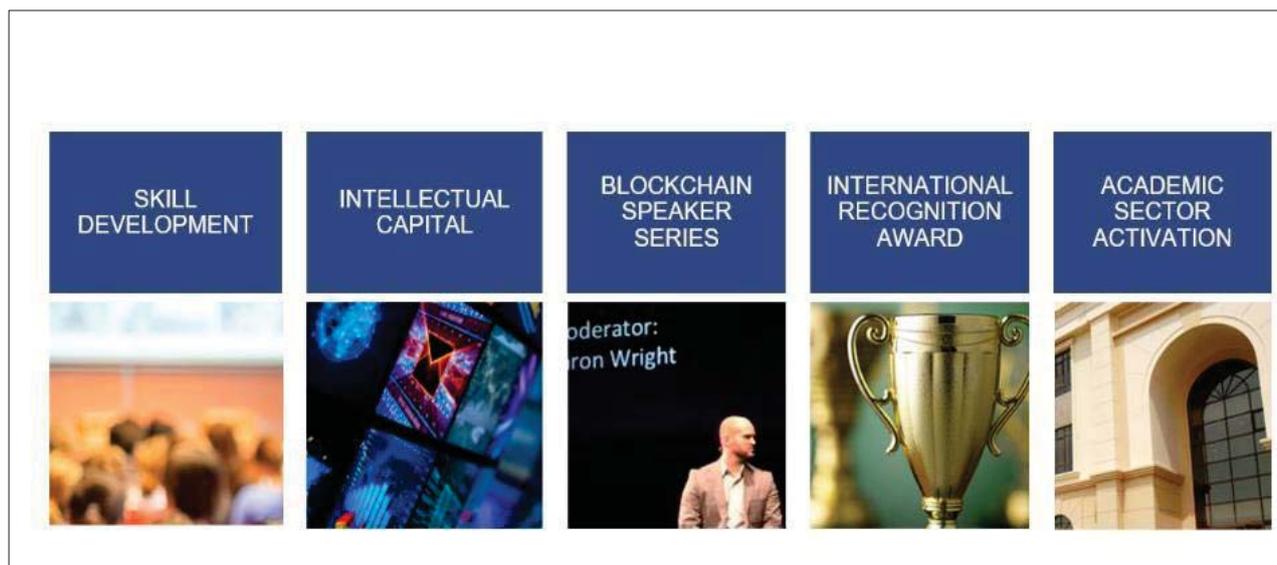


Figure 17 – Thought leadership action areas

2.3 Results

Given that Dubai will begin the implementation of its Blockchain roadmap in the first quarter of 2017, results will become evident by the end of 2017 as government entities start to implement blockchain pilots.

Results are expected to be in the form of transaction cost savings and reductions in transaction durations, resources and paper usage. Once the blockchain pilots are identified with the government entities, key performance indicators will be set and tracked.

The Smart Dubai Office has set a performance management framework that will track the progress on all the action items detailed in this case study on a regular basis.

3 Conclusions

Dubai's adoption of blockchain technology on a citywide scale promises to provide an enabling ecosystem for business and start-ups to thrive as well as drive innovation. Blockchain is still a nascent technology; however, Dubai's clear vision and roadmap on the way forward is expected to inspire other countries to also tread on similar paths and explore the potential of blockchain in the urban domain.

Dubai has been a pioneer in adopting blockchain technology at the citywide level. The Emirate of Dubai strongly believes that the novel approach and the overall framework adopted for blockchain is easily transferable to other cities. The particular context of each city may vary in terms of specific services; however, the approach is both scalable and also highly replicable.

A **References**

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Dubai Blockchain Implementation Roadmap 2017

B **List of discussion partners/interviews**

Dr. Aisha Bin Bishr

Director General, Smart Dubai Office

Younus Al Nasser

Assistant Director General, Smart Dubai Office

Chief Executive Officer, Dubai Data Establishment

Wesam Lootah

Chief Executive Officer, Smart Dubai Government Establishment



DEPARTURES

Time

Flight

Destination

12:00 OD 1961 DELHI

12:15 PN 0034 MUMBAI

12:20 T3 0529 BENGALUR

12:30 PN 2415 CHENNAI

12:50 GI 1872 KOLKATTA

12:55 T3 0944 HYDERABA

13:20 SF 2778 KOCHI

13:45 OD 0061 AHMEDABA

13:50 BK 1532 GOA

14:05 OD 3487 JAIPUR

14:30 PN 0194 NAGPUR

14:35 SF 0028 MUMBAI

Airport PPP Experience in India

Gate

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1 Introduction

1.1 Background

The development of infrastructure is a precondition for the economic growth of a country. Increasing demand for quality infrastructure can only be met with robust investment, proficient project management and technological advancement. To meet these requirements, governments are utilizing the capabilities of the private sector in a big way. Public–private partnerships (PPP) have become the preferred mode for the construction and operation of infrastructure projects, both in developed and in developing countries. As most governments in emerging economies are facing fiscal and capacity constraints, PPP provides a way for them to bridge the gap in infrastructure investment.

The Airports Authority of India (AAI) manages and operates 123 out of a total of 134 airports in India. This includes 12 international airports, 99 domestic airports and 12 customs airports. The remaining eleven airports (5 international airports and 6 domestic airports) are managed by PPP concessionaires, State Governments and the private sector.

The domestic air traffic improved at a compound annual growth rate (CAGR) of 11.3%, from 71 million in FY07 to 121.3 million in FY12. It is expected to touch 209 million by FY17. During the same period, international air traffic grew at a CAGR of 9.4% to reach 40.7 million, and is estimated to reach 60 million by FY17.

1.2 Challenge and response

Upgrading an airport to international standards requires a lot of resources, given a sharp increase in air traffic and the projected future air traffic trends being high. Since the number of airports that require an upgrade is high, it becomes a challenge for the government to provide resources for this purpose. Often, financial resources are pumped into providing basic services and amenities like health and education, thereby leaving fewer resources for airport upgrades. Improving conditions in the aviation sector under such conditions seems to be a luxury.

India is a big tourist destination. Poor air connectivity to some of the exclusive tourist destinations remain a big bottleneck in the growth of tourism. Unless air connectivity improves, the full potential of tourism cannot be harnessed. Air connectivity needs resources. Since the upgrade and augmentation of major airports is a challenge, investing in smaller airports remains an even bigger challenge.

The solution

Financing projects for making cities smarter and more sustainable could be a challenge particularly in the developing nations. One of the alternatives in such cases is to opt for a PPP, wherein the project is funded by the private sector, and the government plays the role of the enabler and regulator.

2 The project(s)

2.1 Vision and content

Vision

The vision behind this project is to provide internationally acceptable aviation facilities in Indian cities, without getting constrained by limited resources.

Concept of Aerotropolis and associated industrial development: With the Hyderabad Airport PPP project, the concept of Aerotropolis, or Airport City was brought to India. This concept, which espouses the development of a self-sustaining city around an airport, promises to take Indian urban development to the next level.

World-class airports are fundamental to the development of a city and its competitiveness. Air traffic to a city in modern times is an indicator of its development. The economy of any city gets a boost with proper air connectivity. This in turn would contribute to its competitiveness.

The concept of Airport City also has a *job multiplier effect* as a large number of jobs are generated within this ecosystem.

The service delivery at the airports improves since the private enterprises have service level agreements (SLAs) with the government. It also helps to bring the airports to international standards, without the government having to invest heavily.

Key features and design

PPP systems were strengthened through the following measures to ensure their success:

- (i) Major policy and institutional initiatives taken:
 - setting up of PPP Appraisal Committee to streamline appraisal and approval of projects;
 - preparation of PPP Toolkit to improve PPP decision making process;
 - establishment of transparent and competitive bidding processes through model bidding documents;
 - extending financing support through development funds, viability gap funding (VGF), user charge reforms, etc.
- (ii) Management information system (MIS) for continuous monitoring of the performance of PPP projects put in place.
 - development of a strong and well-defined institutional structure for a sustainable PPP programme;
 - creation of nodal agencies, such as PPP cells, at the state or sector level;
 - laying down of an appraisal mechanism for PPP projects by the PPP Appraisal Committee (PPPAC);
 - audit mechanisms for transparency and fairness in projects;
 - independent regulatory mechanism (wherever there is no sector-specific regulator) to ensure the protection of interests.
- (iii) Financial initiatives
 - Bank loans to earning-based PPP infrastructure projects under concession agreements are to be treated as secured advances. This is expected to boost infrastructure financing, particularly for Build-Operate-Transfer (BOT) roads projects and power sector projects.
 - External commercial borrowings (ECB) norms have been relaxed to help infrastructure companies raise more funds from overseas markets.
 - Infrastructure companies are allowed to raise bridge finance from overseas markets under the automatic route. Previously, the companies were required to seek permission from the RBI in order to raise bridge finance.
 - Infrastructure companies are allowed to raise ECB for a maximum period of five years for importing capital goods. Previously, the companies could raise ECBs for a period ranging from one year to three years only.
 - The ECB limit has been increased for NBFC-IFCs (non-banking finance companies classified as infrastructure finance companies) under the automatic route from 50% to 75% of their owned funds, and the hedging requirement for currency risk has been reduced from 100% of their exposure to 75%.

It is interesting to note that the aforementioned measures are unique to the Indian Airport PPP system.

- (iv) Role of ICT in enabling the project:
 - As this study is related to PPP funding of the aviation projects, the role of ICT is limited to the processes like e-tendering, project monitoring, execution and implementation of the SLA.

2.2 Implementation

The projects have been implemented in the PPP mode.

Policies and strategies that made it possible

The Ministry of Civil Aviation, Government of India, has taken steps to improve the regulatory environment in the country. The Ministry has come up with a new civil aviation policy (Vision 2020) which facilitates the establishment of a new Civil Aviation Authority. Some of the recent policy initiatives implemented are as follows:

- FDI investment in civil aviation: In September 2012, an amendment was made in the Civil Aviation policy that allowed foreign airlines to take equity share in the operating scheduled air transport services, subject to a limit of 49% of their paid-up capital.
- New aviation regulator: A new bill is expected to be introduced in Parliament to establish a new regulator, to be called the Civil Aviation Authority (CAA) replacing the Directorate General of Civil Aviation (DGCA). It will have full operational and financial autonomy.
- PPP mode for airport development: PPP mode will enable privatization and modernization of airports in metro as well as non-metro cities, and will give priority to the development of regional and remote connectivity in the country.
- Simplification of building rules near the airport: The Government has approved changes in the bylaws regulating building activities around airports. The changes are expected to bring increased transparency and efficiency in the processes of approval for construction of buildings around airports.

The stakeholders involved in the process:

- The Government of India
- State governments
- Private sector enterprises
- Financial institutions of India
- Foreign direct investors

Enablers that made it happen:

- *Efficient leadership of Central Government:* The Central Government's commitment to provide a solution to the resource constraint enabled this process.
- *Governance (within the city and across all levels of government):* The local city and state Governments were also taken on board.
- *Financial (e.g. PPP, risk management):* The Financial institutions came forward to assist with the process. This coupled with the policies of the government ensured risk mitigation, which in turn helped in boosting the confidence of the private enterprises who then willingly joined this collaboration.

The contributions of multilateral agencies, such as World Bank, Asian Development Bank (ADB) and Department for International Development (DFID) in infrastructure development play a key role in improving the investment climate and fostering private sector participation. There has been a shift in the funding pattern of multilateral agencies from public sector infrastructure projects to projects which have private sector participation. These agencies give priority to environment-friendly infrastructure projects.

Multilateral agencies provide financial and advisory support to infrastructure projects. They act as a stable source of long-term funds and knowledge base with strong PPP experience. They extend technical assistance (TA) to the governments to help them bring PPPs to the mainstream at the centre and state level through capacity building, e.g., establishing PPP cells in various states. Over the years, they have come up with new ways of providing financial assistance for infrastructure development, such as through multi-tranche financing facilities and local currency loans.

This type of solution in PPP funding of the airports is *replicable*.

Key upcoming PPP projects are:

- Seven Greenfield airports in Andhra Pradesh: New airports will be developed through the PPP mode and will entail a private investment in the range of INR 10 billion–INR 20 billion each. The Government will also offer concessions, including land, water, power and approach roads.

- Greenfield airports in Maharashtra: The Government plans to build five domestic airports at Solapur (INR3.1 billion), Amravati (INR2.8 billion), Shirdi (INR2.6 billion) and Jalgaon (INR2.6 billion) on PPP basis.
- International airport in Uttar Pradesh: The Government of Uttar Pradesh plans to develop an international airport at Kushinagar worth INR 3.5 billion through Design, Build, Finance, Operate, and Transfer (DBFOT).
- International airport in Mopa, Goa: The Government of Goa plans to develop its airport with an investment of INR 30 billion over the next four years on a PPP basis.
- Greenfield international airport at Navi Mumbai: The new airport is being built through PPP and the cost of the project is estimated to be between INR 32 billion and INR 40 billion.

2.3 Results

The Government's focus on PPP has borne exceptional results during the eleventh five-year plan. It is also observed that the private sector has played an unprecedented role in the area of airport development. Five international airport projects were successfully completed through the public-private partnership (PPP) mode, viz. Greenfield development of Hyderabad and Bengaluru international airports and modernization of Kochi, Delhi and Mumbai international airports. The total investment made by private airport operators in the last five years was to the tune of US \$ 6 Billion. In recent years, airport modernization in the country has taken a new form, with private players bringing in new technologies that not only improve airport operations but also enhance customer experience.

These projects have had an impact also on the Gross State Domestic Product (GSDP). National Council of Applied Research's (NCAER) study of the Hyderabad and Delhi Airport has shown that Hyderabad Airport's operations contributed USD 1.25 billion to the national GDP in 2009-2010; contribution relative to the State's (AP) GSDP was 1.55%. Similarly, Delhi Airport's operations contributed about USD 5 billion to the national GDP in 2009-10; contribution to the State's (Delhi) GSDP was 13.35 %.

The other outcomes of the PPP for the airport sector in India are as follows:

Job multiplier effect: With the airport-centric approach of urban development, gainful employment has been generated to the tune of 1.57 million in the case of Delhi Airport (representing 25.9% of Delhi's total employment) and 840 000 jobs in the case of Hyderabad Airport.

Service levels and improvements – knock-on effects on government run airports and international rankings of Indian airports: PPP airport projects have consistently been ranked at the top of the Airports Council International's (ACI) Airport Service Quality (ASQ) rating for the Best Service Delivery in their respective categories. This drive and focus on the quality has raised the bar for the Indian aviation industry; the new terminals developed by the Government; and its service levels, having been at par with the international standards, as envisioned by the Indian Government.

Fulfilling the state responsibility of Connectivity and Access to air travel: Freeing up of public funds has enabled the Government to focus on regional connectivity and the development of smaller airports, which were earlier underserved or unserved, across the nation. This has enabled the State to fulfil their responsibility towards bringing access to air travel for every citizen.

3 Conclusions

Lessons learnt

The PPP model for Indian Airports has surpassed the initial expectations in terms of economic benefits and better infrastructure. This has also created a whole new travel experience, besides providing decent facilities for travellers.

Despite various bottlenecks, PPP in infrastructure holds great potential in a country like India. A long-term sustainable infrastructure plan needs to be developed that will create an environment for increased private sector investments for faster execution of the projects. Collective efforts by both the private and public sector and enabling policy provisions may help in achieving the infrastructure PPP agenda of the government.

Critical success factors

The critical success factors have been:

- the aviation policy of the Government of India;
- the fact that PPPs can supplement limited public sector capacities and raise additional finance in an environment of budgetary constraints;
- privatization has improved the breadth, efficiency and the quality of services available.

Challenges ahead

The PPP mode comes with its own set of challenges since attracting private investment is not straightforward. The private sector not only requires an investor-friendly regulatory environment, but also returns on investment. The Government of India (GoI), therefore, has been focusing on the development of enabling tools and activities to encourage private sector investments in the country through the PPP format.

The Government needs to work on each stage of PPP development — planning, designing, contracting, financing and monitoring. New models for PPP need to be created to cater to the current challenging business climate. Unless project agencies are suitably empowered for effective and time-bound decision making, the PPP agenda of the country is going to take time to evolve and develop. There also needs to be a clear demarcation of the risks to be borne by public and private parties.

Transferability to other cities and scalability:

Further development is under progress, through the PPP model for new airports such as Goa, Navi, and Mumbai. These projects are based on the learnings of over a decade of the privatization process. These new benefits have started percolating down to the smaller cities.

The projects are scalable, as there is immense opportunity to exploit the available commercial spaces. With a good degree of innovation, the private enterprises involved in these projects are able to generate a reasonable amount of revenue, and since this revenue is also shared with the Government, a certain portion of the finances could be used to upgrade and create new airports in other lesser developed regions, which are also in need of a better transportation infrastructure.

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Maribor, Slovenia PPP



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1 Introduction

1.1 Background

After separating from Yugoslavia in 1991, Maribor went through a period of transition, where old big companies (TAM, Metalna, ...) disappeared one after another and the city lost around 12 000 jobs. Water quality in the river Drava was very poor because of the direct outflow of waste water, so the city decided to build a waste-water clearing facility. The process started in 1994 and through a public-private partnership (PPP) it was finished in 1998, when preparation for construction started. Following the completion of Phase 1, it started operating in 2002.

The process of clearing water in the river Drava was connected to efforts made in Austria, from where Drava joins Slovenia. Also there was need for a sustainable system of waste water treatment that the city did not have. In Slovenia the river Drava has nine hydropower plants, two are downstream from Maribor and water quality is also important to their production.

1.2 Challenge and response

The biggest challenge for the city administration was how to run a successful PPP and how to assess the long-term consequences for the city's budget. The city administration lacked previous experience of PPPs (Maribor was one of first cities in Slovenia with a PPP for this kind of project).

This solution is about smart governance of the city, where this kind of waste-water treatment plant is necessary for every city and if completed in the right way it can benefit a city in many ways. Below is a short history of this PPP process:

▪ August 1994	Pre-qualification
▪ June 1995	Tender
▪ January 1997	LDE – Preferred Bidder
▪ January 97 / June 98	Negotiation
▪ 29 July 1998	Contract Signing
Development Period	
▪ 16 November 1999	Signature of the construction contract
▪ 28 April 2000	Signing of the Loan Agreement
▪ 09 June 2000	Start of the Construction (Phase I)
▪ 09 December 2001	Start of the Construction (New Phase II)
▪ 10 June 2002	Phase I start of Operation
▪ 08 July 2002	MoU - New Phasing
▪ 31 January 2003	Amendment of Concession (New Phasing)
▪ 27 May 2003	Final Acceptance – Phase I
▪ February 2004	Phase II start of Operation

Figure 18 – Short history of the Maribor PPP process

2 The smart project

2.1 Vision and content

This project was implemented to bring the city to another level, to improve the environment in Maribor. It has contributed to many areas of life in the city, beginning with a clear river with life forms that were missing previously. Today the water quality is near the standards required for swimming in natural lakes and rivers and a lot of different birds choose river Drava in Maribor and Ptuj as their summer/winter habitat. Citizens can also now, without health risks, use the river for water sports and fishing, which brings a greater quality of life to the city. The project made a strategic decision for the city whereby every house, factory, street and open space has to be connected into the system, so waste water in the city must go to a facility and after treatment it can be released in the river downstream.

Maribor is surrounded with hills, nature and is the centre of the Styrian wine region. The city's goal is to preserve the natural surroundings and the river Drava is big part of this. The city gets around 60% of its drinking water from underground water wells (beneath the river) and drinking water quality has improved a great deal since the waste water treatment has been in place. Having well-preserved natural surroundings is important for the wellbeing of inhabitants, it provides better air quality (in this area further work remains to be done) and it makes the city attractive to live in or just to come and visit. Since the start of this project (1994) a lot has happened in Maribor and strategic goals have been adapted to the changing situation; however, a clear environment is always high on every agenda. The last strategy that the city adopted in 2016 'Integrated sustainable urban development plan' has this area high on its list of priorities, with clear river water enabling plans for the further integration of the river in inhabitants' lives, with different activities on the river banks planned with the preservation of drinking water quality is kept in mind.

With this new strategy Maribor decided to follow a circular economy, whereby every resource available in the city (and produced by city) will be used for processes in the city. A major part of future plans is a waste water treatment plant, where cleared waste water can be returned through some of the city processes and this will reduce the use of drinking water for these processes; secondly, a material that will be used back in the city is sludge that is produced in the water clearing processes. A circular economy for public utility companies is a strategic project for the city and every possibility will be explored for the use of waste materials from one process as entry materials in another. A short presentation of this project WCYCLE was given at the Smart Sustainable Cities Financing Forum Liechtenstein, in November 2016, and again at EWRC 2016 in Brussels. The concept of the project is described in two slides from the presentation (shown below); the main innovative solution is that all utility companies are involved in some processes, which will have an impact on energy, material recovery and reuse in the city.

- **The service pillars carry out waste recovery services by selected pillars of their formation and with selected recovery operations, for which individual municipal public companies are responsible, which already carry out public services for the city and citizens**
- **Special attention is given to combining the processing of waste from different areas of their formation and to various processes of their treatment in order to achieve maximum treatment effects and reducing the residual waste for disposal to a minimum**
- **Wcycle Institute is a highly professional project core for implementation of research and development, introduction of selected technologies and the use of integrated IT tool for information, monitoring of the system and improving its effectiveness**
- **Prototype construction carries out highly professional services of installation, repair and maintenance for the project and also produces the necessary connecting elements of strategic importance for the operational functioning of selected technologies and procedures**

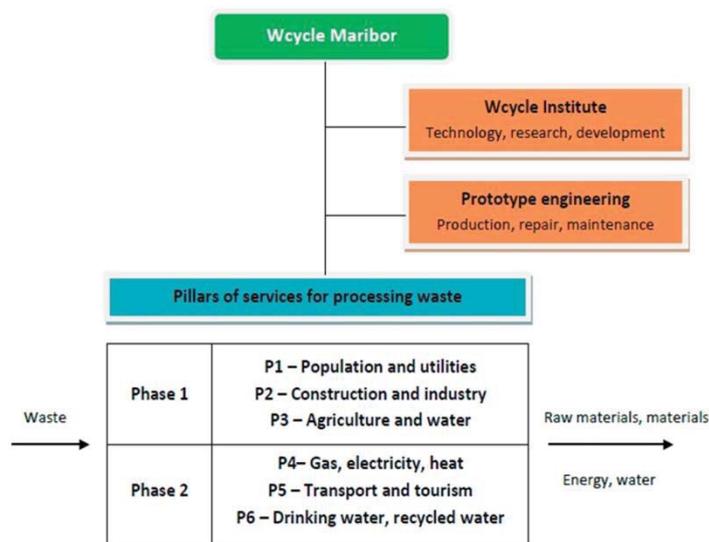


Figure 19 – Two slides on WCYCLE project

ICT will play a big role in enabling this project; it will connect all parts of this project, enable monitoring and evaluation of every part of the project and will contribute greatly to the success of this project.

2.2 Implementation

- Project WCYCLE will be implemented in phases according to the financial possibilities of the city and the utility companies. Currently in preparation are phase 1 – P1 and phase 2 – P4, also two institutes (WCYCLE and Prototype) are in the process of being formed (January 2017). Preparations for other activities are at different stages; phase 1 is to be completed by 2019 and phase 2 by 2022. Locations for facilities in the city are already set.
- Project implementation has been possible due to a decision of the city council that approved the city’s plan for Maribor waste management in 2015. The city council also approved the ‘Integrated sustainable urban development plan’ in which the WCYCLE project is one of the strategic city projects. Part of this project was also included in the Smart specialization strategy of Slovenia and other parts of this project were also approved in call Interreg Alpine space in October 2016.
- Different stakeholders from private and public sectors were involved in the project preparation. From the private sector came consultants for a circular economy, and all public utility companies from Maribor were involved and still are involved in the development of the WCYCLE project. Further to this, specialized institutes from Slovenia are also a part of the development (ZAG, IJS).
- The city leadership has recognized the potential of sustainable development through project WCYCLE. It has actively supported the efforts of a working group of different stakeholders in their activities to form project solutions for Maribor and prepare their implementation.
 - The Mayor’s cabinet has been involved in different activities that brought the project forward, especially at the level of EU cooperation, and presentations on workshops and congresses.
 - A working group has members from city government, utility companies and the private sector; the partners are in transition to a green circular economy on a government level. http://www.vlada.si/en/media_room/government_press_releases/press_release/article/circular_economy_as_new_opportunity_for_economic_growth_58878/, this press release, on Maribor, released on 18.11.2016 was one of the events in the month for a circular economy in Slovenia 2016.
 - Implementation for all possible solutions for the financing of project WCYCLE will be looked at , but the PPP mode will be adapted to meet up-to-date requirements; some kind of dynamic PPP model will be necessary for future investment. The city’s revolving fund for investment that will be used for

financing parts of project WCYCLE will be established; smaller investments will be covered by utility companies.

- Project management is being set up, and a range of stakeholders will be involved in project implementation on different levels and topics.
- WCYCLE as a brand is already set; with time the brand will be developed further.
- The whole process of the implementation and development of project WCYCLE at the city level is innovative; to use resources that the city produces in a sustainable way and to lower material/resource dependence in general are the goals of this project. Figure 20 provides an understanding for energy, material and water flows.

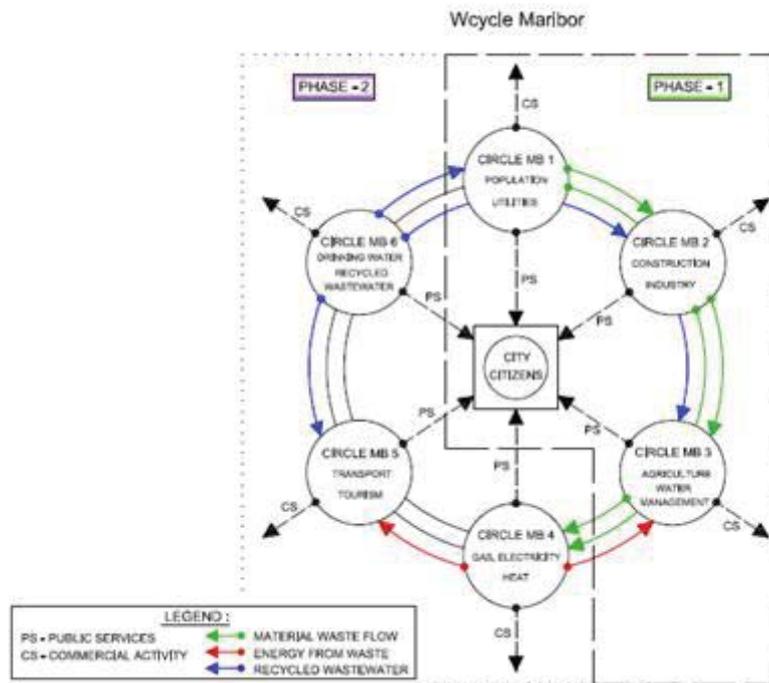


Figure 20 – Wcycle Maribor

- ICT will be an essential part of project WCYCLE to enable the implementation, following up and evaluation of project WCYCLE; some parts of ICT will have to be developed for the purposes of this project.
- A solution is resilient, transferable with adjustments to local needs.

2.3 Results

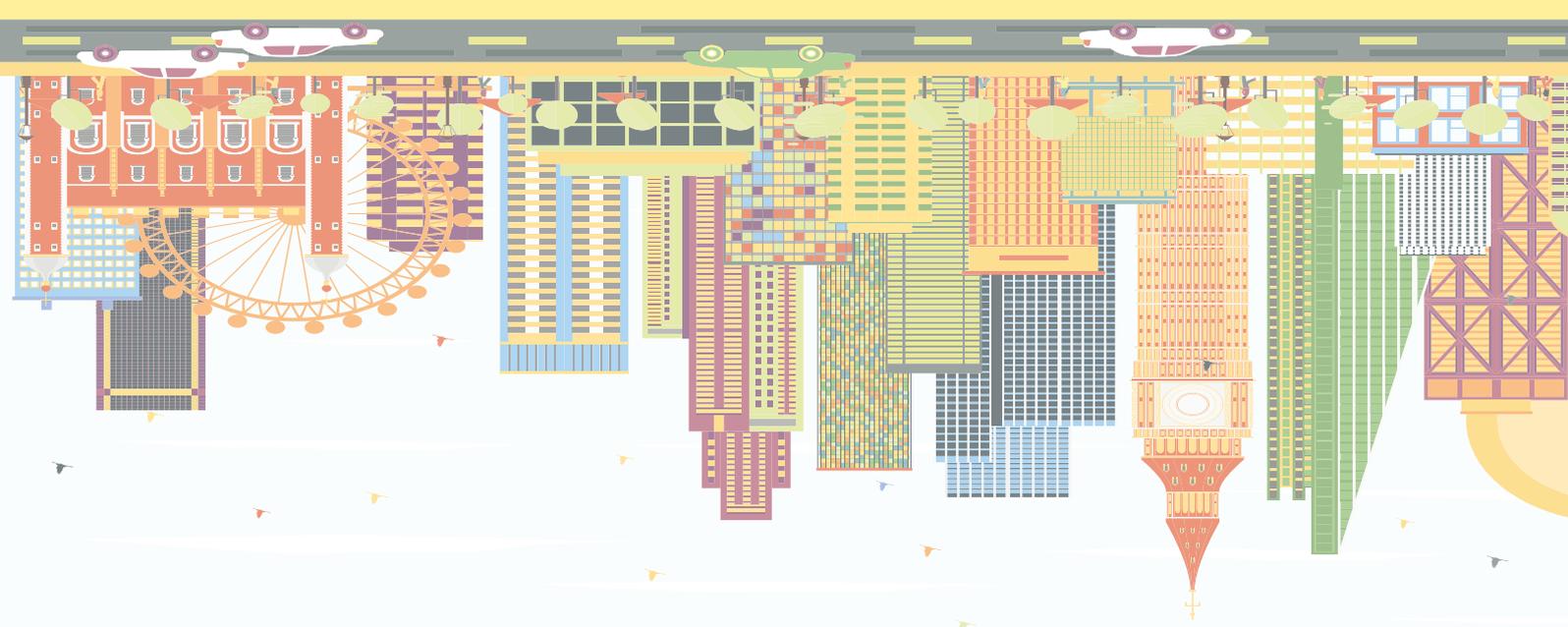
- The city and citizens should benefit from this project in many ways; first it will create new green economy jobs, second, it will reduce dependence on materials in public utility companies; third, it will educate citizens on the benefits of a sustainable way of dealing with waste and different materials, and it will stabilize prices for utility services in the city. Also, more energy will be produced in the city; fuels for public bus service will be provided (CNG, already 1/3 of city buses runs on CNG, later e buses will be added to the system). Water consumption will be lowered and cleared waste water brought back into the city system.
- Every reuse of any material is sustainable in the short and in the long run. This is one of the main objectives of a circular economy and it makes sense as nature does this all the time. Currently we as civilizations are consuming more than the earth can provide in the long run and we have to change that. Every effort in this direction will benefit society in time and to do this on a city scale must bring results for city and citizens. Organizing public utility companies to their benefit in this way will bring positive changes and a long-term sustainable use of resources.

- The project is already contributing to Maribor and will continue to do so in the future.

3 Conclusions

- Lessons learned are most valuable if they are not repeated; the team learned from mistakes made in the first PPP in the 1990s. The approach to project WCYCLE is undertaken with more care about long-term solutions, whilst looking at dispersal risks in project development through different financing solutions for different scales of operations.
- Challenges ahead are many, one of them is legislation which needs to be adopted to the new circumstances of a circular economy model; second, is that some technical solutions for tackling processing problems ahead need to be developed. Note that some people will oppose the changes of a business model.
- Project WCYCLE is transferable to other cities with necessary adjustments to locally-specific situations; one positive thing in the case of Maribor is that all utility companies are still publicly owned, which is in implementation of this project very welcome; models can be scaled up and down according to the needs of cities.







London Green Fund



LONDON



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1 Introduction

1.1 Background

London is a densely populated city with over 8.2 million residents⁶ and 16 500 businesses⁷. Over the last decade, the city has experienced a rapid economic and population growth; according to projections by the Office for National Statistics and Greater London Authority (GLA) this trend will continue for the next two decades. Population boom, urban sprawl and increased electricity consumption are some of the challenges that put the city under environmental pressure and highlight the need for a transition to a low-carbon economy.

To tackle these challenges and position London as a world leading low-carbon capital, the Mayor's London Plan and Economic Development Strategy were designed with a strong environmental focus. A goal of reducing carbon emissions to 60% below 1990 by 2025 was set. Moreover, a budget of EUR 182 million to promote sustainable, environmentally efficient growth as part of the London 2007-2013 Programme was established; supporting economic growth through investment in green infrastructure was identified as the programme's priority, with an allocated budget of EUR 85.5 million.

The European Commission, in cooperation with the European Investment Bank (EIB) and the Council of Europe Development Bank (CEB) set up the Joint European Support for Sustainable Investment in City Areas initiative (JESSICA). This initiative supports sustainable urban development and regeneration through financial engineering mechanisms. As part of this initiative, countries can choose to invest part of their EU structural fund allocations in revolving funds, to recycle financial resources and accelerate investment in urban areas. Another source of financial support for cities to develop green infrastructure was EIB's European Local Energy Assistance (ELENA). Through its programmes RE:FIT and RE:NEW, ELENA would provide a commercial model for public bodies and households to implement energy efficiency measures.

1.2 Challenge and response

Despite authorities' will to promote investment in green infrastructure projects, market imperfections would continue to make this sector too risky for private investors. A funding gap for those projects that were incapable of securing conventional commercial financing was taking place and limiting their contribution to London's carbon reduction goals.

The London Green Fund (LGF) is a holding fund that aims to de-risk the environmental sector and promote the investment in schemes that would reduce London's carbon emissions. Launched in 2009 by the Mayor of London and the European Commissioner for Regional Policy, the LGF was the first JESSICA holding fund in the UK. A mix of EU and other public and private sources were used to set up the fund, attract investment and scale up green infrastructure projects across the city. The LGF is integrated by three commercially managed urban development funds (UDF) that canalize investment to energy efficiency, waste and greener social housing projects.

The LGF applies to the U4SSC smart economy area by encouraging cooperation between private and public stakeholders to engage the private sector and boost low-carbon development in London. The provision of financial incentives was used to encourage investment in green infrastructure.

2 The smart project(s)

2.1 Vision and content

The LGF was envisioned as a financial instrument that would support the development of green infrastructure to contribute to London's carbon reduction targets. The LGF aimed to address identified market failures, de-risk the environmental sector in London and attract private investment in schemes that would cut carbon emissions. In particular, the LGF focused on providing equity or loan capital to attract other investors for those projects that did not result as commercially viable under conventional financing schemes.

⁶ London Councils.

⁷ The City of London Corporation (2016).

The LGF was specifically designed to contribute to London’s environmental vision and strategy. Investment in energy efficiency, waste management and greener social housing projects from LGF projects would directly contribute to the city’s goals of reducing carbon emissions by 60% by 2025, and cutting the amount of waste that ends up in landfill. Furthermore, the LGF would push London towards a lower carbon economy by supporting the generation of green infrastructure related jobs and triggering further investment in the sector.

The LGF follows the structure of a holding fund model. In this way, the fund does not directly invest in projects but makes financial contributions to individual UDFs. The fund was structured in a way that both public and private partners could get involved.

An Investment Board comprised of seven representatives was set up for the management of the fund. The Investment Board appointed EIB as Holding Fund Manager due to its track record in environmental fund management, along with its alignment with the economic development agenda. EIB’s experience in the business raised LGF’s credibility and boosted the confidence of public and private investors. Likewise, each of the UDFs had a fund manager, which was selected through an open and competitive process⁸.

Role	Partner
▪ Intermediate Body	▪ Greater London Authority (GLA)
▪ Funding Partners	▪ GLA, London Waste and Recycling Board
▪ Holding Fund Manager	▪ European Investment Bank
▪ UDFs Fund Managers	▪ LEEF: Amber Infrastructure Ltd. ▪ FEF: Foresight Group ▪ GSHF: The Housing Finance Corporation
▪ Other investors	▪ LEEF: Royal Bank of Scotland, INPP, European Investment Bank (through ELENA) ▪ FEF: European Investment Bank ▪ GSHF: Pension Funds

Another key feature of the LGF is that it moved away from traditional grant-based funding models. This would allow monies to be reinvested in further carbon reduction projects while generating low-carbon growth and jobs in an efficient way.

The LGF was innovative by using a financial instrument to exploit energy efficiency, waste and greener social housing as London’s biggest carbon mitigation opportunities. The London Energy Efficiency Fund (LEEF; equity fund), the Foresight Environmental Fund (FEF; loan fund) and the Greener Social Housing Fund (GSHF; not for profit loans) were created as independent UDFs which were contractually obliged to attract private-sector funding. This segmentation of the market would provide flexibility to each UDF and make the LGF more adaptable to changing market conditions.

Despite the LGF being small in geographic focus and having a niche investment area for the commercial market, it was successful at adopting an attractive structure for investors. The presence of experienced fund managers along with the innovative financial approach of the fund, successfully de-risked the environmental sector and highlighted the opportunity for growing the market in London.

2.2 Implementation

The LGF started as a GBP 100 million fund (EUR 118), constituted in the following way:

- European Region Development Fund (ERDF): GBP 50 million (EUR 59 million)
- London Waste and Recycling Board (LWaRB): GBP 18 million (EUR 21.2 million)
- London Development Agency (LDA): GBP 32 million (EUR 37.8 million)

⁸ UDFs managers were fairly selected, through an open and competitive process published in the Official Journal of European Community

Additional cash contributions were made by the LDA in 2010 (GBP 32 million; EUR 37.8 million) and ERDF in 2014 (GBP 10 million; EUR 11.8 million); GBP 1.5 million was generated from interest on 'idle funds' and added to LEEF resources in 2014.

The following funding sources were secured by UDFs to comply with their contractual obligation of finding private contributors for their funds:

- LEEF: Investments from Royal Bank of Scotland (GBP 50 million; EUR 59 million) and INPP (GBP 20 million; EUR 23.6 million).
- FEF: Investment from Pension Funds (GBP 25 million; EUR 29.5 million).
- GSHF: The fund is linked to an EIB loan (GBP 400 million; EUR 472 million); the LGF contract obliges the UDF Fund Managers to invest at least 50% of this funding in London-based projects.

All funding sources together provided the LGF with a total of GBP 406.5 million (EUR 479.7) to be invested by 2015. The fund managed to commit all the allocated funds by investing in more than 15 projects with a value of over GBP 500 million⁹. Returns from LEEF and FEF would go to the GLA in 2021; returns from GSHF would go to the GLA in 2043. The LGF had a leverage effect of 6.77x for EU leverage and 3.70x for public resources.

The existence of European initiatives to financially support green infrastructure investment in the region (e.g. ERDF, ELENA) was fundamental to making the implementation of the LGF possible. Having an independent investment board with enough flexibility to steer the process was key for the LGF to ensure its resilience during the implementation process; the latter was particularly relevant in 2013 when the third UDF was established¹⁰. Close cooperation between parties was essential to overcome the challenges that arise from developing untested models of financial institutions for infrastructure development.

2.3 Results

By 31 December 2015, the LGF had successfully committed all its allocated funds in more than 15 projects, with a value of over GBP 500 million (around EUR 588 million). It is important to mention that most projects supported by the LGF are not yet complete. However, economic and environmental forecasts by the GLA (September 2014) are promising:

- reduction of 214 963 tons of CO₂ per annum
- creation of over 2 000 jobs
- saving of 330 980 tons of waste to landfill per annum.

The LEEF has successfully supported the adoption of energy efficiency measures in more than 70 buildings in London by providing debt financing¹¹. Highlights from these interventions include the installation of pioneering energy-saving measures (e.g. waste heat recovery) and retrofit for the Tate Modern and Tate Britain art galleries. A regeneration project of 15 000 residential units was undertaken in the Greenwich Peninsula. Finance was also provided for a district heating network that would provide heating and hot water to homes and businesses in the Lee Valley.

The FEF has already invested in seven projects¹². Through its financing, biogas plants will be developed in Dagenham and Enfield. FEF also supported the development London's first plastic recycling plant. Located in Woolwich, it can process around 20 000 tons of post-consumer bags and films annually.

⁹ Mayor of London (2015).

¹⁰ The London Energy Efficiency Fund (LEEF) was initially focused on supporting large-scale decentralized systems and district heating networks; however due to results from soft market testing and a change to Regulations, LEEF's focus changed to retrofitting of public buildings and social housing. Decentralized energy projects could still be funded after case by case approval of the Investment Board. The third UDF (GSHF) was created to broaden the delivery structure of the fund and implement energy efficiency measures in social housing.

¹¹ Amber Green (2012).

¹² Foresight Group.

The GSHF has supported sustainable social housing by investing in three registered providers of social housing¹³. Investment by this fund has supported the refurbishment of over 2 500 properties. Properties were made more environmentally friendly by improving insulation (e.g. solid walls, triple glazing), replacing boilers and installing air source heat pumps.

Additionally, the development of the LGF demonstrated the ability to construct a financial instrument with a limited scope that would still result as attractive to the private sector and could represent a step change in green infrastructure in London.

Projects supported by the LGF can set the baseline for a transition to a low-carbon economy in the city. Results from these projects will have a direct contribution to London's environmental goals, by cutting carbon emissions from the industrial and housing sectors and reducing waste.

3 Conclusions

The LGF was innovative at using a financial instrument (in the form of a holding fund) to de-risk the environmental sector and unlock its potential contribution to London's carbon mitigation targets. The development of the LGF also proved that despite having a small geographic focus and niche investment area, a fund can still be attractive for investors if an innovative design is backed up by experienced managers.

A critical success factor for the LGF was the identification of a financial market gap and its relationship with local and regional environmental targets and funding initiatives. The LGF was effective at securing funding by tapping a shared objective: cutting carbon emissions from the UK's capital. By having public interests together, the LGF became the right initiative to fill the market gap, attracting private investors to green infrastructure projects in London.

Despite its early success, the LGF still faces a series of challenges ahead. Financial instability in the region, and potential backlash from investors and managers due to unprecedented political conditions (e.g., Brexit) are the most relevant ones. The latter could cause important structural changes in the structure of the fund, including managers and funding sources. Ensuring an efficient management of proceeds from investments and interest earned on un-invested capital, along with an effective monitoring of the performance of the fund should be a priority.

Lessons learned from the LGF can be extended to other cities, particularly those in Europe as key funding sources could also be applicable (e.g. ERDF, ELENA). The establishment of UDFs as individual revolving funds under a holding mechanism could also be replicated in other cities. This financial structure could provide the right ecosystem to fund different environmental projects in the long term.

Having secured more than GBP 500 million in funding for green infrastructure projects, the LGF is an important stepping stone for future investment in the city. Further investment in the fund, along with the implementation of similar initiatives will be key to achieving environmental targets and position London as a world leading low-carbon capital by 2025.

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GB	Anglija	FTSE 100
JP	Šiaurės Amerikos	Nikkei 225



Conclusion



Conclusion

Working Group 3 (WG3) discussions and case studies unequivocally reveal the importance of innovation and participation in smart sustainable cities. The following conclusions are based on the deliberations and work carried out by WG3.

- Enhancements in innovation and participation have a far-reaching positive impact on society, economy and the environment.
- The diffusion and uptake of ICT-based digital technologies enable tremendous opportunities for changing the way that cities are governed and the way the public sector functions and delivers services.
- Public services should be digitally provided in a convenient, easy-to-use manner anytime and anywhere, easing the lives of individuals and businesses residing in the city.
- Public services should be provided effectively and efficiently by digitizing, streamlining, simplifying and redesigning public sector processes.
- Public services should target high levels of digital adoption (uptake) by realizing the potential of digital public services while boosting the return on investments for digital transformation.
- Smart sustainable cities should consider providing shared services / solutions in order to create operational efficiencies through savings in public funds. They can create significant fiscal advantages for public sector organizations by leveraging the synergies inherent in them.
- Smart sustainable cities should provide open data to enable easy and convenient access to city information; and to also encourage innovation and value creation by various constituents of the city, including public and private sectors, as well as academia and NGOs.
- Smart sustainable cities should formulate and implement policies and initiatives to achieve high levels of inclusive and sustainable economic growth.
- Policies and regulations supporting innovation and entrepreneurship will be conducive to economic growth, resulting in added economic value. Smart sustainable cities should target removing barriers and impediments to innovation and entrepreneurship in order to enable new products and processes, new companies and business models, and new industries and sectors, which in turn will enhance economic competitiveness. Successful innovation will also create new job opportunities and help reduce unemployment rates in cities.
- Smart sustainable cities should devise creative and alternative smart financing mechanisms; they should explore these alternatives through close collaboration between public and private sectors, where feasible.
- Smart sustainable cities have an enormous opportunity to engage their citizens during the formulation, design and even implementation of urban projects. Since most of these projects ultimately target citizens in cities, participation and engagement of citizens will ensure early buy-in and will also increase the likelihood of their success.
- Smart sustainable city solutions ultimately address and meet the needs of people living in a city (as consumers of solutions) and tend to have a fairly wide scope encompassing various economic, social and daily activities. Furthermore, these solutions are formulated and provided by people working in related public and private sector organizations (as providers of solutions). Hence, they are provided for the people and by the people.
- Smart sustainable cities should aim to equip its people with the right skills and capabilities to ensure their wellbeing and economic prosperity as city residents.
- Skills of people in cities are key enablers for smart sustainable cities. Rapid advances in technology and innovation necessitate continuous skills refinement, enhancement and upgrading. Building an appropriate pipeline of skills is essential to meet cities' future skills needs to ensure sustainability.

United for Smart Sustainable Cities
Enhancing Innovation and Participation

- Smart sustainable cities should aim sustainable and inclusive city solutions, services, policies and governance while ensuring high levels of stakeholder participation and engagement.
- Enhancing people's skills and ensuring their engagement and participation will contribute to innovation and also expedite societal adjustment to innovation in smart sustainable cities.

Enhancing innovation and participation in a city maximizes its social, economic and environmental potential while concomitantly boosting its sustainability.







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