Mobile Governance for Vanuatu – Strategy and Implementation Plan

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Executive Summary

This report is the last of three main deliverables produced by the project "Developing M-Governance Strategy for Vanuatu and Commonwealth m-Governance Toolkit":

1. Mobile Governance for Small Island Developing States – Strategy Knowledge Base
    (Henning and Janowski, 2014)
2. Mobile Governance for Small Island Developing States – Toolkit
    (Estevez and Janowski, 2014)
3. Mobile Governance for Vanuatu – Strategy and Implementation Plan
    (Henning, Janowski, Zoughbi and Estevez, 2014)

The report is based on the findings of the Mobile Governance for Development (MGOV4D) research and policy reviews and the resulting MGOV4D Strategy Knowledge Base for Small Island Developing States (SIDS) documented by Henning and Janowski (2014).

In particular, the report presents:

1. The policy and implementation contexts for MGOV4D development in Vanuatu including a detailed review of the five national policy instruments as well as challenges, solutions, approaches, capabilities and achievements of Vanuatu in ICT and MGOV development.
2. The localized version of the SIDS MGOV4D strategy knowledge base for Vanuatu, extended with strategies obtained as a result of the field visits and interviews with major government, non-government and private sector MGOV4D stakeholders from Vanuatu.
3. The content of the proposed national MGOV4D strategy for Vanuatu comprising the selection of strategies from the localized MGOV4D strategy knowledge base, depending on their contributions to various ICT and national development goals of the country.
4. An approach to MGOV4D strategy implementation including: implementation framework – principles, resources, processes, funding and management; an implementation plan; various tasks to be performed from selecting committee members, to mobilizing resources, to building awareness and human capacity; and the selection of priority projects.

The process of building the tailor-made MGOV4D for Vanuatu strategy has been generalized in the form of a toolkit (Estevez and Janowski, 2014) that can guide other Small Island Developing States in their efforts aimed at developing and implementing national MGOV4D strategies.

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Abbreviations

AC	Absorptive Capacity and Adoption
API	Application Programming Interface
AUSAID	Australian Agency for International Development
B2B	Business to Business
BC	Businesses-Focused Closure Projects
BO	Businesses-Focused Operation Projects
BS	Businesses-Focused Setup Projects
CERT	National Computer Emergency Response Team
CC	Citizen-Focused Civil Matters Projects
CD	Citizen-Focused Transport Projects
CE	Citizen-Focused Education Projects
CH	Citizen-Focused Health Projects
CM	Citizen-Focused Employment Projects
CO	Citizen-Focused Home Projects
CRP	Comprehensive Reform Program
CT	Citizen-Focused Travel and Tourism Projects
CTO	Commonwealth Telecommunications Organization
CW	Citizen-Focused Social Welfare Projects
DD	Design and Development
DM	Delivery Mechanisms
EGOV	Electronic Governance
ES	External Stakeholders
FAIDP	Framework for Action on ICT for Development in the Pacific
G2P	Government to Person
GNI	Gross National Income
GOV	Governance
GOV4D	Governance for Development
GPS	Global Positioning System
GSM	Global System for Mobile Communications
HC	Human Capacity
HIS	Health Information System
HISU	Health Information System Unit
HSS	Health Sector Strategy
HTML	Hypertext Markup Language
HW	Hardware
IADB	Inter-American Development Bank
ICT	Information and Communication Technology
ID	Identity
INF	ICT Infrastructure
IOP	Interoperability
IPB	ITU's ICT Price Basket

ISACA	Information Systems Audit and Control Association
ISP	Internet Service Provider
IT	Information Technology
ITU	International Telecommunication Union
KPI	Key Performance Indicator
L	Leadership
MGOV	Mobile Governance
MGOV4D	Mobile Governance for Development
NCSC	National Cybersecurity Steering Committee
NGO	Non-governmental Organization
OAS	Organization of American States
ODE	Office of Development Effectiveness
OGCIO	Office of the Government Chief Information Officer
PAA	Priorities and Action Agenda
PIV	Personal Identification Verification
PP	Top Priority Projects
SD	Sustainable Development
SDK	Software Development Kit
SEGP	Vanuatu Strategic e-Government Plan
SIDS	Small Island Developing States
SIM	Subscriber Identity Module
SMART	Specific, Measurable, Achievable, Result-oriented and Time-bound
SME	Small- and Medium-Size Enterprise
SMS	Short Message Service
SOE	Standard Operating Environment
SP	Strategy and Policy Framework
SS	Security Safeguards
SW	Software
UAP	Vanuatu Universal Access Policy
UN	United Nations
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNU	United Nations University
UNU-IIST	UNU International Institute for Software Technology
USSD	Unstructured Supplementary Service Data
VMGD	Vanuatu Meteorological and Geo-Hazards Department
VXML	Voice XML
WAP	Wireless Application Protocol
XML	Extensible Markup Language

1.   Introduction

The current report constitutes the third deliverable of the project "Developing M-Governance Strategy for Vanuatu and Commonwealth m-Governance Toolkit" and is focused on the development of a Mobile Governance (MGOV) strategy for Vanuatu.

The project was established as follows:

o   The Commonwealth Connects Steering Committee decided in January 2013 to develop an MGOV strategy for a Commonwealth small state, and based on this experience and the knowledge produced, to build a toolkit that could guide similar efforts in other Commonwealth small states.

o   The Commonwealth Telecommunications Organization (CTO) was mandated to develop the project, with Vanuatu selected as the target state for strategy development, and Small Island Developing States (SIDs) as the target country group for the toolkit.

o   CTO developed the Terms of Reference for the project (Commonwealth Telecommunications Organization, 2013) and in September 2013 contracted the United Nations University through its Center for Electronic Governance to carry out it out.

This report documents the systematic and rigorous process of developing the national Mobile Governance for Development (MGOV4D) strategy for Vanuatu, and the intermediate and final outcomes of this process. In line with this objective, the report has six goals:

1. To establish the state of MGOV research and discover major research findings in the area.
2. To establish the state of practice in the use of ICT and MGOV to contribute to national development through experiences of selected countries in similar conditions to Vanuatu.
3. To establish the policy and implementation contexts for MGOV4D development in Vanuatu including the review of national policy instruments and the implementation environment.
4. To develop the MGOV4D strategy knowledge base and to populate it with the strategies adopted by the countries in similar conditions to Vanuatu and the strategies derived from the field visits and interviews with major stakeholders from Vanuatu.
5. To select those strategies from the MGOV4D strategy knowledge base that can contribute to various ICT and national development goals established for Vanuatu, and could jointly constitute the national MGOV4D strategy for the country.
6. To outline a possible approach to MGOV4D strategy implementation including structures, processes and resources; and to populate the initial project portfolio with priority projects.

MGOV refers in this report to mobile-enabled governance in general, including concrete implementations, while MGOV4D refers to MGOV deployment that serves larger public policy and development goals. In the remainder of this report, Sections 2 to 6 fulfill goals 1 to 5, Sections 7 and 8 fulfill goal 6, and Section 9 provides some conclusions.

2.   MGOV4D Context of Vanuatu

Based on the review of the relevant policy documents and a series of interviews with various MGOV4D stakeholders from Vanuatu, this section presents the context and conditions for MGOV4D policy and its implementation in the country. The section is structured as follows. Section 2.1 covers background and methodology including collection, analysis and synthesis of the relevant data. Section 2.2 presents the country profile. Section 2.3 outlines the MGOV4D policy context including five related policy initiatives. Section 2.4 presents the outcomes of the interviews with various stakeholders from Vanuatu to outline the conditions for MGOV4D policy implementation. The final Section 2.5 provides some conclusions.

2.1. Method of Analysis

This section presents the methodology to guide the assessment of the goals and conditions of Vanuatu for development and implementation of the national MGOV4D strategy, as captured in the remainder of Section 4. It starts with two background sections covering mobile ICT (Section 2.1.1) and the relationship between ICT and development in SIDS (Section 2.1.2), followed by two sections focused on the collection and analysis of data from the relevant policy documents (Section 2.1.3) and from the interviews with major stakeholders (Section 2.1.4).

2.1.1. Background – Mobile ICT

Mobile technology has advanced in recent years towards providing more computing power, turning mobile phones into smart phones and enabling developers to come up with smart applications for them. Software design and development had to adapt accordingly, from individually programmed and downloaded apps to comprehensive mobile solutions including support to interoperability, cross-platform deployment and multichannel operations.

A mobile solution is best viewed as an integral information management system which can be constructed in a variety of ways, with diverse choices of networks, channels, back-end information systems, and enterprise architecture, devices and applications. Apart from data and information resources, a mobile solution comprises a set of jointly-managed applications. With a focus on clearly defined service goals, understanding technology options is central to effectively identifying and deploying affordable and sustainable mobile solutions.

Mobile channels play a significant role in the success of mobile solutions in general and MGOV applications in particular. The use of different channels including text, voice, web and others is necessary for accessibility. In particular:

o   *Voice* – Voice remains a key function for mobile solutions: it works on all telephony networks and all phones, it has great capacity for information exchange, it does not require literacy, it is familiar and trusted, and it can be easily developed in multiple languages not supported on all handsets. Voice XML (VXML) supports voice applications in the same way

that HTML supports visual applications. VXML documents are interpreted by any voice browser, allowing people to access the web using speech synthesis, pre-recorded audio and speech recognition, all supplemented by keypads and small displays.

o *Text* – Text is a popular channel to existing Internet-based EGOV: simple, low-cost, easy to use, supporting native languages, and relying on readily available infrastructure and devices. Mobile messaging and mobile email are emerging but core mobile applications.

o *Data* – Unstructured Supplementary Service Data (USSD), for example, is used for standard GSM devices and transferred directly over network signaling channels.

Facilitated by smart applications, devices and sensors, mobile solutions apply data channels to carry out application-to-person, person-to-application, person-to-person and even machine-to-machine message exchanges.

Other issues of concern for mobile solutions include:

1. *Mobile Device Management* – This entails enterprise-level configuration management and control of mobile devices by private sector operators or government bodies.
2. *Application Services* – This requires better tools to support the monitoring of processes, particularly those involving financial transactions between government and citizens, and guidelines for testing and vetting third-party applications distributed through app stores.
3. *Identity Access Management* – This requires proper implementation and support to user authentication tools, e.g. the Personal Identification Verification (PIV) standard.
4. *Improved Governance and Standards* – Joint government-industry efforts are required to bridge security gaps present in today's smart phones, tablets and other mobile devices, while continuing to identify policy and legal issues to accommodate and manage new technologies and to better fulfill mobile governance requirements.
5. *Interoperability* – The concept refers to the ability of two or more systems to exchange information and to use the information exchanged. It is particularly important for mobile solutions. The Wireless Application Protocol (WAP) is an important standard to support interoperability between mobile solutions, an open, global specification that empowers mobile users with wireless devices to easily and instantly access information and services.
6. *Location-based Mobile Services* – Leveraging GPS chips, they are becoming a significant aspect of mobile solutions and a prominent offering of major platforms.
7. *Other* – High cost of mobile infrastructure, particularly to connect remote communities, blackout areas for mobile signal in remote areas, and difficulties to ensure that users can retain their mobile numbers when changing from one mobile network operator to another.

2.1.2. Background – ICT and Development in SIDS

SIDS face a range of economic, social and environmental challenges which largely set them apart from other developing countries: small land size but often spread over a vast ocean area,

small but rapidly growing population, high degree of economic openness and vulnerability, lack of diversification and economies of scale, excessive dependence on a few exports and imports, remoteness, susceptibility to natural disasters, high transportation, communication and energy costs, and expensive public administration and infrastructure. Such common challenges were highlighted by the analysis of the national development efforts by the five SIDS in Henning and Janowski (2014, Section 3.2): Vanuatu, Samoa, Fiji, Kiribati and Nauru.

As SIDS respond to a common set of development challenges, ICT policies adopted by them would likely be similar or at least result from a similar thinking process. Therefore focusing on the comparison between ICT policies adopted by different SIDS is important to understand why, how and to what extent they are incorporating ICT in their national development agendas. Comparison between ICT and national development policies for the case of India and four SIDS: Mauritius, Micronesia, Singapore and Malta, was carried out in Henning and Janowski (2014, Sections 3.3 and 3.4).

However, as national ICT policies may be unavailable for some states, ICT policy analysis could refer more broadly to ICT policies, strategies and plans. In addition, while the integration of ICT with national development agendas is a key requirement, only 6 out of 22 SIDS specifically identify how their ICT policy objectives link to their national development plans (Panel on ICTs and Small Island Developing States, 2012). Among such SIDS, the most common areas for action are EGOV, telecommunication infrastructure, education, human resources and legal and regulatory environment. While EGOV is considered a priority, it is often restricted to public service delivery, with little attention to political participation and decision making.

2.1.3. Data Collection and Analysis – Policies

For the purpose of policy consistency and contextual relevance, the Vanuatu MGOV4D Strategy should be tightly aligned with existing policies, capabilities and needs of Vanuatu. To this end, a comprehensive review of the MGOV4D policy context for Vanuatu was carried out. First, the review identified five national policy instruments relevant to the MGOV4D strategy context:

1. Vanuatu Priorities and Action Agenda 2006-2015 (Government of Vanuatu, 2006)
2. Vanuatu Strategic e-Government Plan (Government of Vanuatu, 2011)
3. Vanuatu National ICT Policy 2013 (Government of Vanuatu, 2013a)
4. Vanuatu Cybersecurity Policy (Government of Vanuatu, 2012)
5. Vanuatu Universal Access Policy (Government of Vanuatu, 2013b)

Second, the review summarized the key objectives, priorities and goals set forth by these instruments, paraphrasing them in parts but staying as identical as possible to their original wording. Third, the findings were directly incorporated into the Strategy Architecture Matrix, described in Section 4, to inform and ensure context-specificity of the strategy development.

2.1.4. Data Collection and Analysis – Interviews

While the policy review focused mainly on identifying and incorporating into the MGOV4D strategy the relevant goals, the interviews were intended to find out the conditions in Vanuatu for implementing this strategy – problems, solutions, approaches, capabilities, achievements – as well as identifying additional goals not captured by the policy review.

To this end, a series of 16 field interviews were organized with various government (8), financial (3), non-government (2) and private sector institutions (3) from Vanuatu all with major stake in the MGOV development for the country. The interviewed institutions were as follows:

1. Agricultural Research Centre, Ministry of Agriculture
2. Civil Registry Office, Ministry of Internal Affairs
3. Department of Strategic Planning and Aid Coordination, Office of the Prime Minister
4. Financial Intelligence Unit
5. Land Administration Unit, Ministry of Land Administration
6. Office of the Government Chief Information Officer, Office of the Prime Minister
7. Telecommunications and Radiocommunications Regulator
8. Vanuatu Cultural Center
9. National Bank of Vanuatu
10. Reserve Bank of Vanuatu
11. Vanuatu National Provident Fund
12. Council of Women
13. Pacific Institute for Public Policy
14. Digicel Telecom Company
15. Interchange Ltd.
16. TelSat ISP Company

The interviews were conducted through one-on-one discussions with key staff from these institutions. The interviews were partly guided by the protocol relying on the MGOV framework from Section 2.4 to carry out needs assessment along the four dimensions of the framework, identify high-impact strategies and initiatives, and point out possible implementation issues.

The interviews were directly reported by note-taking. The notes were reviewed, analyzed and summarized after every interview. At the end, all summaries were combined and categorized and used as input to the Strategy Architecture Matrix, described in Section 5, to inform and ensure context-specificity of the strategy development.

2.2. Vanuatu Country Profile

The Republic of Vanuatu is a Small Island Developing State located in the South Pacific, north of New Zealand, west of Fiji, east of Australia and south-east of the Solomon Islands. Vanuatu was known as the New Hebrides until the country won its independence from Britain and France in

1980. The country comprises 82 islands, 65 inhabited, with the area of 12,190 sq. km. The 2,528 km long coast line provides ample opportunities for fishing and tourism. The capital city is Port Villa. Figure 1 below depicts the location of Vanuatu in the South-West Pacific region.
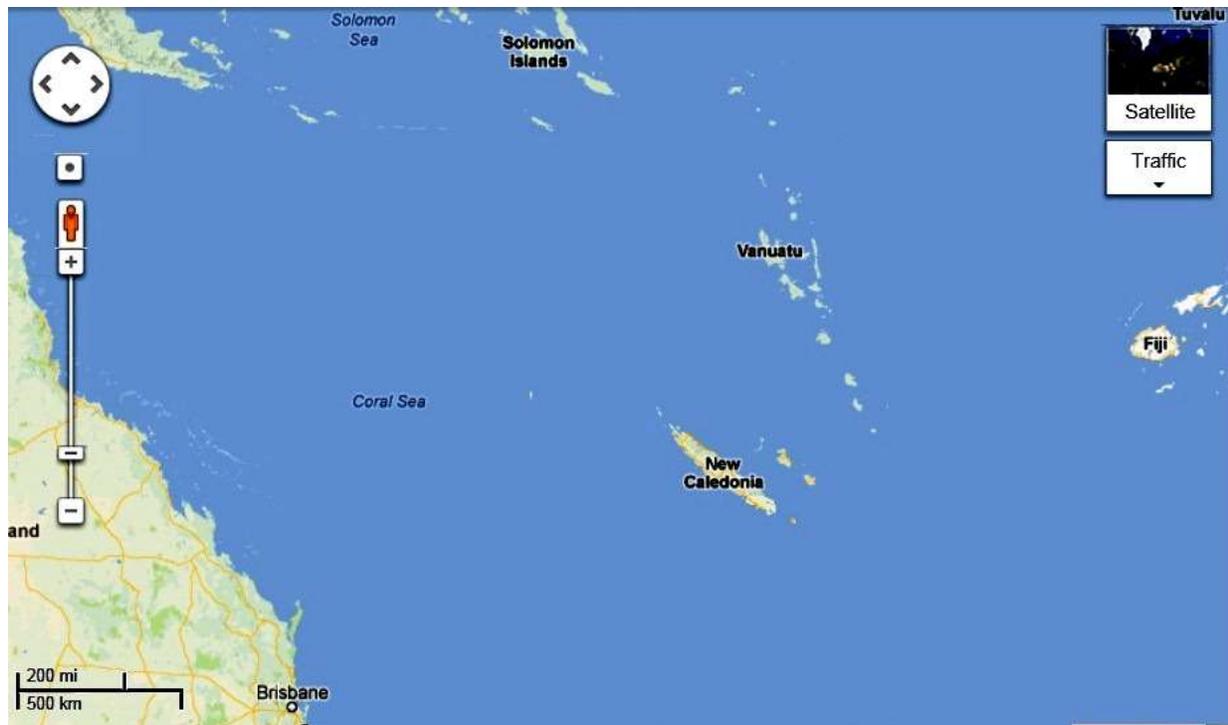
Figure 1: Map of South-West Pacific

According to the July 2013 estimates, the population of Vanuatu was 261,565, including 58 percent below 25 years of age. The people are ethnically Ni-Vanuatu (99 percent) natives with more than 80 percent Christians. 72.6 percent of the population speaks primarily one between 100 and 160 local languages; there are as many local cultures. The remaining population speaks pidgin known as Bislama (23.1 percent), English (1.9 percent) and French (1.4 percent). However, partial or basic knowledge of Bislama, English and French is more widespread than these figures would indicate. The estimated rate of urbanization between 2010 and 2015 is 4.2 percent annually but only 26 percent of the population lives in urban areas.

Vanuatu is a parliamentary democracy with a written constitution, 54-member Parliament elected by every five years by the popular vote, head of state (President) elected by provincial heads, head of government (Prime Minister) elected by the majority vote by members of the Parliament, and the Council of Ministers appointed by the Prime Minister. Votes of no confidence can and often do lead to changes of government every one to three years, before the five year term of office. Besides the formal political system, Vanuatu has the traditional system of chiefs at the village and province levels.

Vanuatu is divided administratively into six autonomous provinces: Malampa, Penama, Sanma, Shefa, Tafea and Torba, each headed by an elected provincial council. In turn, provinces are divided into municipalities which usually consist of individual islands, each headed by an elected council. Provinces collect local taxes and make by-laws in local matters. See Figure 2.

Figure 2: Map of Vanuatu

Vanuatu's economy is based upon small-scale agriculture which provides a living for about two-thirds of the population. Other productive economic sectors are tourism – over 200,000 tourists visit Vanuatu annually, and small light industries that cater to the local market. Tax revenues come mainly from the import duties. Economic development is hindered by the dependence on relatively few commodity exports, vulnerability to natural disasters, and long distances from the main markets and between the islands. Two thirds of the labor force works in agriculture, and the remaining third in the service sector. The health expenditures in the country are only 4.1 percent of the GDP (2011) with three physicians for every 20,000 people and two beds per 1,000 people. Education expenditures are less than 6 percent of the GDP, with 83.2 percent of the population of age 15 and over able to read and write. The natural resources include manganese, hardwood forests and fish. The arable land does not exceed 1.64 percent and the permanent agricultural crops constitute about 10 percent of this area.

Vanuatu is one of the countries generating the least electricity in the world per capita. According to the 2010 estimates, the country generates 55 million kWh and consumes 51.15 million kWh. However, this does not indicate that the country is energy-self-sufficient as many island communities do not have any access to electricity. Only the two towns Port Vila (population 40,000) and Luganville (population 12,000) and some of the areas nearby have access to mains electricity, which is provided by a private French monopoly. Electricity is generated locally, mostly from fuel fossils; imported refined petroleum covers 72 percent of the consumption. Vanuatu also has some of the highest electricity prices in the world per KwH.

2.3. Vanuatu MGOV4D Policy Context

This section reviews the Vanuatu policy context as relevant to the development and implementation of the country's MGOV4D strategy; see Figure 3.
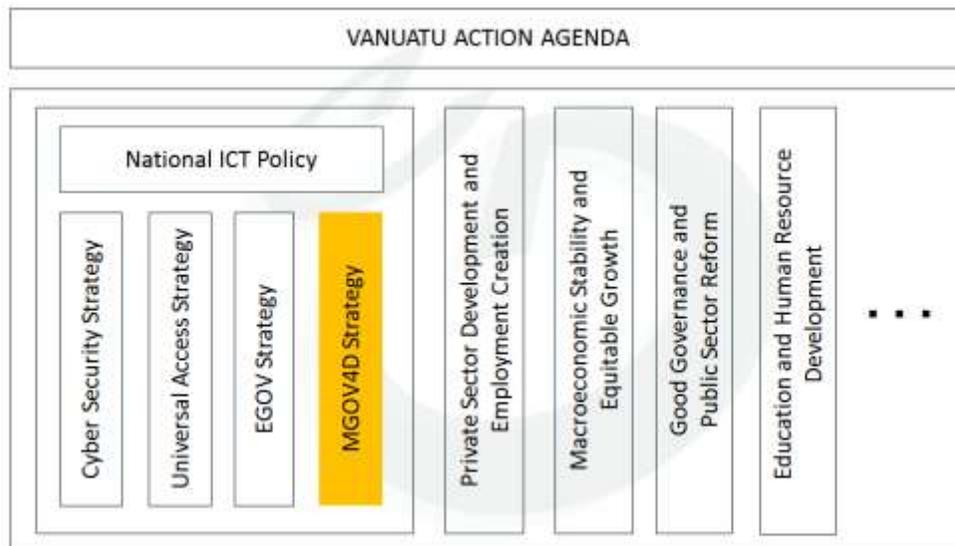
Figure 3: MGOV4D Policy Context for Vanuatu

According to Figure 3, the MGOV4D strategy is directly supporting the implementation of the National ICT Policy along with EGOV, Universal Access and Cyber Security strategies, which in turn responds to the development needs of the country captured by the Vanuatu Priorities and Action Agenda. In remainder of this section, the Vanuatu Priorities and Action Agenda is outlined in Section 2.3.1, Vanuatu National ICT Policy in Section 2.3.2, Vanuatu Strategic e-Government Plan in Section 2.3.3, Vanuatu National Cyber Security Policy in Section 2.3.4 and Vanuatu Universal Access Policy in Section 2.3.5.

2.3.1. Policy 1 – Vanuatu Priorities and Action Agenda

The current Priorities and Action Agenda (PAA) follows the first agenda established in 2003. The PAA covers the period from 2006 to 2015. It was updated in 2010 to address governance issues. The PAA is situated within the larger development policy context, commenced in 1997 by means of the Comprehensive Reform Program (CRP). It integrates and prioritizes action agendas from the on-going development programs including CRP, Business Forum Outcomes and Rural Economic Development Initiatives. The stated goal of the PAA is to raise the welfare of the people of Vanuatu and its overall vision is "A Just, Educated, Healthy and Wealthy Vanuatu".

To this end, the PAA sets forth three major strategies (Government of Vanuatu, 2006):

o   Achieving higher and sustainable economic growth to create jobs and raise incomes while conserving resources for future generations;
o   Ensuring macroeconomic stability to create a stable investment climate; and
o   Raising the standards of service delivery, particularly in the rural and outer regions in order to improve access to basic health and primary education services while lowering the cost of internal trade.

Together with these strategies, the PAA specifies seven key priority areas, each accompanied by a number of policy objectives and strategic priorities (Government of Vanuatu, 2006):

1. *Private Sector Development and Employment Creation* – The objectives under this priority include: lowering the costs of business; providing better support services to business; creating more employment opportunities; improving access to rural financial services; ensuring equitable and sustainable land development while protecting the heritage for future generations; increasing tourism; and enhancing trade and industry performance.
2. *Macroeconomic Stability and Equitable Growth* – The objectives include: re-prioritizing expenditures and maintaining a sustainable fiscal balance; reducing debt and minimizing subsidies paid to public enterprises; maintaining sound and stable monetary policy; and promoting equitable and sustainable growth through the implementation of the PAA policies to improve services, infrastructure and the environment for private sector development.
3. *Good Governance and Public Sector Reform* – The objectives include: providing policy stability; building and maintaining stable institutions; developing productive public sector; promoting gender equality; and empowering women.

4. *Primary Sector Development (Natural Resources and the Environment)* – The objectives include: increasing production and productivity in the primary sector to increase and sustain incomes and livelihoods; increasing the market access in agriculture, livestock, fisheries and forests; increasing the quality, safety and competitiveness of agriculture, livestock, fisheries and forest products; strengthening the regulatory and institutional arrangements, policy development, coordination, implementation and monitoring of the primary sector; protecting and conserving natural resources and biodiversity including climate change issues; and preparing the population to face disasters.

5. *Provision of Better Basic Services (Especially in Rural Areas)* – The objectives include: improving the health of the population; ensuring equitable access and improving the quality of health services; promoting good management and effective use of resources.

6. *Education and Human Resource Development* – The objectives include: improving equitable access to education and ensuring gender and rural-urban balance; raising the quality and relevance of education; improving and strengthening the management of the education sector; nurturing educational and sustainable livelihood opportunities for the youth; and developing and implementing a national human resource development plan.

7. *Economic Infrastructure and Support Services* – The objectives include: ensuring the provision of accessible quality infrastructure, utilities and services through public enterprises or private sector partnerships and competition; reducing the price of utility services; optimizing subsidies for the shipment to the remote areas; and ensuring that economic infrastructure and support services are available to other sectors.

2.3.2. Policy 2 – Vanuatu National ICT Policy

The Vanuatu National ICT Policy was adopted on 7 November 2013.

The objective of the policy is

> *To maximize the contribution, efficiency and effectiveness of information and communication technologies in achieving the National Vision of 'A Just, Educated, Healthy and Wealthy Vanuatu', thereby empowering and benefiting every citizen and resident of Vanuatu (Government of Vanuatu, 2013a).*

The policy is well-aligned with the global, regional and national policy contexts:

o *Global Policy Context* – Following the 2012 UN Resolution 67/195, the Vanuatu ICT Policy recognizes that "information and communications technologies have the potential to provide new solutions to development challenges, particularly in the context of globalization, and can foster sustained, inclusive and equitable economic growth and sustainable development, competitiveness, access to information and knowledge, poverty eradication and social inclusion that will help to expedite the integration of all countries, especially developing countries, in particular the least developed countries, into the global economy" (United Nations, 2012). The policy also explicitly aims to contribute to the

achievement of the Millennium Development Goals, especially Target 8.F: "[i]n cooperation with the private sector, make available the benefits of new technologies, especially information and communications" (Government of Vanuatu, 2013a).

o *Regional Policy Context* – The Vanuatu ICT Policy is well-aligned with the 2006 Pacific ICT Minister's Wellington Declaration and 2010 Framework for Action on ICT for Development in the Pacific (FAIDP). In particular, the Wellington Declaration states that "information and communications technologies (ICTs), while not an end in themselves, have a key role as a basis for economic development, while also promoting and enhancing social cohesion, cultural enrichment and environmental conservation" while FAIDP pursues the outcome of "enhanced social and economic sustainable development, good governance and security through better access and use of ICT" (Pacific ICT Ministers Tonga Declaration, 2010). In addition, the policy relies on the 2011 statement by Pacific Energy, ICT and Transport Ministers that the national ICT policies are key to utilizing ICT for development through multi-stakeholder partnerships and coordination, and explicitly states its purpose "to serve as a framework and tool for an effective coordination of efforts of various stakeholders towards achieving the overall objective" (Government of Vanuatu, 2013a).

o *National Policy Context* – The key national reference point for Vanuatu's ICT Policy is the PAA described above. In particular, the policy states that its overall objective reflects the commitment to contribute to all seven priority areas from the PAA.

Based on this context and Vanuatu's current situation and challenges, the ICT Policy specifies four criteria to determine policy priorities (Government of Vanuatu, 2013a):

1. Give impetus to socio-economic development that would not be achieved otherwise.
2. Produce a significant impact in terms of the matters addressed as well as the broader socio-economic development sought by the PAA.
3. Lower complexity and reliance on inputs from multiple stakeholders.
4. Rely as much as possible on ready demand and existing models of ICT development and implementation capacity.

The policy applied these criteria to determine eight priorities (Government of Vanuatu, 2013a):

1. *Access to ICTs in Education* – providing access to infrastructure, equipment, services and content to educational institutions and students.
2. *Access to ICT Infrastructure and Devices* – enhancing the availability and affordability of infrastructure and devices as well as related services, emphasizing demand-side measures, to enhance the resilience of the national ICT infrastructure and lower end-user costs.
3. *E-Government* – enhancing effective and cost-efficient use of ICT for government's internal administration, and interaction with citizens and other stakeholders.
4. *Integration of ICTs into Sectoral Policies* – realizing through the appropriate sectoral policies, the transformative use of ICT in all sectors, particularly in education, health, productive

sectors, transport (especially maritime), trade and attraction of foreign investment, gender equality, social equity, democratic participation, preservation and promotion of local culture (including arts), protection of the environment as well as disaster management.

5. *Building Trust (Mitigating Risks and Threats related to ICT Development)* – recognizing ICT risks such as harmful information, criminal and fraudulent activities, threats to information confidentiality and infrastructure and potential for disrupting social and economic life; and addressing these risks through preparedness, education and awareness-building.

6. *Locally Relevant Content* – increasing the availability of locally-relevant sustainably supported content, especially by making such content accessible in local languages.

7. *Capacity Building* – enhancing the skills necessary to utilize and develop ICT, especially in the delivery of public services.

8. *Platform for Multi-Stakeholder and Multi-Sector Coordination and Collaboration* – enabling a coordinated and self-organized ICT development process by setting up a platform for knowledge exchange among various stakeholders and sectors, while avoiding duplication and detecting synergies.

The ICT Policy also specifies 13 principles to enhance the achievement of the above-mentioned priorities by: 1) facilitating synergies among different strategies for achieving the priorities, 2) building on the previous achievements and c) employing the most affordable, efficient and effective solutions (Government of Vanuatu, 2013a). The principles are:

1. *Multi-Stakeholder and Multi-Sector Collaboration* – based on procedural principles of transparency, stakeholder involvement, clear procedures, planning and accountability, promote a coordinated collaboration of various stakeholders including the government, private sector, civil society (NGOs and churches), communities and custom chiefs, international and regional institutions, development partners, academia and users.

2. *Pragmatic Approach* – take an ambitious but pragmatic approach to implementing the ICT Policy, particularly by: using appropriate, efficient and effective technologies and services; having reasonable expectations of access and reliability of the ICT infrastructure; taking an add-on approach to existing infrastructure; and disseminating and diffusing the projects outwards from the center towards remote areas.

3. *Private, Locally-Based, Sector Driven Development* – employ the private sector as the engine for ICT-driven development for instance by: limiting government intervention and supporting private sector initiatives with long-term benefits and public value; supporting a Universal Access Policy based on the "play, don't pay" approach where instead of levies, the private sector is requested to make ICT accessible beyond profitable areas; and encouraging joint ventures between foreign investors and private sector partners.

4. *Sustainable Best Practice ICT Sector Governance* – promote ICT sector regulation through an independent regulatory authority, free from political or private interference in its daily activities, but held accountable for its activities by means of continuous reporting and judicial review; and the provision of consistent, impartial and effective guidance to the regulator by the government through the enabling policy environment to confine the regulator's activities according to the legislative background.

5. *Fair and Effective Competition and Enhancement of Economies of Scale* – achieved by government acting as a prudent and responsible buyer; favoring demand-side over supply-side interventions except when the welfare-enhancing advantage of the latter can be clearly demonstrated; refraining whenever possible from the government competing with the private sector; reducing service costs through economies of scale by minimizing market fragmentation and by private-public sector collaboration; and developing effective solutions to embrace the benefits and address the challenges introduced by the internationalisation of the domestic ICT market.

6. *"Squeezing-the-Assets" and "Thinking-of-a-Greater-Good"* – minimize costs and maximize utilization of ICT investments by expanding access to ICT by enhancing the usage of existing infrastructures and maximizing cross-utilization of ICT facilities by considering the greater good such as positive externalities of multi-stakeholder ICT investments.

7. *Kick-Starting Sustainable Development* – designing government interventions to overcome initial investment barriers and create impetus for development that can be continued by other, e.g. private stakeholders, to make efficient use of the scarce public funds.

8. *Subsidiarity and Stakeholder Ownership and Drive* – leveraging the expertise and interest of the local stakeholders by, wherever possible, limiting government action to only those tasks that cannot be performed more effectively by the local stakeholders; ensuring demonstrable support from the local communities; and ensuring that the stakeholders have a clear stake in the policy outcomes, that they make a substantial contribution to the projects, and that they have substantial freedom to carry out their activities and receive appropriate support from government to do so.

9. *Policy as a Process* – ensuring the constant adaptability of the ICT Policy by integrating policy design and implementation into a cohesive process with built-in feedback loops.

10. *Integration into the Work as Usual* – designing ICT policy not as a standalone instrument, but as an integral part of policy making in all sectors relevant to socio-economic development, using existing institutional, political, community-based etc. structures.

11. *Socially Inclusive and Equitable Development* – designing ICT-enabled initiatives to achieve equitable benefits across all groups in the society, particularly for the vulnerable groups, and doing this through non-targeted interventions.

12. *Being a Responsible Member of the International and Regional Community* – observing international and regional commitments of Vanuatu in the ICT area, coordinating and aligning its actions with international partners and organizations, learning from international best practices, and utilizing the synergies with the international community whenever appropriate, with due regard to own national priorities and available resources.

13. *Prioritizing the Priorities* – identify and work on a limited number of realistic priorities over an extended period of time to ensure stability and achievement of tangible results.

14. *Utilization of Appropriate Tools* – utilize appropriate tools for implementing the ICT Policy, suitable to specific aims and initiatives, least interventionist, most effective and cost-efficient, most sustainable, most fitting with the principles set out in the policy, and maximizing long-term returns from respective initiatives.

The ICT Policy assigns responsibility for its implementation to the following stakeholders: 1)

Prime Minister; 2) multi-stakeholder National ICT Development Committee; 3) Office of the Government Chief Information Officer; 4) Telecommunications and Radiocommunications Regulator; 5) responsible ministries, departments, and constitutional and statutory entities; and 6) other stakeholders holding responsibility in respective areas. The implementation is to be funded through the funds made available by the respective stakeholders including regular ministerial budgets, ICT Development Fund and Universal Access Policy fund.

The implementation of the ICT Policy is to adopt a programmatic approach supported by: 1) a consolidated list of strategies, 2) implementation plan, 3) issue- and sector-specific policies and strategies, 4) corporate and business plans and 5) expenditure frameworks and budgets. In addition, the policy is supported by a monitoring and evaluation framework under the supervision of the National ICT Development Committee, which is also responsible for documenting the progress in policy implementation through annual reports.

2.3.3. Policy 3 – Vanuatu Strategic e-Government Plan

Vanuatu's Strategic e-Government Plan (SEGP) was developed in 2011 under the auspices the Department of Finance and Treasury of the Ministry of Finance and Economic Management, against the background of the 2011 Vanuatu ICT Services Policy, the PAA and the Millennium Development Goals. In this context, SEGP was set up as a vision and action plan to guide the Vanuatu Government's ICT activities over the period 2011-2013. Specifically, its purpose was threefold: 1) to define a strategic framework for Vanuatu government's ICT architecture and services; 2) to define an institutional structure for the Government's ICT efforts; and 3) to identify key initiatives towards the national ICT policy goals (Government of Vanuatu, 2011).

In terms of strategic framework, SEGP adopts seven objectives (Government of Vanuatu, 2011):

1. Develop systems and processes to ensure transparency, accountability and accessibility of government programs
2. Optimize the use of the government's human and financial resources through ICT so as to maximize effective delivery of public goods and services and reduce costs
3. Maximize the availability of public information and services through remote access
4. Ensure effective balance between manual and automated processes in government systems through the use of ICT
5. Ensure that all government office employees are trained in the use of ICT and integrate ICT in their daily work
6. Ensure that all government institutions have ICT policies and programs incorporated into their short and long-term development plans
7. Maximize the use of ICT to ensure corporate governance, transparency and compliance

At the center is the ultimate outcome "Good Governance" goal, situated at the intersection of three outcomes (Government of Vanuatu, 2011): 1) effectiveness and efficiency in government operations and service delivery, 2) affordable and convenient access to relevant government services and 3) full transparency and accountability in the management of public resources.

In order to prescribe how these outcomes are to be achieved, SEGP specifies three program components (Government of Vanuatu, 2011): 1) Leadership and Governance, 2) Delivery Capability and Processes, and 3) Infrastructure and Applications; and 11 guiding principles (Government of Vanuatu, 2011): 1) citizen-focused, 2) business-focused, 3) transformational, 4) partnership-based, 5) efficient, 6) integrated, 7) results-oriented, 8) standards-based, 9) secure, 10) private and 11) transparent.

SEGP also specifies institutional structure for the government's ICT efforts. As the key ICT functions it identifies: 1) policy-making, 2) regulation, 3) EGOV, 4) e-enablement and capacity building and 5) sectoral development (Government of Vanuatu, 2011). As the key ICT entities it defines: 1) Telecommunications and Radiocommunications Regulator; 2) National ICT Services Steering Group; 3) Government ICT Officers Forum and 4) Office of the Government Chief Information Officer; the latter further divided into six divisions: 1) Program Management; 2) Planning and Policy; 3) e-Government Services; 4) Infrastructure and Technology; 5) e-Enablement; and 6) ICT Sector Development (Government of Vanuatu, 2011).

Finally, SEGP identifies a set of five EGOV development initiatives in order to complete and sustain the government's enterprise architecture (Government of Vanuatu, 2011): 1) complete the establishment of the institutional framework, 2) creating an immediate value and ensure the sustainability of the EGOV infrastructure, 3) establish the ICT governance practice, 4) manage ICT investments and 5) establish the EGOV applications portfolio.

2.3.4. Policy 4 – Vanuatu National Cyber Security Policy

The National Cybersecurity Policy for Vanuatu was developed by a multi-stakeholder group under the auspices of the Prime Minister in 2012. The policy was aligned with the ITU Global Cybersecurity Agenda, and in direct reference to the National ICT Policy, particularly to Priority 5 "Building Trust (Mitigating Risks and Threats related to ICT Development)".

The purpose of the Policy is to set out the goals, policies and objectives for maximizing the safety and security in relation to ICT and for achieving the National Cybersecurity Vision:

> *Citizens of Vanuatu, tourists, businesses and government to enjoy the full benefits of a safe, secure and resilient cyber space enabling them to get access to knowledge and share information while understanding and addressing the risks, to reduce the benefits to criminals (Government of Vanuatu, 2012).*

The Policy identifies five goals towards the achievement of this vision, each consisting of a set of individual objectives (Government of Vanuatu, 2012):

1. *Develop the necessary organizational structures with a focus on utilizing existing structures in Vanuatu as well as the region* – The objectives for this goal are to: 1) create the National Cybersecurity Steering Committee (NCSC) to coordinate the implementation of the

Cybersecurity Policy; 2) identify existing institutions that are currently active in the field of Cybersecurity; 3) identify local contact points in rural areas to collect inputs and spread information about Cybersecurity; 4) establish the National Computer Emergency Response Team (CERT) capable of dealing with relevant Cybersecurity threats; 5) create the child online protection working group to identify the areas of child online protection; 6) develop a strategy to encourage the reporting of Cybersecurity incidents; 7) develop law enforcement unit to serve as a single point of contact on Cybersecurity issues; and 8) carry out a coordinated survey of Cybersecurity and Cybercrime incidents.

2. *Defining the minimum Cybersecurity standards for critical infrastructure operations and providing Cybersecurity tools and services for citizens, businesses and government* – The objectives under this goal are to: 1) identify critical infrastructure operators and related risks; 2) develop minimum technical and organizational standards for such infrastructure and related control and evaluation mechanisms; 3) employ CERT to carry out assessment and development of minimum standards with regard to ICT operations by government; 4) provide basic services to citizens and businesses to address their Cybersecurity concerns; 5) require commercial Internet providers to, upon user request, restrict access and employ technical measures to block inappropriate content for children; 6) oblige commercial mobile communication providers to deliver upon user request SIM cards with restricted access to inappropriate services for children; and 7) employ CERT to develop routines to detect recent trends in relation to Cybersecurity incidents.

3. *Strengthening the legal framework to meet the highest regional and international standards with regard to the protection of fundamental rights as well as criminalization, investigation, electronic evidence and international cooperation* – The objectives for this goal are to: 1) carry out a review of existing legislations related to Cybersecurity and Cybercrime under the supervision of NCSC and 2) based upon this review prepare a draft legislation in this area.

4. *Raise the level of knowledge about Cybersecurity and ways to protect against cyber threats among citizens and businesses of Vanuatu* – The objectives for this goal are to: 1) develop a curriculum to ensure that all students at primary and high schools receive at least once a year an updated training on Cybersecurity; 2) identify cooperation partners, e.g. chiefs in rural areas to support capacity building initiatives; 3) develop a sustainable training program for police, customs and other law enforcement services, Financial Intelligence Unit and the judiciary; and 4) develop a national Cybercrime prevention strategy.

5. *Responding to the global nature of Cybersecurity threats by strengthening the ability of Vanuatu to participate in international cooperation against such threats* – The objectives for this goal are to: 1) ensure that the Vanuatu's legal framework is fully in line with international best practices; 2) require NSCS to recommend access to relevant international or regional agreements and processes of developing standards for Vanuatu to participate; and 3) require NSCS to provide a list of Cybersecurity capacity building programs that Vanuatu could benefit from.

In term of implementation, the coordination and monitoring of the Cybersecurity Policy implementation is assigned to the National Cybersecurity Steering Committee which consists of the public and private sector stakeholders. The policy also assigns responsibility to the Directors General in all ministries for developing action plans to achieve its objectives.

2.3.5. Policy 5 – Vanuatu Universal Access Policy

Vanuatu's Universal Access Policy (UAP) is directly linked to the 2013 National ICT Policy. As such, it supports the overall ICT vision and particularly the achievement of Priority 2 "Access to ICT Infrastructure and Devices". To this end, the policy specifies: 1) the required level of access to telecommunications services and 2) the prices of telecommunications services.

With regard to the level of access, the policy prescribes that by 1 January 2018, 98 percent of the population will have access to voice, narrowband data services such as text messaging, and broadband services of at least 21Mbps download and 12 Mbps upload speeds, and these telecommunications services will comply with the minimum standards prescribed by the Regulator. The Policy specifies that these services shall be accessible in particular to all educational and health facilities and public offices (Government of Vanuatu, 2013b).

With regard to the prices of telecommunications services, the policy prescribes that such services shall be available at geographically-uniform prices, at the level of an effectively competitive market, with exception to favorable pricing for educational, health and public office facilities (Government of Vanuatu, 2013b).

The Regulator carries the responsibility for the implementation, enforcement, monitoring and reporting of the policy. The policy gives specific rights to the Regulator to carry out these tasks, in particular the right to issue decisions, orders and regulations, to make amendments to licenses, and to make appropriate agreements with the service providers to support the policy. The policy also assigns the responsibility to the Regulator for the UAP fund, to ensure that the fund is administered in an open, transparent and accountable was and in compliance with best practices. The Regulator also has the power to collect levies for the UAP fund and to provide subsidies out of this fund, primarily to subsidize the provision of the passive infrastructure that would be used by the service providers on an open, shared and non-discriminatory basis. As the main responsible actor for the implementation of the policy, the Regulator is also to provide reports to the Minister and the public (Government of Vanuatu, 2013b).

2.4. Vanuatu MGOV4D Policy Implementation Context

This section summarizes the outcomes of the interviews carried out with different stakeholders from Vanuatu to understand the conditions for implementing the MGOV4D strategy for the country. The interviewed stakeholders included government, financial, non-government and private sector organizations. The list of the interviewees and the method of conducting the interviews are outlined in the earlier Section 2.1.4. The MGOV4D implementation conditions

discovered during the interviews are described in the remainder of this section covering: facts and figures (Section 2.4.1), challenges (Section 2.4.2), solutions (Section 2.4.3), approaches (Section 2.4.4), capabilities (Section 2.4.5) and achievements (Section 2.4.6).

2.4.1. Facts and Figures

Beyond the country profile outlined in Section 2.2, the interviews produced a number of general and ICT-related facts and figures about Vanuatu that may influence the implementation of the MGOV4D strategy in the country.

General facts and figures:

o 43 percent of the population of Vanuatu is illiterate but various studies, press reports and anecdotal evidence put the illiteracy rate at anywhere from 25 percent to 65 percent; to date no truly reliable definition and study has been undertaken. Basic numeracy is also low.
o 70 percent of the illiterate Vanuatu population are women.
o 20 to 25 percent of students graduating from primary school continue to secondary school.
o 60 percent of Vanuatu woman face domestic and other forms of violence.
o 70 percent of the population of Vanuatu live on the outlying islands.
o 70-80 percent of the land of Vanuatu is custom-based and un-surveyed.
o Large parts of the population of Vanuatu is undocumented and has no bank accounts. In particular, an estimated 20-30 percent of children in rural areas and outer islands do not receive birth certificates at birth, and often not until they enter the school system, and sometimes not even then. In addition, a substantial portion of the rural and outer island population do not have bank accounts, and few have credit cards.

ICT-related facts and figures:

o 50 percent of the population living on the outlying islands, almost all in small villages, have limited access to energy.
o Only fuel-based and solar energy are available on the outlying islands. Use of petrol-powered generators in rural areas and outer islands is widespread, since mains electricity is not available. Such generators are notoriously bad for laptops and desktops.
o An estimated 80% or more of the population of Vanuatu has access to voice mobile signals, mostly 2G; this estimated figure derived from computer modeling of terrain will be verified over the next two years by various other methodologies.
o One third of the 39 percent have access to 3G and two thirds to 2G networks.
o 7 to 15 percent of the hand sets in Vanuatu are smart phones.
o 1/3 of the mobile subscribers in Vanuatu use data transfer.
o SMS is used by 50-60 percent of the mobile subscribers in Vanuatu. SMS texting is the preferred mode of communication among youth in Vanuatu, since it is free. Actual phone conversations among youth are quite rare.

Concerning the usage of ICT in public schools in Vanuatu, according to Toulmin (2013), this usage is currently quite low. Specifically:

o   There are three types of public schools: those with computer labs usable by students, those with a few computers used by teachers or administrators, and those with no computers. There are no schools with computers well integrated into the classrooms. The most numerous type by far is schools with no computers. Virtually no primary schools have computer labs; all computer labs are at the secondary level. Of the 514 schools in the system, there are only about 15-30 public schools with computer labs or computers in school libraries, in which the computers are made available to students.
o   Over 94 percent of respondents (school officials) stated that ICTs are currently given low or very low priority in the schools.
o   The two leading obstacles to ICT development in the schools are poor or no electrical power, and lack of trained ICT teachers and support personnel.
o   Only about 5 percent of students in the schools have access to ICTs.
o   The percentage of students estimated to be computer literate is 4 percent; almost all of these are secondary school students.
o   The number of students per computer across all the schools is about 205, placing Vanuatu in the 4th percentile of countries reporting to the ITU (International Telecommunication Union) on this important indicator.
o   The total number of computers in the schools that students have access to, is in the low hundreds, probably about 300 (three hundred). The number of children in the schools was about 61,416 in 2012-13 and is now estimated at about 70,000.
o   Only about 6 percent of schools nationwide have access to the Internet. This places Vanuatu in the 14th percentile of countries reporting to the ITU on this important indicator.
o   Vanuatu scores low on providing broadband to the schools, with only about 1 percent of schools enjoying this important resource. This places Vanuatu in the 3rd percentile of countries reporting to the ITU on this measure.
o   To begin to correct this matter, TRR and OGCIO are launching a program to install computer labs in the schools which will be accessible to the community after school hours, and a related program to distribute 1000 tablets to schools on a trial basis."

2.4.2. Challenges

The challenges facing ICT development in Vanuatu are similar to those faced by other developing countries, particularly SIDS, characterized by tremendous development needs and limited resources to fulfill them. For example, the typical challenge of building communications infrastructure is exacerbated in Vanuatu by the remoteness of the islands, scarcity of the electric power, and difficult terrain to extend cables or install telecom towers.

Vanuatu has some of the most challenging terrain and conditions in the world for mobile service, ranking just behind and very similar to Papua New Guinea in this regard. Specific challenges include: high vegetation cover; high rainfall, often in torrents; numerous

thunderstorms; steep, narrow valleys on many islands that are hard to reach by mobile signals; extremely poor roads for transporting equipment except on Efate (the capital island) and the east coast of Espiritu Santo (there are only about 200 miles of non-urban paved roads in the entire country); volcanic threats on a number of islands, including eruptions, explosions, Sulfur Dioxide (SO2) outgassing, lava flows, lahars, pyroclastic flows and others; high threats from other natural disasters, including cyclones, tsunamis, floods, droughts, pests, malaria, dengue fever and others; high transport costs for building new infrastructure; total absence of local helicopters suitable for rural construction of towers; institutional resistance to tower facility sharing; a very high number of on-going and often unsolvable land disputes which affect tower and other facility construction, and even affect schools, clinics, roads, airports and other public facilities; and high shipping costs for bringing in ICT equipment from Australia or New Zealand.

In particular, computers and devices which might last 2-5 years in the Western countries often only last about 12-18 months in Vanuatu. This is due to numerous factors, including: use of generators without devices to smooth out power transmission and prevent spikes; lack of air conditioned environments; high heat and humidity; various areas subjected to volcanic ash; numerous insects and small lizards which enter and destroy the fans and other parts of computers; poor maintenance and a general lack of a culture of preserving equipment; and a lack of understanding of the delicacy of computers by users, especially the youth.

It is also estimated that about 20 percent of mobile customers change their phone numbers each year. This is not due to "churn" as in the Western countries, where customers switch operators frequently, but due to the loss, destruction or theft of phones.

However, the interviews uncovered a wide range of challenges for the implementation of MGOV4D in Vanuatu, well beyond infrastructure development. In the following sections, these challenges are categorized into: social challenges (Section 2.4.2.1), economic challenges (Section 2.4.2.2), policy-related challenges (Section 2.4.2.3), legal and regulatory challenges (Section 2.4.2.4) and technical and content-related challenges (Section 2.4.2.5).

2.4.2.1. Social Challenges

A number of social challenges that could adversely impact the development and adoption of MGOV initiatives in Vanuatu were uncovered in the course of the interviews. Many of them are either embedded or implied by other types of challenges, particularly economic ones. In particular, the interviews uncovered four major challenges of a social nature:

o   An increasing rate of mobile ICTs is being used to disseminate inappropriate content that may affect the local culture and youth, accessible in image and video formats regardless of the literacy levels. This danger is exacerbated by an increasing access to mobile communication due to lowering prices, and a high rate of illiteracy in the country.

o   Lack of a social security system for very low paid or subsistence farmer workers – the bulk of the population, is one reason why part of the population to remains undocumented and have no access to regular incomes or bank accounts, and therefore are likely to be outside the MGOV user base. Employees paid more than 3000 Vatu per month i.e. about $27 USD must pay into the Vanuatu National Provident Fund for an eventual pension payout.

o   Absence of a national approach for utilizing ICT for culture and heritage preservation, and, in general terms, an apparent lack of attention to the culture and heritage issues despite the richness of the country in this regard is a social problem that also affects the tourism, economy, education and other sectors. With about 100-160 languages and cultures and only about 255,000 people, Vanuatu is the most linguistically and culturally dense country on Earth. However, it is in danger of losing these languages and cultures, and this process is already underway, partially due to the influx of attractive ICT-borne Western content, almost all in English. This is an area where MGOV can be of great assistance.

o   The geographic and cultural diversity of Vanuatu makes the engagement of stakeholders in the implementation of MGOV4D initiatives, particularly outside the capital city, difficult. The engagement requires initially face-to-face contact, which in turn entails travel and costs.

2.4.2.2. Economic Challenges

Although Vanuatu faces many economic challenges, many shared with other small developing countries and particularly other SIDS, some of these challenges could become major obstacles to the successful implementation of MGOV initiatives. Here are some of the economic challenges to restricting MGOV4D development uncovered in the course of the interviews:

o   Mobile devices and mobile accessories are expensive in Vanuatu. Smart phones are especially expensive, and thus only a few (perhaps 7-15 percent or less) of mobile customers have smart phones as of early 2014. The high cost is clearly a barrier to common citizens having access to mobile technologies and generally to increasing the user base for mobile technologies in general, and for MGOV in particular. On the other hand, fixed line penetration is currently below 3 subscriptions per 100 inhabitants and slowly dropping.

o   Similarly, the cost of communications in Vanuatu is also high. Although a new submarine cable is being installed to connect Vanuatu with Fiji, installing the telecommunications infrastructure to connect the islands is difficult given the remoteness and terrain and costly. In addition to the one-time installation cost, the cost must include labor and maintenance.

o   Vanuatu faces a serious shortage of power generation capacity, particularly in the remote areas, as well as environment-related difficulties in addressing this shortage. As a result, a major part of the population of Vanuatu has no access to mains electricity.

o   The growth in mobile technologies will require a whole range of technical support services including maintenance, application development, etc. which the fledging ICT industry in

Vanuatu may have difficulties to fulfill. This is an opportunity for established ICT businesses to invest and for an ICT business incubation program to grow the local ICT industry.

o The high cost of traditional tax invoicing, mostly for land taxes, involves paper and delivery costs with official correspondence frequently returned to the sender due to the lack of a clear addressing system. The same challenge constitutes an opportunity for MGOV services given than the land addressing problem can be tackled with mobile phone numbers.

o Lack of a national approach to utilizing ICT for tourism and culture promotion is a lost opportunity given the cultural diversity of Vanuatu and the large number of tourists vising the country. Through MGOV services and particularly ICT support to efforts to enrich cultural and heritage sites, the tourism industry and the country as a whole could benefit economically.

Concerning the high-cost of communication in Vanuatu, this is accurately measured by the ITU's ICT Price Basket (IPB) (International Telecommunication Union, 2012). IPB is a composite measure based on the cost of fixed telephone, mobile telephone and fixed broadband Internet services, and computed as percentage of the average monthly Gross National Income (GNI) per capita. IPB monitors the relative price of ICT services and provides an indication of how affordable they are across countries, and over time.

In 43 out of 44 developed economies included in the 2011 IPB, IPB value represented less than 5 percent and in 33 economies less than 2 percent of the GNI. While for developing economies it is expected that IPB should be less than 5 percent of GNI, in 2011 still more than half of them (61 out of 117) had IPB values over 5 percent of the GNI. The economies with the highest IPB are mainly low-income and lower-middle-income countries. Among them, SIDS tend to have a relatively high IPB of around 10 percent in Tonga and Micronesia to 39 percent in Kiribati. The exception is Fiji with IPB is 5.2 percent.

In Vanuatu, the value IPB was 26 percent in 2011, way above the 5 percent limit. Looking closer at this figure, the fixed telephone price was 18.6 percent, mobile-cellular price was 11.6 percent and the fixed broadband was 77.7 percent. While Vanuatu improved substantially between 2011 and 2013, its current IPB value is a clear demonstration of how expensive is ICT to its citizens and businesses.

2.4.2.3. Policy-Related Challenges

Policy-related challenges refer broadly to the concerns that policy-making is detached from the larger population and that the government lacks the capacity to engage citizens and for policy implementation in general. In particular:

o   The process of policy-making is largely detached from the knowledge and needs of the population of Vanuatu, who are often not consulted about policy drafts, nor asked to provide feedback about effectiveness of policy implementations.

o   Concerning the ICT policy, although completed and adopted, there is insufficient public and civil service awareness about this policy, what it means to different stakeholders and how it may change government performance once implemented. The MGOV4D strategy should build upon and provide added value to how the ICT Policy is being implemented.

o   Government agencies tend to own the data they collect and resist requests to share this data with other agencies, to maximize their utilization and ensure data integrity, which in turn results in other agencies collecting their own data and the duplication of databases. The civil registration database is a case in point.

o   Government ministries tend to operate in "stovepipes" and not communicate across ministerial lines.

o   There is no actual active government portal, just a government website with information dating from about 2008 to 2012. This links to pages for each ministry but these are usually just one page with a mission statement. However, there are some ministries and agencies with good, active websites, including Telecommunications and Radiocommunications Regulator of Vanuatu (http://www.trr.vu/index.php/en/), Vanuatu Office of the Government Chief Information Officer (http://www.ogcio.gov.vu/), Vanuatu Customs and Inland Revenue Department (http://customsinlandrevenue.gov.vu/), Vanuatu Department of Corrections (http://www.vanuatucorrectionalservices.gov.vu/) and Vanuatu Meteorological Services (http://www.meteo.gov.vu/).

2.4.2.4. Legal and Regulatory Challenges

A number of legal and regulatory challenges that restrict ICT development in Vanuatu in general and MGOV in particular were mentioned during the interviews. These are:

o   Lack of legislation to protect the Civil Registry System, managed by the Ministry of Internal Affairs. This is an instance of a larger problem of missing legislation to protect data collected and administered by government, particularly data about citizens.

o   Lack of unified regulations regarding the sharing of information across the government, with government agencies required to abide by such regulations to facilitate secure electronic operations carried by government in the service of citizens.

o   Lack of legal protection of the customer rights in the electronic space, making the citizens of Vanuatu vulnerable to criminal activities, scams and other kinds of cyber-threats, and forcing any mobile service to protect on its own the rights of its users.

o Lack of the payment gateway and lack of regulations to govern electronic payments is a major obstacle to the development and adoption of electronic public services in general and MGOV in particular, and should be addressed along with the customer rights legislation.

2.4.2.5. Technical and Content-Related Challenges

Technical and content-related challenges raised during the interviews include lack of reliable databases to build upon mobile services or to support and follow-up on major policy decisions, low quality of telecommunication services, and lack of standards to govern the development and utilization of ICT within and across government agencies, as follows:

o Lack of well-established, reliable data repositories that could be used by the industry and government to build useful electronic services, make them available to citizens, businesses and government, and eventually build the critical mass of mobile technology users. This can be partly attributed to the lack of standards and rules regarding the management, ownership, protection and usage of digital content, and partly due to the lack of systematic, incremental data collection processes and procedures.

o An illustration of the earlier issue is the civil registry data. However, the absence of reliable data and the underpinning data collection processes affects major sectors of the society and economy – health, education, demography, agriculture, justice, security, tourism and others – and may potentially lower the quality of government decision-making. A case in point is the coordination of international aid, a major source of income for Vanuatu.

o OGCIO has made considerable progress in establishing a government-wide Enterprise Architecture, inventorying all government ICT assets and systems, and developing a Standard Operating Environment (SOE) for servers and proposing one for all government laptops and desktops. However, in the area of applications, major under-investment still exists. A comprehensive applications investment plan developed in 2011-2012 is stalled, due to lack of government or donor funds.

o The lack of standards and rules to govern the production and use of digital content was extended in the interviews to the management of ICT by government in general. While the efforts in this area by the Office of the Government Chief Information Officer are noted, there is still a large space of ICT operations that are not covered by any standard practices.

o Another technical problem raised was the quality of telecommunication services offered in terms of access, speed and the range of services options offered to customers. One reason to explain this is the infrastructure itself, and the difficulty and cost of making it available not only in the capital city, but the outlying islands. Another reason is the small user base and therefore limited profit margin for the operators to make the necessary investments into infrastructure and to improve the delivery of telecommunication services.

o The interviews and the associated field visits also highlighted that the systems used by government offices are in many cases outdated and require maintenance, organizational actions and in some cases replacement. The same is the case for the networking capabilities which are not uniform across the government, and generally lack provisions for physical and digital security. Lack of adequate data center capability was also observed, with desktop servers hosting sensitive government datasets in simple and easily accessible formats.

2.4.3. Solutions

A number of solutions to the challenges uncovered during the interviews and documented in the Section 2.4.2 were also suggested and discussed during the interviews by the stakeholders. In the following, these solutions are divided into nine major sectors: health, security, economy, finance, culture, politics, participation, administration and technology.

o Health
  1. Enable teleconferencing system to provide access to specialized doctor care
  2. Disseminate health, nutritional and educational information through mobile devices

o Security
  3. Report incidents of violence against woman through mobile phones
  4. Institute violence hotline to report incidents of violence against woman
  5. Facilitate woman-to-woman support networks, particularly in the outlying islands
  6. Provide custom chiefs (approximately 2500) with mobile devices such as tablets, to report on their security, law and justice activities. It is estimated that 70-85 percent of all justice in Vanuatu is administered by the chiefs, not the courts, but no firm figure has ever been established, and there is no reporting system.

o Economy
  7. Establish mobile technology-based agricultural e-marketing system
  8. Develop an application to notify local producers about the arrival of passenger ships
  9. Create community centers to promote and support the development village economies
  10. Develop mobile e-business and e-commerce applications particularly to the exporters
  11. Offer microcredit lines to woman entrepreneurs through mobile devices
  12. Open government data with geographic, economic, environmental, demographic, etc. information in machine-processable formats to businesses and the public

o Finance
  13. Overcome distrust towards formal banking system by promoting m-wallet solutions
  14. Issue SMS notifications for salary payments and other financial transactions

o Culture
  15. Employ mobile devices for citizen records of culture, artefacts and traditions

16. Establish the electronic library of cultural and heritage content, to complement the national archives, and make it available online and through mobile devices

o Politics
17. Support relation-building between members of parliament, political parties and voters including political campaigning through mobile technologies

o Participation
18. Seek feedback from the public about policy drafts through mobile devices
19. Collect data to assess the performance of international aid through mobile devices
20. Crowdsource citizen opinions and suggestions on government programs and services

o Administration
21. Develop better civil registry system to address the issues of access, security and privacy
22. Develop the mobile service to inform citizens about land management decisions

o Technology
23. Standardize information structures that underpin major government databases
24. Standardize government information sharing environment including interoperability

2.4.4. Approaches

During the interviews, the stakeholders also suggested the adoption of specific approaches to facilitate effective implementation and utilization of the proposed solutions and more generally to guide MGOV4D implementation. These approaches are summarized as follows:

o Design MGOV without exacerbating existing divisions in the country
o Deliver education and awareness building for people on how to deal with new technologies
o Empower the youth to carry out technology-focused capacity building in communities
o Promote public-private partnerships particularly in the financial and telecommunication sectors, to satisfy public objectives without compromising business objectives
o Encourage partnerships and knowledge sharing in building technology-oriented capacity
o Empower woman through ICT capabilities to raise their status in the society
o Help farmers to move beyond subsistence economy to longer-term financial security through investment and saving schemes
o Pilot technology-related initiatives through selected villages to showcase benefits
o Ensure that ICT is appropriated in locally-beneficial ways
o Ensure that ICT is widely desirable across the local society
o Generate locally-relevant content to justify public investment in the infrastructure
o Adopt uniform privacy and security standards across the government
o Implement Internet governance by the government according to its current policies

Additional approaches, not mentioned during the interviews, include learning from other countries across the Commonwealth or in a region, regional coordination to build capabilities, implement strategies and increase sustainability of MGOV initiatives, and developing strategic partnerships including public-private, public-voluntary, and public-academia partnerships.

2.4.5. Capabilities

Earlier in this section we focused on exploring the interviews in view of identifying problems to implementing the MGOV4D strategy and finding solutions to them. A complementary approach is to identify existing strengths and capabilities, build upon them, and develop further strengths and capabilities in the process. The following list includes the strengths and capabilities present in Vanuatu for MGOV4D development, as identified during the interviews:

o   Support for ICT development in general and for MGOV development in particular from the prime minister and several members of the parliament.

o   Active presence of the Office of the Government Chief Information Officer, empowered by to play a coordinating role for ICT including MGOV development in the country, and enabled by strong leadership and a competent team.

o   Effective leadership by the Telecommunications and Radiocommunications Regulator in implementing telecommunication policies and regulations, enjoying positive and productive relationships with the operators, and playing an important role for MGOV development.

o   A network of 24 offices in different islands established by the National Bank of Vanuatu, equipped with text-based and limited telecommunication facilities, providing basic financial services to the communities across the country. Building on the presence of the bank across the country, the network could be utilized to deliver MGOV services to local communities.

o   As the owner and supplier of one of the most critical datasets for the development of new EGOV and MGOV services across the government, the Office of the Civil Registry, part of the Ministry of the Interior, could be an important partner to any MGOV development effort.

o   The Vanuatu Providence Fund is another important partner for further MGOV development efforts, with proven technical capabilities in serving its customers across the country with mobile technology services, and a strong in house team.

2.4.6. Achievements

Driven by the Office of the Government Chief Information Office, an impressive number of ICT-related achievements could be observed in 2013. These include:

o   Rise of mobile penetration from about 10 percent to over 80 percent in just six years

o   Launching and maintaining true competition in mobile and Internet provision
o   An external investor (Mauritius Telecom) increasing its holding in one of two main telecom operators in Vanuatu (TVL) to 90 percent, thus injecting a new investment in the country and making TVL a more viable competitor on the market
o   The installation of the submarine cable connecting Vanuatu and Fiji is expected to lower the prices, and increase Internet speed and opportunities for ICT development in the country
o   The launch of the first-ever Internet Exchange Point located in the Pacific islands, called the Vanuatu Internet Exchange
o   The launch of a project aimed at standardizing the Standard Operating Environment (SOE) for all servers, desktops and laptops used across the Government of Vanuatu
o   The development of the ICT Visions for the Customs and Revenue sector
o   The launch of a similar effort to develop ICT Vision for the Law and Justice sector
o   The launch of the first-ever survey about the usage of ICT in the Vanuatu schools and the benchmarking of the findings against international peers
o   The establishment of the Cybersecurity Working Group which held numerous meetings, undertook the first-ever survey about cyber-bullying and related issues, received assistance from ITU on cyber-security, and drafted the National Cybersecurity Policy
o   The adoption of a comprehensive National ICT Policy after a period of public consultation
o   The drafting and dissemination of the Universal Access Policy for public consultation
o   The launch of the National ICT Development Committee with several meetings attended by the ministers and other stakeholders, each led by the Prime Minister or his representative
o   First-in-the-Pacific national video conference between the Prime Minister and ordinary citizens from all major islands, in which citizens asked tough questions of their leader
o   Launching in 2012 and subsequent years of National ICT Day on May 17, which is now one of the biggest events on the national calendar, with a 1000-person parade and 2000-3000 attendees

2.5. Conclusions

Based on the review of the country profile, review of the relevant policy instruments including the comprehensive National ICT Policy, Universal Access Policy and Cybersecurity Policy, and a series of sixteen interviews and field visits with various stakeholders from Vanuatu including major government, financial, non-government and commercial institutions, this section outlined the conditions for MGOV4D implementation in Vanuatu.

These conditions include challenges, solutions, approaches, capabilities and achievements:

o   *Challenges* – The identified challenges are of the social, economic, policy-related, legal and regulatory, and technical and content-related nature. For example: inappropriate content disseminated through mobile technologies affecting the local culture and youth (social); high costs of telecommunication services compared to the average income and shortages in power generation capacity (economic); government agencies tending to own the data they collect and resisting requests from other agencies to share this data (policy-related); lack of

unified regulations regarding the sharing of information across the government (legal and regulatory); and absence of reliable data sets to support major policy and program-related decisions and to develop useful services for the public (technical and content-related).

o *Solutions* – The identified solutions belong to the health, security, economy, finances, culture, and participation sectors. For example: teleconferencing system to provide access to specialized doctor care (health); woman-to-woman support networks particularly in the outlying islands (security); mobile agricultural e-marketing system (economy); SMS notifications for salary payments (finances); recording of culture, artefacts and traditions by citizens using mobile devices (culture); and collecting data to assess the performance of international aid through mobile devices (participation).

o *Approaches* – The identified approaches guide the implementation of MGOV solutions through, e.g. piloting technology-related initiatives through selected villages to showcase benefits or empowering the youth to carry out technology-focused local capacity building.

o *Capabilities* – Building MGOV solutions incrementally upon, e.g. active presence of the Office of the Government Chief Information Officer, empowered to play a coordinating role for ICT including MGOV development in the country or the network of 24 ICT-enabled offices in different islands established by the National Bank of Vanuatu.

o *Achievements* – Showcasing the benefits and creating quick wins through, e.g. the installation of the submarine cable connecting Vanuatu and Fiji or the adoption of a comprehensive National ICT Policy after a period of public consultation.

3.   Localizing MGOV4D Strategy Knowledge Base

The goal of this section is to localize the MGOV4D Strategy Knowledge Base for Small Island Developing States documented by Henning and Janowski (2014) to the case of Vanuatu. To this end, the knowledge base is extended with a set of strategies derived from the MGOV4D context analysis of Vanuatu carried out in Section 2 including the challenges, solutions, approaches, capabilities and achievements for MGOV development in Vanuatu. The localized knowledge base will provide a pool of potential strategies to select from when developing the tailor-made MGOV4D strategy for Vanuatu in Section 4. The rest of this section explains the localization method (Section 3.1), presents the additional Vanuatu-specific strategies added to the SIDS MGOV4D strategy knowledge base (Section 3.2) and provides some conclusions (Section 3.3).

3.1. Localization

The method of localizing the SIDS MGOV4D strategy knowledge base to the case of Vanuatu is an extension of the six-step process outlined by Henning and Janowski (2014, Section 4.1):

1. Define the assessment framework to organize the pool of strategies comprising the MGOV4D strategy knowledge base.
2. Identify the criteria to determine which strategies from the source strategy documents are of relevance to the target countries.
3. Select which strategy documents should serve as sources of individual strategies to populate the MGOV4D strategy knowledge base.
4. Apply the criteria (2) to the set of selected strategy documents (3) to choose the strategies for the MGOV4D strategy knowledge base.
5. Remove or consolidate the duplicates to obtain the final set of strategies for the MGOV4D strategy knowledge base.
6. Summarize the resulting strategies.

The localization entails adding another step (7) and subsequently repeating steps (5) and (6):

7. Expand the knowledge base with Vanuatu-specific strategies identified from other sources particularly the review of the MGOV conditions in Vanuatu documented in Section 2, relevant MGOV literature, and consultations with experts and practitioners in the field.
8. Remove or consolidate the duplicates to obtain the final set of strategies for the MGOV4D strategy knowledge base.
9. Summarize the resulting strategies.

As the strategy knowledge base is structured into a multi-level hierarchy that comprises dimensions at the first level (e.g. MGOV Institutions), elements of these dimensions at the second level (e.g. Strategy and Policy Framework SP), strategies at the third level (e.g. SP6), sub-strategies at the fourth level (e.g. SP6.3), and concrete projects at the fifth level (e.g. SP6.3a), the additional strategies must fit into this hierarchy without altering existing elements.

3.2. Content

This section presents Vanuatu-specific extensions to existing MGOV strategy knowledge base presented by Henning and Janowski (2014) according to the four dimensions of the MGOV framework: Institutions (Section 3.2.1), Innovation System (Section 3.2.2), Infrastructure (Section 3.2.3) and Services and Applications (Section 3.2.4). Each strategy is assigned a unique identifier and a one-sentence description.

3.2.1. Dimension 1 – MGOV Institutions

This section provides Vanuatu-specific strategies under the first dimension of the MGOV framework. The strategies are organized using two elements in this dimension: Strategy and Policy Framework (Section 3.2.1.1) and Leadership (Section 3.2.1.3), and individual strategies are identified using the prefixes SP and L respectively. Higher-level strategies under which a given Vanuatu-specific strategy is inserted are listed with the "Other" label.

3.2.1.1. Strategy and Policy Framework (SP)

ID	STRATEGY	SOURCE
SP6	Develop targeted strategies and action plans for individual key MGOV sectors, e.g. health, education and the environment	Other
SP6.1	Develop high-impact MGOV initiatives for the education sector	Vanuatu
SP6.1a	Use tablets and smart phones in educational settings to increase student access to Internet-based content (or pseudo-Internet access, done by loading extensive approved educational and other content on the local school server, thus providing instant access to wholesome materials)	Vanuatu
SP6.1b	Use tablets and smart phones to encourage student collaboration on school projects, within and across schools	Vanuatu
SP6.1c	Use tablets and smart phones to encourage school projects in and about local languages and cultures, e.g. including "talking video dictionaries," video interviews with chiefs and senior citizens about cultural traditions, and video documentation of cultural ceremonies and folkways.	Vanuatu
SP6.1d	Use tablets and smartphones to improve the reporting of school administrative information via VEMIS (the Vanuatu Education MIS)	Vanuatu
SP6.1e	Use tablets and smartphones to improve posting of education schedules, grades, projects, holidays, etc. for use by students, parents, teachers and admin staff	Vanuatu
SP8	Implement a Right to Information Act that incorporates citizens' right to mobile access to information, mandating that public information be available through mobile ICT	Other
SP8.1	Implement an Open Government Data Strategy	Vanuatu
SP10	Communicate and promote a strategy related to the use of MGOV to	Other

	respect local culture and standards	
SP10.2	Enact legislation to restrict abuse of mobile ICT i.e. inappropriate content that affect local culture and youth	Vanuatu
SP11	Enact legislation to facilitate governmental information management and information sharing	Other
SP11.1	Enact legislation to protect the civil registry system	Vanuatu
SP11.2	Enact unified regulation regarding inter-ministerial information sharing, e.g. civil registration	Vanuatu
SP12	Devise methods and apps across the government to solicit input from citizens via mobile systems	Vanuatu
SP13	Ensure that all websites and on-line content developed by the government is mobile-accessible	Vanuatu

Table 1: Vanuatu-specific MGOV strategies – Strategy and Policy Framework

3.2.1.2. Leadership (L)

ID	STRATEGY	SOURCE
L6	Ensure sound financial management for MGOV	Other
L6.1	Create sustainable MGOV business models based on cost-benefit analyses	Vanuatu
L6.2	Develop sustainable investment models for MGOV: devise suitable funding models, identify financial sustainability gaps, address division among stakeholders, secure sufficient return on investment	Vanuatu

Table 2: Vanuatu-specific MGOV strategies – Leadership

3.2.2. Dimension 2 – MGOV Innovation System

This section provides Vanuatu-specific strategies under the second dimension of the MGOV framework. The strategies are organized according to the two elements in this dimension: External Stakeholders (Section 3.2.2.1) and Absorptive Capacity and Adoption (Section 3.2.2.2), and individual strategies are identified using the prefixes ES and AC respectively.

3.2.2.1. External Stakeholders (ES)

ID	STRATEGY	SOURCE
ES2	Promote private sector integration into MGOV: develop public-private strategies for the use of MGOV to enhance the productivity of local business, the marketability of local goods and services, and the overall efficiency of economic development	Other
ES2.4	Establish an Innovation Fund in MGOV	Vanuatu

ES3	Develop capabilities within the mobile ICT industry to support innovation in the public sector	Other
ES3.1	Support MGOV research and development: create a Mobile Governance Innovation Fund to support the development of suitable applications by government departments and agencies and also by third-party developers	Other
ES3.1a	Encourage partnerships and knowledge sharing in building MGOV-oriented capacity	Vanuatu

Table 3: Vanuatu-specific MGOV strategies – External Stakeholders

3.2.2.2. Absorptive Capacity and Adoption (AC)

ID	STRATEGY	SOURCE
AC1	Develop marketing and awareness strategies for MGOV services, especially for people in the underserved areas	Other
AC1.4	Address perceived risks of MGOV services, e.g. regarding reliability, privacy and security	Vanuatu
AC1.5	Pilot MGOV initiatives through selected villages in order to showcase benefits	Vanuatu
AC5	Provide MGOV training and support	Other
AC5.4	Empower younger generations to carry out MGOV-focused community capacity building	Vanuatu
AC5.5	Ensure that ICT is appropriated in locally beneficial ways and desirable widely across the local society	Vanuatu

Table 4: Vanuatu-specific MGOV strategies – Absorptive Capacity and Adoption

3.2.3. Dimension 3 – MGOV Infrastructure

This section provides Vanuatu-specific strategies under the third dimension of the MGOV framework. The strategies are organized by three elements in this dimension: ICT Infrastructure (Section 3.2.3.1), Interoperability (Section 3.2.2.2) and Security Safeguards (Section 3.2.2.3), and individual strategies are identified using the prefixes INF, IOP and SS respectively.

3.2.3.1. ICT Infrastructure (INF)

ID	STRATEGY	SOURCE
INF1	Identify appropriate technical solutions and prioritize funding opportunities to support the implementation, operation and maintenance of the general ICT networks, equipment and services	Other
INF1.1	Secure wide and reliable mobile network coverage and bandwidth	Other

INF1.1b	Set up mechanisms for proper infrastructure management including regular maintenance	Vanuatu
INF1.5	Substantially increase the number and quality of volcano, weather and flood monitoring stations, reporting wirelessly back to Vanuatu Meteorological Services, and thence generating SMS or smartphone warnings to the population	Vanuatu
INF2	Ensure accessibility of infrastructure	Other
INF2.5	Support the diffusion of mobile devices with higher capabilities, e.g. smartphones	Vanuatu
INF4	Secure reliable and accessible power sources as the basic infrastructure for mobile ICT	Vanuatu

Table 5: Vanuatu-specific MGOV strategies – ICT Infrastructure

3.2.3.2. Interoperability (IOP)

ID	STRATEGY	SOURCE
IOP1	Develop standardization of mobile ICT hardware to be used in all government sectors	Other
IOP1.1	Develop a first-class interoperability framework to enhance interoperability and information sharing across public services	Other
IOP1.1a	Promote national standard for information structures underpinning major databases	Vanuatu

Table 6: Vanuatu-specific MGOV strategies – Interoperability

3.2.3.3. Security Safeguards (SS)

ID	STRATEGY	SOURCE
SS3	Establish a national mobile information security framework	Other
SS3.2	Enact legal protection of customers including privacy	Vanuatu
SS3.3	Adopt uniform privacy and security standards across government	Vanuatu

Table 7: Vanuatu-specific MGOV strategies – Security Safeguards

3.2.4. Dimension 4 – MGOV Services and Applications

This section provides the pool of strategies under the fourth dimension of the MGOV framework. The strategies are organized according to the two elements in this dimension: Design and Development (Section 3.2.4.1) and Delivery Mechanisms (Section 3.2.4.2), and individual strategies are identified using the prefixes DD and DM respectively.

3.2.4.1. Design and Development (DD)

ID	STRATEGY	SOURCE
DD1	Ensure suitable service and application design strategies	Other
DD1.7	Ensure scalability of service and application design	Vanuatu
DD1.8	Design for low-cost services and applications	Vanuatu
DD1.9	MGOV should be designed not to exacerbate existing divisions of the country	Vanuatu
DD1.10	Generating locally relevant content to justify investment in the infrastructure	Vanuatu
DD2	Develop specific MGOV services in education, health, public safety, environment and other sectors and lessen the cost of providing such services to remote and rural communities	Other
DD2.1	Develop MGOV services for institutional development: utilize mobile ICT to provide public access to government information to promote transparency, accountability, participation and the rule of law	Other
DD2.1e	Support relationship-building and regular interaction between voters and political party activities, including campaigning, through mobile technologies	Vanuatu
DD2.1f	Use SMS-based systems for regional and local authorities to disseminate information to citizens in their area, e.g. for village heads to communicate with the villagers	Vanuatu
DD2.1g	Exploit crowdsourcing as a solution for consultation, and for collecting ideas to assess aid performance	Vanuatu
DD2.3	Develop MGOV applications in the health sector	Other
DD2.3b	Enabling mobile teleconferencing to access specialized doctor care	Vanuatu
DD2.3c	Develop SMS-based health consultation systems, e.g. services to answer health-related questions from the public through SMS blasts	Vanuatu
DD2.3d	Disseminate health information by public SMS announcements, e.g. nutrition information for women with infants	Vanuatu
DD2.3e	Gather health statistics from the field, sent through SMS codes, e.g. on the number of clients seen, diagnosis, etc.	Vanuatu
DD2.5	Develop MGOV services for public safety	Other
DD2.5a	Integrate mobile ICT in the national disaster management and recovery plans for monitoring risk reductions, early warning alert systems and for assisting in disaster recovery; implement SMS-based disaster alerting system, e.g. SMS blasts to all phones in a given district to warn the population about impending disasters	Vanuatu
DD2.5b	Sharing cases of judicial proceedings and settlements by local authorities, including chiefs, to a central point through SMS	Vanuatu
DD2.5c	Provide mobile-ICT enabled neighborhood watch mechanisms, e.g. SMS-	Vanuatu

	based notifications of observed threats	
DD2.7	Develop MGOV applications for businesses and consumers	Other
DD2.7d	Provide mobile payment services particularly in the rural areas, e.g. mobile wallet, domestic remittances, G2P payments	Vanuatu
DD2.7e	Develop an SMS notification system for salary payments and other financial transactions	Vanuatu
DD2.7f	Provide microcredit lines to woman entrepreneurs	Vanuatu
DD2.7g	Develop mobile applications for e-business and e-commerce applied particularly to exporters	Vanuatu
DD2.10	Develop MGOV applications in the culture sector	Other
DD2.10b	Establish a virtual library for cultural and heritage content and make it available online and through mobile devices	Vanuatu
DD2.15	Develop mobile services to inform recipients about land management decisions	Vanuatu
DD2.16	Develop mobile applications to facilitate public data collection in various sectors	Vanuatu
DD2.16a	SMS-based system in civil registration through which remote villages can report births, deaths and marriages	Vanuatu
DD2.16b	SMS-based data collection and management for aid coordination including health, food, education demography and other sectors	Vanuatu
DD2.17	Utilize mobile ICT to support gender equality	Vanuatu
DD2.17a	Report incidents of violence against women through mobile phones, e.g. SMS-based system or violence hotline	Vanuatu
DD2.17b	Facilitate woman-to-woman support networks based on mobile ICT	Vanuatu

Table 8: Vanuatu-specific MGOV strategies – Design and Development

3.2.4.2. Delivery Mechanisms (DM)

ID	STRATEGY	SOURCE
DM5	Align and link MGOV delivery with the larger service delivery framework to reduce costs and ensure a critical mass of services for sustainability	Vanuatu
DM6	Provide a one-time subsidy to a trial wave of rural Internet cafes, to assist in launching of this absent service.	Vanuatu

Table 9: Vanuatu-specific MGOV strategies – Delivery Mechanisms

3.3. Summary and Conclusions

This section localized the MGOV4D strategy knowledge base from Henning and Janowski (2014) to the case of Vanuatu by adding new strategies based upon the analysis of Vanuatu in Section 2 and listed along the four dimensions of the MGOV framework. The localized knowledge base will be applied in Section 4 to build a tailor-made MGOV4D strategy instrument for Vanuatu.

4. MGOV4D Strategy for Vanuatu

This section provides the content of the proposed National MGOV4D Strategy for Vanuatu. In line with Vanuatu's larger policy context, it presents the objective, goals and principles for MGOV development in Vanuatu, and provides a set of strategies selected from the localized MGOV strategy knowledge base outlined in Section 3, to advance the achievement of the goals.

The overall purpose of the Vanuatu MGOV4D strategy is to formulate the commitment of the Government of Vanuatu to leveraging mobile ICT in support of the national development vision and related policy objectives laid out particularly in the Priorities and Action Agenda and the National ICT Policy, described in Sections 2.3.1 and 2.3.2 respectively. As such, this strategy forms an instrument aimed at directing and coordinating the efforts of the government and its partners to effectively utilize mobile technologies in the achievement of these policy objectives.

The rest of this section is structured as follows. Section 4.1 explains the methodology applied to guide the development of this strategy. Section 4.2 presents the objective, goals and principles underpinning Vanuatu MGOV4D strategy. Section 4.3 presents a list of concrete strategies selected from the localized MGOV4D knowledge base outlined Section 3, and organizes them along the four dimensions of the MGOV framework: MGOV Institutions (Section 4.3.1), MGOV Innovation System (Section 4.3.2), MGOV Infrastructure (Section 4.3.3) and MGOV Services and Applications (Section 4.3.4). Section 4.4 provides some conclusions. The implementation plan and initial project portfolio are described respectively in the Sections 5 and 6 of this report.

4.1. Methodology

The presented strategy builds heavily on the groundwork laid out in Henning and Janowski (2014), particularly on the conceptual frameworks for Mobile Governance (MGOV) and Sustainable Development (SD) introduced in Sections 2.4 and 3.1.1 of this report, and on the MGOV4D Strategy Knowledge Base localized to the case of Vanuatu in Section 3.

The next step is the elaboration of the criteria for the selection of the relevant strategies from the Strategy Knowledge Base. These criteria were derived from the relevant policy goals consisting of the eight priorities set forth in the Vanuatu National ICT Policy (Section 2.3.2) and ten additional goals identified through stakeholder consultation and needs assessment for Vanuatu carried out as part of this project and documented in the Section 2.

For data analysis and decision-making, the Strategy Architecture Matrix was applied to organize the strategies selected from the MGOV4D Strategy Knowledge Base as the rows of the matrix and the policy goals as the columns. As some strategies do not target specific policy goals but play an enabling role for other strategies and goals, in order not to exclude them from the analysis, these strategies were marked with the presence of "x" in the additional GENERIC column. A fragment of the strategy matrix containing all strategies ranked at 50 percent or above of the maximum score is depicted in Figure 4 below.

ID	STRATEGIES	SCORE	PERCENTAGE	GENERIC	G1 Access to Mobile ICT in Education	G2 Access to Mobile ICT Infrastructure/Devices	G3 M-Government	G4 Integrating Mobile ICT Into Sectors	G5 Mitigating Risks related to Mobile ICT	G6 Locally Relevant Mobile Content	G7 Capacity Building	G8 Coordination/Collaboration Platform	G9 Economic Growth	G10 Participatory and accountable governance	G11 Public records and data	G12 M-Economy, M-Commerce, M-Banking	G13 Access to ICT in Health	G14 Health	G15 Gender Equality	G16 Environmental Sustainability	G17 Public Safety	G18 Cultural Heritage Preservation
					NATIONAL ICT POLICY								OTHER GOALS									
		30	100%	3	1	2	3	1	3	2	3	2	1	1	1	1	1	1	1	1	1	1
DD	Services and Applications - Design and development	29	97%	x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x	x
SP	Institutions - Strategy and Policy Framework	28	93%	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x
L	Institutions - Leadership	23	77%	x			x	x	x	x	x	x	x	x		x			x	x	x	
INF	Infrastrucure - ICT infrastructure	23	77%	x	x	x	x	x	x		x	x	x	x	x	x	x					
AC	Innovation System - Absorptive capacity/adoption	22	73%	x	x	x	x	x	x	x	x	x	x	x			x					
SP6.1	Develop high-impact MGOV initiatives for the education sector	20	67%	x	x	x	x	x			x	x	x		x	x						x
L3	Provide the necessary guidance and assistance to all government departments and agencies,	18	60%	x			x	x		x	x	x		x		x			x		x
ES	Innovation System - External Stakeholders	18	60%	x	x		x	x		x	x	x	x	x		x					
DD1.2	Design new MGOV services according to the needs and lifestyles of various stakeholders e.g.	18	60%	x		x	x		x	x	x	x								
DD2	Develop specific MGOV services in education, health, public safety, environmental protection	17	57%		x		x	x		x			x	x	x	x	x	x	x	x	x	x
SP6	Develop targeted strategies and action plans for key MGOV sectors e.g. health, education an	16	53%			x	x	x		x	x		x	x					x	x
SP6.2	Use MGOV as tool to reduce the impacts of government on the environment	16	53%	x			x	x	x		x	x							x	
DM	Services and Applications - Delivery mechanisms	16	53%	x		x	x		x		x	x								
SP1	Develop and implement MGOV policy in line with the national ICT policy	15	50%	x			x	x	x		x	x								
AC1	Develop marketing and awareness strategies for MGOV services especially for people in und	15	50%	x		x			x	x	x	x								
INF2.3a	Create a mobile applications (m-apps) store to facilitate the process of development and de	15	50%	x		x	x	x	x		x			x						
IOP	Infrastructure - Interoperability	15	50%	x		x	x	x			x	x		x	x		x			
DD1	Ensure suitable service and application design strategies	15	50%	x		x	x		x	x		x								

Figure 4: Strategy Architecture Matrix

Finally, the analysis of the strategy matrix consisted of the following four steps:

1. First, an "x" marker was inserted in every cell of the matrix whenever a given strategy (row) was determined to contribute to a given goal (column).

2. Second, every goal (column) was assigned numerical weight between 1 and 3 to determine its relative importance to the current stage of MGOV development in Vanuatu. In addition, the GENERIC column was assigned the highest weight of 3 to give importance to all strategies that while not contributing to specific goals, contribute to all goals and strategies.

3. Third, a score was calculated for every strategy (row) by adding the weights of all goals this strategy contributes to – column SCORE. After sorting the strategies on the value of the SCORE column, a context-specific strategy ranking was obtained.

4. Fourth, all strategies in the ranking that scored at least 33 percent of the total available score were selected for possible inclusion in the National MGOV Strategy for Vanuatu.

The overall sequence of methodological steps for constructing the Vanuatu MGOV Strategy is summarized in Figure 5 below.

Figure 5: Method for compiling the Vanuatu MGOV Strategy

4.2. Strategic MGOV4D Framework

The purpose of the Strategic MGOV4D Framework is to provide the general structure for the Vanuatu's MGOV Strategy by combining its overall objective, goals, approaches, principles and strategies into a single integrated framework. The framework is schematically depicted in Figure 6 below. Its key elements are the overall objective located at the top level of the MGOV strategy, which is translated into a number of goals at the second level, reflecting priority areas and expected outcomes for the achievements of the overall objective. In order to fulfill these goals, a number of approaches and principles are deployed at the third level of the framework. The fourth and final level contains specific strategies to be implemented in accordance with the approaches and principles, in order to contribute to the achievement of the MGOV4D goals. The various elements of the framework are explained in the following subsections.

Figure 6: Strategic MGOV Framework

4.2.1. Objective

At the top of the Strategic MGOV4D framework is the overall objective of the proposed Vanuatu National MGOV Strategy:

> *Maximize the contribution, efficiency and effectiveness of mobile ICT in achieving the National Vision of 'A Just, Educated, Healthy and Wealthy Vanuatu', thereby empowering and benefiting every citizen and resident of Vanuatu.*

To ensure the maximum consistency and alignment with the National ICT Policy, and thus to support the national development vision for Vanuatu as prescribed by the Vanuatu PAA, the statement literally adopts the objective of this policy, only replacing "ICT" with "mobile ICT".

4.2.2. Goals

This overall objective of the MGOV4D Strategy is translated into 18 goals that represent expected outcomes in a number of priority areas for MGOV4D development. In order to maintain close alignment with the National ICT Policy and reflect the aspirations and conditions for MGOV4D development in Vanuatu as expressed by the interviewed stakeholders, these goals include eight priority areas from the National ICT Policy (G1-G8) and ten goals (G9-G18) identified based on stakeholder consultation and field visits.

The goals are described as follows:

G1.   *Access to Mobile ICT in Education* – Providing educational institutions with access to mobile ICT infrastructure and related services and equipment, adequate to support the educational process, provide students with access to mobile ICT devices, and provide appropriate mobile ICT-based educational content.

G2.   *Access to Mobile ICT Infrastructure and Devices* – Enhancing general access, availability and affordability of the reliable mobile ICT infrastructure and related mobile services and devices, with an emphasis on demand-side measures, enhancing the overall resilience of the national mobile ICT infrastructure, and lowering the costs of mobile services and devices as they are delivered to the end-users.

G3.   *M-Government* – Enhancing the effectiveness and cost-efficiency of the mobile ICT use in government operations, particularly in internal administration; and promoting mobile ICT-enabled interactions between the government and citizens and other stakeholders.

G4.   *Integration of Mobile ICT into Sectoral Policies* – Recognizing the enabling and transforming potential of mobile ICT for every sector and policy area, particularly for education, health, production, transport (especially maritime), trade and attraction of foreign investment, gender equality, social equity, democratic participation, preservation and promotion of local culture including arts, environmental protection disaster management; and achieving a strong direction towards realizing such potential through the development and implementation of the appropriate sectoral policies.

G5.   *Building Trust (Mitigating Risks and Threats related to Mobile ICT Development)* – Recognizing that alongside numerous benefits, mobile ICT also brings various dangers, including the exposure to harmful information; new avenues for criminal including fraudulent activities; new threats to protection of confidential information and important infrastructure; as well as new risks of disruption of social and economic life; and ensuring that those dangers are properly addressed and managed, in particular through the appropriate preparedness, education and awareness-building.

G6.   *Locally Relevant Mobile Content* – Increasing the availability of the locally-relevant and sustainably-supported mobile content, especially by making global content accessible in local languages.

G7.   *Capacity Building* – Enhancing the skills necessary for utilizing and developing mobile ICT, especially in public service delivery.

G8.   *Platform for Multi-Stakeholder and Multi-Sector Coordination and Collaboration* –

Recognizing that any pre-established policy cannot foresee every initiative that could benefit from the development of the mobile ICT sector, neither any one central agency can envisage and direct all of them; and therefore setting up a platform for expertise, knowledge and skills to be shared among various stakeholders and sectors, duplications to be eliminated and potential synergies exploited, thereby enabling a substantially self-organizing (although enabled and coordinated) mobile ICT development process.

G9.   *Economic Growth through mobile ICT* – Enhancing the economic growth of Vanuatu through the deployment of mobile ICT to support and expand economic activities throughout the country, both as an enabler of existing activities and as a contribution to continuous innovation in various sectors of the economy and society.

G10.   *Participatory and Accountable Governance through Mobile ICT* – Achieving more interactive and participatory engagement between the government and citizens, businesses and other stakeholders by means of mobile ICT, particularly by using mobile ICT for public consultation; and using mobile ICT to increase the transparency and accountability of the institutions of public governance.

G11.   *Improved Public Records and Data Management through Mobile ICT* – Improving the integrity, coverage and quality of public records by applying mobile ICT to collect more timely, accurate and comprehensive data of public value; and improving the accessibility of public record by means of mobile ICT.

G12.   *M-Economy, M-Commerce, M-Banking* – Facilitating the integration of mobile ICT and mobile services into the general and digital economy including trade, commerce and financial sectors, and develop m-economy, m-commerce and m-banking services.

G13.   *Access to Mobile ICT in Health* – Providing health-related institutions with access to mobile ICT infrastructure and related services and equipment to support the provision and administration of health care.

G14.   *Health through Mobile ICT* – Utilizing mobile ICT to improve the health of Vanuatu's citizens, in particular by using mobile ICT to facilitate access to health services and to disseminate health-related information.

G15.   *Gender Equality through Mobile ICT* – Improving gender equality by leveraging mobile ICT to empower women in all sectors, in particular by increasing their participation in economic activities and safeguarding their personal safety and well-being.

G16.   *Environmental Sustainability through Mobile ICT* – Protecting Vanuatu's environment and facilitating sustainable use of its natural resources by means of mobile ICT.

G17.   *Public Safety through Mobile ICT* – Using mobile ICT to improve public safety, particularly from criminal activities at home and abroad, and from disasters.

G18.   *Cultural Heritage Preservation through Mobile ICT* – Using mobile ICT to facilitate the preservation of the cultural heritage, both by collecting and archiving knowledge about local cultures through mobile devices, and by devising appropriate measures to protect local cultures from the potentially destructive impact of ICT and mobile ICT.

4.2.3. Approaches and Principles

The third level of the strategic framework consists of a range of 14 approaches and principles with the aim of guiding and supporting the implementation of the National MGOV4D Strategy. In order to ensure the maximum degree of alignment with the National ICT Policy, these are identical to the approaches and principles from policy, described in Section 2.3.2:

A1.   Multi-Stakeholder and Multi-Sector Collaboration
A2.   Pragmatic Approach
A3.   Private, in particular Locally-Based, Sector Driven Development
A4.   Sustainable Best Practice ICT Sector Governance
A5.   Fair and Effective Competition and Enhancement of Economies of Scale
A6.   "Squeezing-the-Assets" and "Thinking-of-a-Greater-Good"
A7.   Kick-Starting Sustainable Development
A8.   Subsidiarity and Stakeholder Ownership and Drive
A9.   Policy as a Process
A10.   Integration into the Work as Usual
A11.   Socially Inclusive and Equitable Development
A12.   Being a Responsible Member of the International and Regional Community
A13.   Prioritizing the Priorities
A14.   Utilization of Appropriate Tools

4.3. MGOV4D Strategies

Individual strategies, the fourth level in the MGOV4D strategic framework, represent concrete measures that can be undertaken to support the achievement of the overall objective and goals of the MGOV4D Strategy. To serve this purpose and in accordance with the methodology outlined in the Section 4.1, the strategies were selected from the localized knowledge base provided in the Section 3, based on their relevance to the goals specified in Section 4.2.2.

The remainder of this section provides the list of strategies selected for inclusion in the National MGOV4D Strategy for Vanuatu. For each strategy, its name and unique identifier used in the Strategy Knowledge Base, all strategic goals the strategy is claimed to contribute to, and a brief justification are provided. The selected strategies are organized along the four dimensions of the MGOV framework and included in subsequent sections: MGOV Institutions (Section 4.3.1), MGOV Innovation System (Section 4.3.2), MGOV Infrastructure (Section 4.3.3) and MGOV Applications and Services (Section 4.3.4).

4.3.1. Dimension 1 – MGOV Institutions

This section provides selected strategies under the first dimension (MGOV Institutions) of the MGOV framework. The strategies are organized using two elements in this dimension: Strategy

and Policy Framework (Section 4.3.1.1) and Leadership (Section 4.3.1.2), and individual strategies are identified using the prefixes SP and L respectively.

4.3.1.1. Strategy and Policy Framework

ID	STRATEGY	GOALS	SOURCE
SP1	Develop and implement MGOV policy in line with the national ICT policy	G3 G4	Other
	This strategy requires regular analysis of the existing policy context i.e. the National ICT Policy and its related policies such as Cybersecurity and Universal Access, and continuously aligning the national MGOV Strategy in order to ensure policy consistency. The MGOV strategy should specify long-term objective and goals, as well as concrete strategies for the short and medium terms.	G5 G7 G8	
SP1.3	Develop MGOV implementation plan and update it at regular intervals	G3 G5	Other
	This strategy requires setting up an implementation plan for the MGOV Strategy, continuous progress monitoring and making the required adjustments to implementation. The implementation plan should be ready in the short term from the outset of the MGOV development and be monitored and updated at regular intervals thereafter.	G7 G8	
SP2	Deploy a financially-driven MGOV program aimed at deriving financial benefits through revenue generation and cost-savings	G2 G3	Other
	This strategy involves developing investment and funding plans for MGOV, and plans to ensure cost-effectiveness and benefits management guidelines. This involves long-term planning as well as monitoring in appropriately short- to medium term intervals.	G7 G8 G9	
SP2.1	Develop periodic multi-year MGOV investment plans to gradually replace and/or upgrade the incumbent strategic and legacy systems	G3 G7 G8	Other
	Investment plans should be developed in a coordinated manner across stakeholders and sectors. This strategy involves long-term planning as well as monitoring in short- to medium term intervals.		
SP2.2	Prepare guidelines and standards for the procurement of mobile ICT Systems in government	G3 G7	Other
	Procurement guidelines should be developed through government-wide consultation to ensure consistent procurement practice across the government. When possible, consideration should be given to procuring systems based on open source and open standards in order to avoid vendor lock-in and ensure cost effectiveness. Procurement planning should be long term.	G8	

SP4	Set in place non-discriminatory laws, mandates, policies and practices for equal and equitable access to MGOV infrastructure and services	G1 G2 G8 G9 G13	Other
	The implementation of this strategy should be closed aligned with the Universal Access Policy and make special consideration to the groups that are at risk from exclusion from MGOV infrastructure and services, particularly rural communities and women. Implementation of this strategy should be planned for the medium- to long-term.		
SP6	Develop targeted strategies and action plans for individual key MGOV sectors, e.g. health, education and the environment	G3 G4	Other
	In developing these strategies and action plans, attention should be given to cross-sectoral and multi-stakeholder coordination as well as alignment with existing policy framework, in particular the National ICT Policy, in order to ensure policy consistency. These action plans should include a long-term vision, but specify actionable and realistic milestones in the short and medium-terms as "low-hanging fruits".	G5 G7 G8 G10 G11 G16 G17	
SP6.1	Develop high-impact MGOV initiatives for the education sector	G1	Vanuatu
	Here are example high-impact initiatives: 1) use tablets and smart phones in educational settings to increase student access to Internet-based content or pseudo-Internet access done by loading extensive approved educational and other content on the local school server, thus providing instant access to wholesome materials; 2) use tablets and smart phones to encourage student collaboration on school projects, within and across schools; 3) use tablets and smart phones to encourage school projects in and about local languages and cultures, e.g. including "talking video dictionaries", video interviews with chiefs and senior citizens about cultural traditions, and video documentation of cultural ceremonies and folkways; 4) use tablets and smartphones to improve the reporting of school administrative information via the Vanuatu Education MIS; and 5) Use tablets and smartphones to improve posting of education schedules, grades, projects, holidays, etc. for use by students, parents, teachers and administrative staff.	G2 G3 G4 G7 G8 G10 G11 G18	
SP6.2a	Develop and implement green MGOV guidelines	G3	Other
	Such guidelines should be designed for cross-sector relevance and specify processes to deal with ICT waste avoidance and disposal e.g. through front-end recycling fees, and strategies to leverage, mobile ICT for reducing transport. These guidelines should take the long-term perspective on environmental sustainability.	G4 G5 G7 G8 G16	
SP6.2b	Ensure energy-efficient MGOV, conduct an assessment of energy	G3	Other

use for MGOV and develop energy reduction plan per sector to encourage the use of technologies that use less power and are more energy efficient	G4 G7 G8	
This strategy involves identifying technological solutions that consume the least amount of power, and setting concrete medium- to long-term targets for the reduction of energy use through ICT.	G16	

Table 10: Selected MGOV strategies – Strategy and Policy Framework

4.3.1.2. Leadership

ID	STRATEGY	GOALS	SOURCE
L2	Establish a range of specialized MGOV bodies under the oversight of the national MGOV unit	G3 G5	Other
	The implementation of this strategy rests on first mandating a suitable national body with the overall responsibility for the development and implementation of MGOV – most likely OGCIO, and then devising relevant associated bodies under its direction (possibly under the same roof) such as a committee for legal and regulatory review, and multi-stakeholder working groups to identify needs and resources for sectoral MGOV applications. These bodies should be established in the short- to medium term at the latest.	G8	
L2.2	Establish a national MGOV contact center	G3	Other
	The national MGOV contact center should be under the direct leadership of the national MGOV unit and proactively provide information and guidance to relevant domestic and international stakeholders regarding Vanuatu's MGOV Strategy and its implementation. The center should be established in the short term and be operational together with the launch of the strategy.	G5 G8	
L3	Provide the necessary guidance and assistance to government departments and agencies as well as partners from the private sector	G3 G4 G6	Other
	Such guidance should focus on encouraging stakeholders to establish partnerships for MGOV development, and especially emphasize the provision of guidance to remote and local stakeholders, e.g. chiefs, and private sector partners. Its implementation should be made into a short-term goal.	G7 G8 G10 G12 G16 G18	
L4	Develop a pool of "MGOV strategists", well-versed in the technical aspects of MGOV as well as in their respective business domains	G3 G7	Other

| | This strategy involves making and regularly updating an inventory of experts and keeping them engaged in the national development of MGOV through regular interaction, e.g. information dissemination, consultations. This inventory should be developed in the short term and continuously maintained and updated. | G8 | |

Table 11: Selected MGOV strategies – Leadership

4.3.2. Dimension 2 – MGOV Innovation System

This section provides the strategies under the second dimension (MGOV Innovation System) of the MGOV framework, and organizes them according to the two elements in this dimension: External Stakeholders (Section 4.3.2.1) and Absorptive Capacity and Adoption (Section 4.3.2.2), and individual strategies are identified using the prefixes ES and AC respectively.

4.3.2.1. External Stakeholders

ID	STRATEGY	GOALS	SOURCE
ES1	Use the MGOV framework to engage trusted third parties, including local councils, NGOs, professionals, employers, retailers, contractors and public-private partnerships, to deliver agent-driven MGOV.	G3 G6 G8 G10	Other
	This strategy should build on developing and maintaining an inventory of past and possible future partners, identifying their possible contribution to MGOV development and engaging with them through regular interaction, e.g. information dissemination, consultations and project partnerships. These inventory and interaction strategies should be developed in the short term, and continuously maintained and updated.		
ES2	Promote private sector integration into MGOV: develop public-private strategies for the use of MGOV to enhance the productivity of local business, the marketability of local goods and services, and the overall efficiency of economic development	G3 G4 G7 G8 G9 G12	Other
	This strategy includes identifying and establishing suitable partnerships, in particular with the mobile ICT industry, for both developing and rolling out MGOV services. The implementation of this strategy should start in the short-term.		
ES2.2	Sustain vertical strategic alliances for MGOV education, and technical support to SMEs in MGOV	G3 G7 G8 G12	Other
	This strategy involves identifying suitable partners, and engaging them in MGOV-relevant capacity building with public sector and private sector partners to support the development of MGOV and		

ID	STRATEGY	GOALS	SOURCE
	m-economy. The identification of partners should take place in the short term, and yield suitable partnerships in the medium term at the latest.		
ES3	Develop capabilities within the mobile ICT industry to support innovation in the public sector	G3 G4	Other
	The implementation of this strategy includes attracting and nurturing a mobile ICT industry and mobile ICT entrepreneurship, devising support measures for MGOV research and development (e.g. MGOV Innovation Fund) and establishing suitable public-private partnerships for developing and implementing MGOV services. Whilst establishing an attractive environment for the mobile ICT industry is a medium- to long-term strategy, building partnerships needs to start in the short-term.	G7 G8 G9 G12	
ES3.3	Develop an MGOV workforce preparation program	G1	Other
	This strategy should involve identifying gaps between demand and supply for MGOV skills, and identifying suitable educational measures to address such gaps, including partnerships for MGOV education together with educational and private-sector partners. Identification of possible partners should start in the short term, and feasible targets for workforce development should be set in the medium and long term.	G3 G4 G7 G8 G9	

Table 12: Selected MGOV strategies – External Stakeholders

4.3.2.2. Absorptive Capacity and Adoption

ID	STRATEGY	GOALS	SOURCE
AC1	Develop marketing and awareness strategies for MGOV services, especially for people in the underserved areas	G2 G5	Other
	This strategy should include campaigns to increase awareness and encourage the take-up of MGOV, addressing possible benefits and perceived risks. The strategy should run in parallel with the roll-out of the first MGOV initiatives in the short and medium term.	G6 G7 G8	
AC1.2	Develop and broadcast MGOV-awareness programs, establish the 'first steps' MGOV call center	G2 G5	Other
	This strategy should be tightly aligned with strategy AC1 and focus on providing contact points for outreach, both locally in collaboration with existing community groups as well as through the national MGOV contact point. It should run in parallel with rolling out the first MGOV initiatives in the short and medium term.	G7	

AC1.3	Work in collaboration with existing community groups such as churches, women groups, seniors, schools and libraries to provide outreach to their constituents in raising the awareness of the benefits of MGOV	G2 G5 G6 G7	Other
	The implementation of this strategy should be tightly aligned with strategy AC1 and should run in parallel with the roll-out of the first MGOV initiatives in the short and medium term.		
AC1.5	Pilot MGOV initiatives through selected villages in order to showcase benefits	G2 G5	Vanuatu
	The implementation of this strategy should build on identifying suitable locations for pilot roll-outs, identifying suitable local partners (see strategy AC1.2) and aligning them with the local and national MGOV awareness programmes (see AC1.1). The implementation of the first MGOV pilot initiatives should be scheduled as a short-term strategy.	G8	
AC5	Provide MGOV training and support	G2	Other
	This strategy should include the development of local training capacity by collaborating with community groups (AC1.2) to carry out MGOV capacity building. Such training programs should be developed in the short term.	G7 G8	
AC5.1	Provide MGOV starter-training for all who need it, particularly among women, teachers, youth, farmers, chiefs, the disabled, the elderly, etc. for example by means of specialized equalizer programs; promote the use of MGOV as assistive technology	G2 G7 G8	Other
	This strategy should be developed in the short term.		
AC5.3	Empower younger generations to carry out MGOV-focused community capacity building	G2 G7	Vanuatu
	The development of local training capacity should be secured in the medium term.	G8	
AC5.4	Set up a help desk to help citizens facing problems in the use of MGOV; provide on-site support for all at community centers	G2 G7	Other
	The development of local training capacity should be secured in the medium term.	G8	

Table 13: Selected MGOV strategies – Absorptive Capacity and Adoption

4.3.3. Dimension 3 – MGOV Infrastructure

This section provides the strategies under the third dimension (MGOV Infrastructure) of the MGOV framework, and organizes them according to the three elements in this dimension: ICT Infrastructure (Section 4.3.3.1), Interoperability (Section 4.3.3.2) and Security Safeguards (Section 4.3.3.3). Individual strategies are identified using the prefixes INF, IOP and SS.

4.3.3.1. ICT Infrastructure

ID	STRATEGY	GOALS	SOURCE
INF1	Secure reliable and accessible power sources as the basic infrastructure for mobile ICT	G1 G2	Vanuatu
	Break the current monopoly in power and introduce competition wherever possible. Change the current weak energy regulator to an active one focused on customer satisfaction, competition, forcing local investment and lowering end user prices drastically. Set up a rural electricity lending system to cooperatives similar to the one introduced in the 1930s in the US, but focused on solar, geothermal, hydro, wind and other sustainable systems.	G3 G9 G13	
INF2	Identify appropriate technical solutions and prioritize funding opportunities to support the implementation, operation and maintenance of the general ICT networks, equipment and services	G1 G2 G3 G4	Other
	This strategy includes securing wide and reliable mobile network coverage, focusing on 2G network consolidation in the medium term and gradually spreading 3G coverage in the medium- to long-term. For general IT networks, as far as possible, consideration should be given to capitalizing on existing synergies, shared resources and infrastructure.	G9 G13	
INF2.1b	Set up mechanisms for proper infrastructure management including regular maintenance	G2 G5	Vanuatu
	This strategy includes specifying ownership and responsibilities for infrastructure assets and needs to be implemented in the short term.	G7 G9	
INF2.3	Create a mobile services delivery gateway to put in place government-wide shared infrastructure and services to enable rapid development, mainstreaming and deployment of MGOV	G2 G3 G4	Other
	This strategy involves a thorough inventory of existing infrastructure and specifying how to share it across government for delivering MGOV services. In addition, it involves setting clear guidelines and standards for service and application design to ensure coherent MGOV that can be delivered through a single gateway such as a government m-apps store. This should be addressed in the short-term to ensure consistency from the outset.	G8 G11	
INF2.3a	Create a mobile applications (m-apps) store to facilitate the process of developing and deploying suitable applications	G2 G3	Other
	This strategy involves developing the m-apps store as a single point of delivery, specifying guidelines and standards for	G4 G5	

ID	STRATEGY	GOALS	SOURCE
	application design to ensure consistency and interoperability and regular maintenance. Such a unified outlet for MGOV applications should ideally be available in the short term.	G8 G10	
INF2.4	Offer shared tools like data collection, helpdesk services, APIs, SDKs to the agencies that wish to deploy mobile applications	G1 G2	Other
	Such shared tools should be available in the short term, to be continuously updated.	G3 G4 G8	
INF3	Ensure accessibility of infrastructure	G2	Other
	This strategy should be tightly aligned with Vanuatu's Universal Access Policy and strategy SP2, involving setting time-specific targets for accessibility as well as concrete mechanisms to achieve them, for instance through incorporating accessibility as a key design criterion in all MGOV services, and regulatory incentives such as publishing national mobile accessibility standards, taxes and levies. This strategy should be implemented with concrete medium- to long-term targets.	G3 G4 G7 G8	
INF3.3	Make mobile broadband infrastructure affordable and accessible to educational institutions	G1 G2	Other
	This can include special costing schedules for services, as well as price ceilings and subsidies for hardware investments. The targets should be set in the medium- to long term.	G3 G7 G9	
INF3.4	Support proliferation of free WIFI	G2	Other
	According to the "add-on" approach specified in principle 2, free WIFI hotspots should be developed at highly populated areas first, gradually moving outwards to enlarge the number of such points throughout the country. Concrete targets should be set for the medium and long terms.	G3 G4 G7 G9	
INF4	Develop an MGOV contingency plan that includes a secure data center and disaster recovery capabilities	G3 G5	Other
	Due to the high exposure of Vanuatu to natural disasters, this should be achieved as soon as possible in the short term.	G17	

Table 14: Selected MGOV strategies – ICT Infrastructure

4.3.3.2. Interoperability

ID	STRATEGY	GOALS	SOURCE
IOP1	Develop standardization of mobile ICT hardware to be used in all government sectors	G2 G3	Other
	This strategy includes the development of an interoperability framework (IOP1.1) and providing clear policy-level incentives to	G4 G8	

	all government stakeholders for compliance with such standardization, for instance by means of a "comply-or-explain" obligation for government agencies. Standardization of MGOV should be achieved at the latest in the medium term.	G11	
IOP1.1	Develop a first-class interoperability framework to enhance interoperability and information sharing across public services	G2 G3	Other
	This strategy includes specifications of a clear and regularly maintained list of standards for interoperability in the technical, semantic (information structures), and organizational (processes and structures) dimensions. A first list of standards should be available in the short term and be gradually expanded.	G4 G8 G11	

Table 15: Selected MGOV strategies – Interoperability

4.3.3.3. Security Safeguards

ID	STRATEGY	GOALS	SOURCE
SS1	Establish legislation to address cyber-crime threats to MGOV	G3	Other
	This strategy involves a risk analysis based on identifying possible cyber-security threats, their potential impact and likelihood of materializing, in order to develop the necessary organizational structures, defining mandatory Cybersecurity standards and mandating them as addendum to the national Cybersecurity Policy. Such an update to the Cybersecurity Policy should be available in the short term.	G5 G9 G11 G17	
SS1.1	Establish a national framework to protect identity, security and privacy that covers MGOV	G3 G5	Other
	This strategy should take the same approach as specified in SS1 and be published as part of the same package in the short term.	G9 G11 G17	

Table 16: Selected MGOV strategies – Security Safeguards

4.3.4. Dimension 4 – MGOV Services and Applications

This section provides strategies under the fourth dimension (MGOV Services and Applications) of the MGOV framework, and organizes them according to the two elements in this dimension: Design and Development (Section 4.3.4.1) and Delivery Mechanisms (Section 4.3.4.2). Individual strategies are identified using the prefixes DD and DM respectively.

4.3.4.1. Design and Development

ID	STRATEGY	GOALS	SOURCE
DD1	Ensure suitable service and application design strategies	G2	Other
	This strategy builds on setting government-wide guidelines and standards for designing MGOV services according to the needs and lifestyles of the stakeholders (DD1.1), maximizing public value, ensuring accessibility and usability of applications (taking into account the constraints of mobile devices, special-needs users, and service costs), as well as their scalability. These guidelines should be developed in the short term.	G3 G5 G6 G8	
DD1.2	Design new MGOV services according to the needs and lifestyles of stakeholders, e.g. citizens, businesses, agencies; establish a "Know Our Customer Better" Program for citizen-centric m-service design, and mobilize local government officials to partner with their communities for design and implementation of content	G2 G3 G5 G6 G7 G8	Other
	This strategy involves identifying the (local) needs and lifestyles of potential users, for instance by establishing a Know-Our-Customer-Better-Program and by mobilizing local government officials to partner with their communities for content production. Such practices should be included in the guidelines recommended in the strategy DD1 and made available to service developers in the short term.		
DD1.8	Design for low-cost services and applications	G1	Vanuatu
	This strategy might include setting acceptable cost ceilings for MGOV services, and providing guidelines for cost-saving application design such as for instance using open standards and open source software. This strategy should be implemented in the short term to ensure affordable services from the outset of the national MGOV roll-out.	G2 G3 G5 G9 G13	
DD2	Develop specific MGOV services in education, health, public safety, environment and other sectors and lessen the cost of providing such services to remote and rural communities	G1 G3 G4	Other
	This strategy involves identifying priority sectors in which MGOV applications can be developed to reach "low-hanging fruits" and mainstream MGOV in the short- to medium term, gradually expanding the services portfolio across all policy sectors in the long term.	G6 G9 G10 G11 G12 G13 G14 G15	

		G16 G17 G18	
DD2.2	Develop MGOV applications in the educational sector	G1	Other
	This strategy builds on the development of solutions to specific problems in the educational sector, such as student opportunities for mobile learning (DD2.2) as well as strengthening the administrative capacities of the educational sector (DD2.3). As the top priority sectoral area for the government, this should be addressed in the short term.	G3 G4 G7 G9 G11	
DD2.2a	Increase student opportunities for mobile learning	G1	Other
	This strategy concerns in particular the creation of mobile learning resources to address the shortage of qualified teachers particularly in remote areas. As a priority area for Vanuatu, this should be addressed in the short term.	G2 G3 G4 G7 G9	
DD2.2c	Strengthen administrative functions of the educational system through use of mobile ICT, e.g. by using mobile ICT as a tool to measure the performance of teachers and students	G1 G3 G4	Other
	This strategy concerns the development of mobile solutions for improving the collection and administration of public records in the educational sector, e.g. by using mobile ICT as a tool to measure the performance of teachers and students. As a priority area for Vanuatu, this should be addressed in the short term.	G7 G8 G9 G11	
DD2.3	Develop MGOV applications in the health sector	G3	Other
	This strategy includes applications for health information dissemination (e.g. public SMS announcements) as well as remote health care (e.g. mobile teleconferencing or SMS-based health consultation systems). As a priority area for Vanuatu, this should be addressed in the short term.	G4 G6 G9 G11 G13 G14	
DD2.3e	Gather health statistics from the field, sent through SMS codes, e.g. on the number of clients seen, diagnosis, etc.	G1 G3	Vanuatu
	This strategy should focus on the applications that can easily be used over 2G networks such as SMS codes, e.g. on the number of clients seen, number of patients with specific symptoms, etc. As the top priority sectoral area for the government, this should be addressed in the short term.	G4 G6 G10 G11 G14	
DD2.7	Develop MGOV applications for businesses and consumers	G3	Other
	This strategy includes for instance developing mobile payment services, a mobile B2B platform or SMS notification systems for salary payments. As a priority area for Vanuatu, this should be	G4 G5 G6	

		G8	
	addressed in the short term.	G9	
		G12	
DD2.7a	Utilize MGOV for consumer protection and advocacy complaints	G3 G4	Other
	This strategy includes for instance SMS-based mailboxes for complaints. As a priority area for Vanuatu, this should be addressed in the short term.	G5 G6 G9 G12	

Table 17: Selected MGOV strategies – Design and Development

4.3.4.2. Delivery Mechanisms

ID	STRATEGY	GOALS	SOURCE
DM3	Set up a government call center to provide information on MGOV services	G3 G5	Other
	This strategy should be aligned with the setting up of the national MGOV contact center (L1.1) and be available in the short term as soon as MGOV initiatives are being rolled out.	G7 G8	
DM5	Align and link MGOV delivery with the larger service delivery framework to reduce costs and ensure the presence of a critical mass of services for sustainability	G2 G3 G8	Vanuatu
	This strategy includes setting guidelines and standards for service delivery and establishing mechanisms to ensure compliance. These guidelines should be provided in the short term to ensure a coherent approach from the outset.		
DM6	Provide a one-time subsidy to a trial wave of rural Internet cafes, to assist in launching of this absent service.	G2 G3	Vanuatu
	Focus initially on locations which will attract numerous foreign as well as local users, such as the cruise ship stops at tiny Wala island off Malekula, and Aneityum island (the cruise ship "Mystery Island") in the south of Vanuatu, and near the tourist attractions on Tanna island of the Mt. Yasur volcano, the John Frum (Prum) tribe village, and the island airport.	G7	

Table 18: Selected MGOV strategies – Delivery Mechanisms

4.4. Summary

This section described the proposed content of the National MGOV4D Strategy for Vanuatu. The content was structured into a four-layer strategic framework, with:

1. The overall strategy objective as the top layer and defined in Section 4.2.1 – the objective was obtained by literally adopting the overall objective of the National ICT Policy except replying ICT with mobile ICT;
2. A set of 18 goals aimed at assuring the achievement of the overall objective as the second layer defined in Section 4.2.2 – 8 goals were adopted from the National ICT strategy and 10 were formulated based on the interviews with the key stakeholders from Vanuatu aimed at determining the conditions and aspirations for MGOV4D in the country;
3. A set of 14 principles and approaches to guide the selection and implementation of individual strategies defined in Section 4.2.3; and
4. A set of 53 strategies to advance the achievement of the strategic goals and ultimately the overall objective of the strategy defined in Section 4.3; the latter strategies were selected from the localized MGOV4D Strategy Knowledge Base described in Section 3 according to the methodology described in Section 4.1 – by scoring and ranking the strategies depending on their contributions to individual goals and also priorities assigned to such goals.

A possible implementation plan and initial project portfolio for the proposed MGOV4D strategy will be subsequently described in the Section 5 and 6 respectively.

5. MGOV4D Strategy Implementation for Vanuatu

The purpose of this section is to propose how the MGOV4D strategy for Vanuatu outlined in Section 4 of this report could be implemented, considering the present conditions in the country. To this end, the section first presents the implementation framework to establish the environment for decision-making and carrying out any MGOV4D projects (Section 5.1), followed by the implementation plan where different steps to be carried out in rolling out the MGOV4D implementation are outlined (Section 5.2) and the details of such steps including immediate and ongoing tasks (Section 5.3). The final section presents some conclusions (Section 5.4).

5.1. Implementation Framework

The purpose of this section is to outline the implementation framework for initiating and carrying out MGOV4D projects. The framework comprises tentative implementation roadmap (Section 5.1.1), resources and capabilities (Section 5.1.2) underpinning any MGOV4D project implementation, processes (Section 5.1.3), finances and investment conditions (Section 5.1.4), key performance indicators (Section 5.1.5), and monitoring and management (Section 5.1.6).

5.1.1. Tentative Implementation Roadmap

As the guiding principles underpinning any MGOV4D project implementation we adopt the principles and approaches A1-A14 (Section 4.2.3) directly following the 14 priority areas set forth in the National ICT Policy (Section 2.3.2). These principles are applied to define and constrain the following three-stage implementation roadmap:

o *Stage 1* – This stage should comprise of "quick-win" projects that require the least resources to start and that build upon existing attempts to develop mobile services. This stage should also carry out capacity building among civil servants and citizens, and initiate public awareness campaign to receive public support and identify future partners.
o *Stage 2* – This stage should move beyond the "quick-wins" and include the development of high-priority, high-impact mobile applications for the government and for Vanuatu including civil registry, basic agriculture support, basic electronic public services, etc. and promoting the usage of such services among citizens and businesses.
o *Stage 3* – This stage should aim at scaling up the deployment of MGOV services in different sectors of the economy and society including education, health, security, environment, tourism, culture, trade and commerce, finances and economy, etc. and simultaneously engage in continued promotion and capacity building to use such services by the public.

Figure 7 elaborates on the tentative three-stage implementation roadmap, including operating conditions and actions expected for each stages, and Table 19 provides further details on each stage including implementation approach, strategy area and high-priority projects.

2014	2015-2016	2017-2018	2019-2020
READINESS AND QUICK WINS		USAGE	IMPACT
80-90% voice coverage 20% population by 3G 7% has smart phones smart phone price 300-500USD	90-93% voice coverage 25-30% covered by 3G 12-20% has smart phones smart phone price $200-300 USD	95-98% voice and high speed coverage 75% covered by 3G 50-70% has smart phones smart phone price $40-100 USD	98-99% voice and high speed data coverage 85-90% has smart phones smart phones price $25-90 USD

Develop implementation plan

Develop investment plan

Create governance structures

Create MGOV leaders

SMS-based MGOV applications:

o   Civil Registry (birth, death, marriage, etc. registration)
o   Civil Defense (weather forecasts, emergency warning alerts, etc.)
o   Health (vaccination alerts, public health prevention, etc.)

MGOV mobile applications:

o   Health (collection of health-related data)
o   Education (courseware for mobile learning)
o   Civil Defense (protection responder/safety)

MGOV mobile applications

According to sectoral strategies

Provide MGOV training

Facilitate access to mobile devices

(One laptop per child)

Establish legal framework

(ICT policies for equal and equitable access and the related rules)

Establish legal framework

(ICT policies for equal access,

Define guidelines and good practices

Guidelines for green mobile technologies)

Develop capabilities of ICT industry

(Promotion of private sector integration on

MGOV Strategy for Health Sector

MGOV Strategy for Education Sector

MGOV Strategy for Tourism Sector

MGOV Strategy for Transport Sector

MGOV Strategy for X Sector

Figure 7: MGOV4D implementation roadmap for Vanuatu – Stages

Year	Operating Conditions	Basic Approach	Strategy Area	High Priority Project Title	Brief Project Description	Possible Model or More Information
2014	80-90% voice coverage of the population; 20% of the population covered by 3G; about 7% of the population has smart phones; price of a smart phone is $300-500 USD	Building institutional capacity	Strategy and Policy Framework (SP1.3, SP2)	MGOV Implementation Plan	Develop MGOV Implementation plan	Balance Scorecard
				MGOV Investment Plan	Develop multi-year MGOV investment plan including guidelines and standards for procurement of mobile ICT systems in government	Val IT Framework
		Creating governance structures	Leadership (L2)	National MGOV Unit	Establish the national MGOV unit and governance structures to oversee the implementation of the MGOV strategy	OGCIO Vanuatu Working groups
		Creating leaders	Leadership (L4)	Develop MGOV strategists	Develop a pool of MGOV strategists well versed in MGOV technology	Training Site visits
2015 - 2016	90-93% voice coverage of the population 25-30% of the population covered by 3G about 12-20% of the population has smart phones; price of a smart phone about $200-300 USD	Quick-wins SMS-based MGOV applications	Design and Development (DD2) Civil Registry (CC2, CC6)	Birth registration and birth certificates in rural areas	Rural health workers and principals of schools will issue birth certificates to undocumented children and send information to Civil Registry Headquarters via SMS	"A new solution to birth registration in Tanzania: http://www.unicef.org/infobycountry/tanzania_71827.html. In Niger, birth registration takes a big step forward http://www.unicef.org/infobycountry/ niger_71507.html. Every child's birth right - Inequalities and trends in birth registration: http://www.unicef.org/media/files/Embargoed _11_Dec_Birth_Registration_report_low_res.pdf
				Death certificates	Rural health workers will notify the Civil Registry Headquarters via SMS about deceased and will issue death certificates	Innovations in monitoring vital events – mobile phone SMS support to improve coverage of birth and death registration: a scalable solution, eHealth Digital Library, http://ihi.eprints.org/2113/
			Design and Development (DD2)	Public Weather Service	Issuing SMS related to weather forecasts and warning messages in preparation of emergencies	"National Oceanic and Atmospheric Administration (NOAA), Mobile Weather Warnings on the way!

				Emergency Response			http://www.noaa.gov/features/03_protecting/wireless_emergency_alerts.html. Mobile phone weather warnings for elderly http://english.gov.cn/2011-01/19/content_1788444.htm
				Design and Development (DD2) Health (CH4)	Vaccination Alerts	Parents receiving SMS informing about the vaccination schedule for their children	Send SMS for free mobile vaccination alerts for your child http://health.india.com/news/send-sms-to-5667 78-for-free-mobile-vaccination-alerts-for-your-child/
			Smartphone-based MGOV applications developed and launched	Design and Development (DD2) Health (CH1)	Collection of health-related data	Collecting, communicating and retrieving population- and health-related data at the source of events, communicating the data to the Health Information System (HIS) platform and allowing informants to retrieve statistical data about their community	Mobile platforms for data collection like Open Data Kit (http://opendatakit.org) and EpiCollect (http://www.epicollect.net)
				Design and Development (DD2) Health (CH1)	Location of health services	Providing services for locating hospital, health care centers and pharmacies	Alberta Health Services, http://www.albertahealthservices.ca/mobile.asp National Health Services Directory http://www.nhsd.com.au/download-app
				Design and Development (DD2) Education (CE9)	Courseware for mobile learning	Developing learning courses for mobile devices	Mobile Education for 1 Million Philippine Out-of-School Youth: http://www.futuregov.asia/articles/2013/ sep/26/mobile-education-1-million-philippine-out-school-y/. Mobile Learning Resources: http://www.unesco.org/new/en/ unesco/themes/icts/m4ed/mobile-learning-resources/
				Design and Development (DD2) Social Welfare	Protecting women's safety	Developing mobile applications for protecting women against domestic and sexual violence	Protecting Women's Safety? https://www.dur.ac.uk/resources/sass /research/briefings/ResearchBriefing12Protecting WomensSafety.pdf. Mobile Technologies for Child Protection http://www.unicef.org/wcaro/english/mobile_tec

					hnologies_for_child_protection.pdf
	Building human capacity	Absorptive Capacity and Adoption (AC5)	Providing MGOV training	Providing MGOV training for government workforce, community leaders, school teachers, health workers. Empower young generations to carry MGOV-focused community capacity-building	TARAhaat, Helping People Help Themselves, http://www.tarahaat.com/education.aspx
	Facilitating access to mobile devices	Infrastructure (INF3)	Facilitating access to mobile devices	Ensuring the use of mobile devices in educational settings by delivering tablets to high-school students	One laptop per child http://one.laptop.org/
	Building institutional capacity	Strategy and Policy Framework (SP4)	Establishing legal framework	Set in-place non-discriminatory laws, mandates, policies and practices for equal and equitable access to MGOV infrastructure and services	Overview of the Proposed Principles in the ICT Policy Review Framework Paper April 2013, http://www. ellipsis.co.za/ wp-content/uploads/2013/04/Overview-of-Proposed-Principles-in-the-ICT-Policy-Review-Framework-Paper-April-2013.pdf Regulatory Framework for mobile financial services, http://www.mgovworld.org/libra/mbanking/papers/regulatory-framework-for-mobile-financial-services.pdf
		Strategy and Policy Framework (SP6.2a, SP6.2b)	Defining MGOV guidelines and good practices	Define government-wide and cross-sectoral guidance on green and good practices for MGOV products and services, including waste avoidance and disposal, reduced emissions, etc.	Mobile's Green Manifesto, http://www.gsma.com/publicpolicy/wp-content/uploads/2012/03/environgreenmanifesto.pdf
	Developing mobile ICT industry	External Stakeholders (ES3)	Developing capabilities within the mobile ICT industry	Promote private sector integration into MGOV: develop public-private strategies for MGOV to enhance the productivity of local business	Public-Private Partnership in e-Government: Knowledge Map, http://www.infodev.org/infodev-files/resource/InfodevDocuments_821.pdf

2017 - 2018	95-98% voice and high speed coverage of population; 75% of the population covered by 3G; about 50-70% of the population has smart phones; price of a smart phone about $40-100 USD	SMS-based systems continued: major smart phone-based MGOV applications launched	Design and Development (DD2) Health	Mobile health-related apps	Providing comprehensive, and easy to understand health and medical information through a mobile app	http://www.vic.gov.au/social-media/mobile-apps/better-health-channel-health-information-and-services.html#
				Mobile app for healthy living	Providing information for health living,	A Primer for Women's Health, Learn about your Body in 52 Weeks, http://52weeks4women.nih.gov/
				More mobile applications	According to sectoral strategy	
			Design and Development (DD2) Education (CE8)	Establishing a mobile learning platform	Deploying mobile learning platform where students can access educational resources and assignments	Singapore schools introduces mobile learning experience http://www.futuregov.asia/articles/2012/apr/03/singapore-school-launch-mobile-learning-experience/
				More mobile applications	According to sectoral strategy	
			Design and Development (DD2) Tourism (CT2, CT6, CT8)	Look up services for hotels and tourism information	Providing mobile apps for tourism, like: arrival guides, city guide by local people, etc.	Helsinki mobile apps: http://www.visithelsinki.fi/en/come/tourist-information/helsinki-mobile-apps through mobiles: apps.hel.fi
				More mobile applications	According to sectoral strategy	
2019 - 2020	98-99% voice and high speed data coverage; about 85-90% of has smart phones; smart phone costs $25-90 USD	SMS-based systems phased out; more smart phone-based MGOV apps launched	Design and Development (DD2) Health Education Transport Tourism Social Welfare…	More mobile applications	According to sectoral strategies	

Table 19: Tentative MGOV4D implementation roadmap for Vanuatu – Details

5.1.2. Resources and Capabilities

Any MGOV4D project has to rely on various resources and capabilities for its implementation: human – management and technical personnel with required skills and competencies; organizational – rules, procedures and processes for building, managing and monitoring the performance of project teams; financial resources including budgets, accounting procedures, public-private partnerships and business models for sustainability; technical resources including infrastructure, systems, services and facilities.

These resources and capabilities must be fully identified and accounted for as part of any MGOV4D projects, and include the values for the following attributes:

1. *Name* – Each resource should be assigned a concise and unique name for easy reference.
2. *Type* – Four resource types are defined: human, organizational, financial and technical.
3. *Owner* – The role assigned to any person with the responsibility for managing the resource and overseeing its usage by any MGOV4D project. If the person is not a decision-maker, he or she should obtain the required commitments and decisions from the higher authorities.
4. *Liaison* – The role assigned to the main contact within the MGOV project on the matters concerning these resources and a liaison between project leadership and the resource owner. The person assigned to this role should be part of the project's Steering Committee.
5. *Contents* – The definition and content of the resource, e.g. the amount and distribution of the project budget, the cost and availability of certain kinds of manpower, technical parameters and specifications of available technologies, equipment and facilities, etc.
6. *Usage* – The specification including conditions and constraints how the resource can be used in general and for the MGOV4D project, e.g. accounting rule for the use of financial resources, staffing rules specifying the rights and obligations of the personnel, etc.

Any MGOV4D project should maintain the matrix of all resources used, with resources as rows and attributes as columns of the matrix. The matrix should be maintained by the project team, and updated to reflect any changes in the project's execution environment.

5.1.3. Processes

A number of processes must be executed by every EGOV4D project in order to achieve the set goals, while utilizing available resources. These processes include but are not limited to:

1. *Finances* – Acquire, approve and manage financial resources to cover the costs of project operations and ultimately to contribute to the achievement of the project goals.
2. *Political Leadership* – Ensuring political leadership is a key success factors for implementing EGOV and MGOV strategies. Such leadership is needed to ensure long-term commitment to provisioning of resources, to bringing together all major stakeholders who may have conflicting interests, and to building consensus.

3. *Administrative Commitment* – In addition to strong political support from the highest level of government, there is a need to ensure administrative commitment, so that various changes that should be implemented proceed smoothly and synchronously. To achieve this, one approach is to create a guiding coalition. The guiding coalition should have a strong power position, with enough key players on board so that those who are left out cannot block progress, and with members representing various points of view, experiences and disciplines relevant to the tasks at hand, so that they can make informed decisions and build good reputations to ensure that the statements made by the coalition are taken seriously by employees. The coalition must ensure that leadership and management work in tandem – leadership driving changes and management keeping the processes under control.

4. *Change Management* – Successful development, deployment and operation of MGOV solutions usually involves changes in business processes, organizational culture, service delivery frameworks, regulations, and in other areas. A change management process is needed to ensure that the desired changes are effective and that no undesired side-effects of such changes are introduced into the organizations, and to provide strategies to manage resistance to change by government workforce and other stakeholders.

5. *Development* – Carry out a range of technical activities involved with building software for the MGOV application/service under development, from user and requirement analysis, through design and analysis, to implementation, testing and operation support.

6. *Connectivity* – Working with telecom operators, establish the telecom connection in a given area to make the developed MGOV4D application/service available to its customers.

7. *Outreach* – Raising awareness among citizens, businesses and other potential users about the benefits of the developed MGOV4D application/service and building capacity in using this application/service, thus increasing adoption and scale up.

The MGOV4D project leader, supported by the project's Steering Committee should derive a comprehensive list of such processes and maintain this list throughout the project.

5.1.4. Investment Aspects

The setup of the projects should include the development of a business case and an investment plan, to be agreed among all project partners, on how to acquire financial and other kinds of resources required by the project. For the sake of feasibility and sustainability of the project, irrespective of the funding received from government, the project should seek to generate revenue and return-on-investment. However, given the public nature and development context of such projects, revenue generation must be carefully balanced with public value creation requirements typical for such projects. In order to encourage investment in MGOV application and service development, the following should be considered:

o The investment need not be limited to large, one-time contributions. Instead, it should be part of a strategic partnership for development, with the project divided into sub-projects with individual goals, costs and return-on-investment targets defined for each of them.

- o The investment should not be limited to the private or public sectors but include citizens, who might be offered to fund and manage m-service centers in remote areas and receive part of the fees as return-on-investment, or who might provide innovate ideas.
- o The investment need not be limited to financial resources only but include the provision of in-kind support, e.g. dedicating one's own time to resource mobilization.

Possible investors from Vanuatu include but are not limited to:

1. Agricultural Research Centre
2. Office of the Government Chief Information Officer
3. Telecommunications and Radiocommunications Regulator
4. Department of Strategic Planning and Aid Coordination
5. Digicel Telecom Company; time-cost usage of mobile telecommunications
6. Council of Women; mobilizing women to become mobile service users
7. Providence Fund; sharing existing m-service infrastructure
8. National Bank of Vanuatu; partnership for financial m-services

In practical terms, a sequence of activities of the investment management practice defined by the Val IT Framework (IT Governance Institute, 2007) includes: 1) develop a high-level definition of investment opportunities; 2) develop initial business case; 3) develop a clear understanding of the candidate program; 4) perform alternatives analysis; 5) develop program plan; 6) develop benefits realization plan; 7) identify full lifecycle costs and benefits; 8) develop detailed business case; 9) assign clear accountability and ownership; 10) initiate, plan and launch the program; 11) manage the program; 12) manage and track the benefits; 13) update the business case; 14) monitor and report program performance and 15) retire the program. The activities of the investment management practice are depicted in Figure 8.
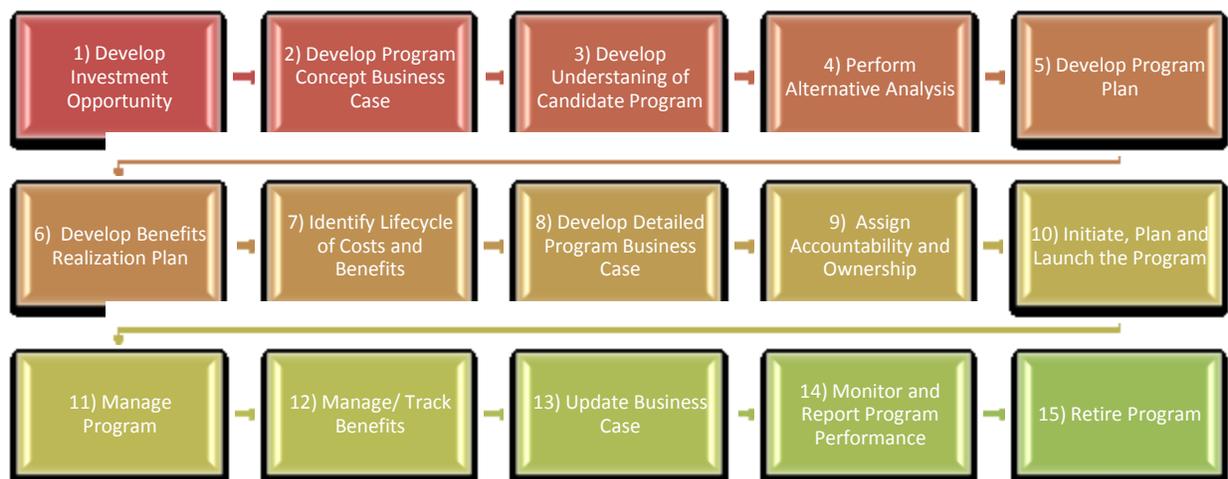

Figure 8: Val IT investment management practice

5.1.5. Sustainability Plan

Based on (Dzhusupova, 2011), here are some approaches for ensuring the sustainability of the MGOV4D projects and their deliverables:

o *Stakeholder Engagement* – Bringing relevant partners as external stakeholders can ensure successful completion as well as sustainability of the project outputs and outcomes. Two among possible stakeholders include: 1) private sector representative, who can contribute to software development and capacity-building activities, as well as to service operations through some kind of public-private partnerships and 2) international organizations who can provide good practices and promote South-to-South collaboration with countries with similar conditions and experiences.

o *Ownership* – Ensuring that the project is locally-owned. For example, OGCIO as the project owner should coordinate project activities and manage communications with stakeholders.

o *Human Capacity and Awareness* – There is a need to build human capacity in the use of mobile technologies as well as in the need to create public value through the use of such technologies. Capacity and awareness-building programs targeting internal stakeholders should be carefully planned and implemented.

o *Institutional Capacity* – Deploying MGOV applications and services goes far beyond deploying ICT solutions. It also involves building institutional capacity in terms of legislative and regulatory frameworks, policies and guidelines on the use of such services, and possible transformations of government structures and processes to enhance efficiency and effectiveness, and ensure the delivery of public value. All dimensions, not only technology, must be addressed for deploying such applications and services.

o *Public Private Partnership (PPP)* – PPP is a cooperative venture between public and private sector entities, built on the expertise of each entity, which best meets clearly-defined public needs through the appropriate allocation of resources, risks and rewards (CCPPP, 2005). PPP can produce benefits to both public and private sector entities involved. Benefits to public sector entities include (Field et.al., 2003): 1) accessing specialized skills which may be difficult or uneconomical to maintain in government; 2) sharing of services and resources with private sector entities to benefit from the economies of scale; 3) obtaining private sector funding to develop and operate new public services; 4) engaging private sector entities to discover opportunities for innovation and efficiency gains in government; and 5) sharing project risks with private sector entities. In general, partnering with the private sector allows government to dedicate more attention and resources to core policy and governance issues. The benefits to private sector entities include (Field et.al., 2003)(PBC, 2003): 1) delivering public services through privately owned infrastructures and hence creating business opportunities; 2) learning about the government domain and the needs of public sector entities; 3) accessing secure, long-term investment opportunities; and 4) generating new businesses with the certainty and security guaranteed by a government

contract. It is strongly recommended to seek the establishment of PPP for sustainability of MGOV initiatives. Moreover, PPP can be also treated as a funding mechanism for such initiatives. Many governments around the world define their own PPP models. Examples are the Government of Ireland (http://ppp.gov.ie/), the Government of Australia through Department of Treasury and Finances (http://www.dtf.vic.gov.au/Infrastructure-Delivery/Public-private-partnerships/Resources/National-Public-Private-Partnerships) and the Government of South Africa (http://www.ppp.gov.za/Pages/default.aspx).

o *International Collaboration* – Several international organizations are dedicated to building human and institutional capacity in various regions in need, e.g. the Commonwealth Telecommunications Organization collaborating with the Government of Vanuatu in the development of the MGOV strategy (the current report is a reference to this collaboration); the Australian Agency for International Development (AusAID) assisting developing countries in reducing poverty and achieving sustainable development, for example offering assistance to the Government of Vanuatu in conducting assessment studies on health management system in Vanuatu (On et al., 2009); the Center for Electronic Governance at UNU supporting governments in developing countries in strategic use of technology to transform the working of public organizations and their relationships with citizens, businesses, civil society, and with one another, including collaboration on the development of the Vanuatu MGOV strategy (this report is a reference); UNICEF providing assistance to building capacity of civil registries (UNICEF, 2013) which may be required for the development of mobile services related to the Civil Registry in Vanuatu; and many other. To bring the expertise that the Government of Vanuatu lacks, to assist the Government in building its own capacity, to facilitate South-South and regional collaboration on common problems, and generally to ensure the continuity and growth of MGOV initiatives, the Government of Vanuatu should leverage existing partnerships as well as develop new partnerships with international organizations and countries in the region.

5.1.6. Key Performance Indicators

Another important component of the implementation of MGOV4D projects is measuring their execution, i.e. the value delivered by them to the stakeholders and how they contribute to the implementation of the overall MGOV4D strategy. In project management practice, such measurement is captured through Key Performance Indicators (KPIs): "a set of measures focusing on those aspects of organizational performance that are the most critical for the current and future success of the organization" (Parmenter, 2012).

Agreed upon all parties when the project begins, KPIs are quantifiable measures that can be shared and analyzed by different project stakeholders at any time. The definition of KPIs contributes to the successful completion of projects, since they can be used to closely monitor the results of actions and contribute to unifying organizational efforts. However, not all performance measures should be considered as KPIs. KPIs are those performance measures that significantly affect project performance e.g. budget deviations.

As a quantifiable measures of effort, KPIs should be SMART: Specific; Measurable, Aachievable, Result-oriented and Time-bound. According to Parmenter (2012), KPIs have seven main characteristics: 1) they are measured in non-financial, non-monetary terms; 2) they are measured frequently, e.g. weekly or daily; 3) they are acted upon by the senior management team, i.e. senior management can call relevant staff to enquire about the results obtained and the consequence of such results; 4) they clearly indicate what actions are required from staff, i.e. staff are aware of the measurement system and understand what actions to take to fulfill the set targets; 5) they tie responsibility down to a team, i.e. the team leader is required to take the necessary actions to improve the measures; 6) they have a significant impact, i.e. they affect one or more of the critical success factors and more than one strategy perspective; and 7) they encourage action in the right direction, i.e. they have been tested to have a significant impact on the performance if the indicated direction is taken.

For implementing KPIs, seven foundational principles have been defined by Parmenter (2012): 1) successful performance improvements require the establishment of effective partnerships among management, employees and their representatives, suppliers and other stakeholders; 2) improving performance and achieving performance goals require empowering employees, particularly those at the front-line; 3) an integrated framework a needed to measure and report performance in a way that results in positive actions and outcomes; 4) critical success factors should be the source of all KPIs; 5) an organization needs to recognize and abandon a process that does not work or deliver value; 6) there is a need for all stakeholders to understand the behavioral consequences of a given measure; and 7) unless an organization embraces KPIs and what they mean, the progress towards performance improvement will be limited.

Two categories of qualitative and quantitative KPIs can be identified for measuring progress in EGOV and MGOV strategy implementation: 1) KPIs for measuring sector-independent implementation performance and 2) KPIs for measuring sector-specific implementation performance in social, economic, governance and other sectors. Tables 20 and 21 present examples of such KPIs in both categories respectively.

TIME	KPIs
By 2016	o Number of SMS-based mobile services provided o Number of civil servants trained in the use of mobile technologies
By 2018	o Number of government agencies offering SMS-based services o Number of mobile apps provided for service delivery
By 2020	o Number of government agencies offering mobile apps for service delivery o Number of mobile apps delivered by non-government actors

Table 20: Example KPIs for sector-independent MGOV implementation performance

SECTORS	OUTCOMES	KPIs
SOCIAL	Increased access to quality education	o e-Learning systems in place using mobile devices o Number of schools using mobile devices for educational purposes
	Better delivery of and access to health services	o Mobile health services in place
	Improved health management Capacity	o Number of medical doctors using health mobile services o Number of services on the health information systems platform using mobile devices
	Move to development-oriented and people-centered service delivery culture	o Percentage of increase in customer satisfaction due to service delivery through mobile devices o Percentage of increase in people using mobile services
ECONOMIC	Alternative, cost-effective service delivery	o Percentage of reductions in face-to-face transactions o Percentage of reductions in the overall operating costs o Percentage of transactions performed through mobile devices
	Redeployment and rebalancing of the civil service	o Number of staff trained in mobile technologies o Increased number of staff with new required skills
	Promotion of internal and external investment	o Percentage of increase in foreign direct investment due to mobile technologies o Percentage of increase in internal investment due to mobile technologies
GOVERNANCE	Greater accountability and transparency in public administration	o Availability of government budget, expenditure, contacts and other data on mobile devices o Access to government reports and documents through mobile devices
	Improved communications and public relations	o Percentage of people interacting with government through mobile devices o Timely government response through mobile devices
	Enabling legal infrastructure	o Legislation in place to deal with e-authentication, e-signature, etc. Through mobile devices o Green practices in place for reducing, reusing, and recycling mobile devices

Table 21: Example KPIs for sector-specific MGOV implementation performance

5.1.6. Monitoring and Management

For any MGOV4D project, in addition to the implementation team and its role to carry out technical and substantive work, monitoring and management functions are critical to success. The monitoring function is typically assigned to the Steering Committee while the management function is assigned to Technical and Governance Committees:

o *Steering Committee* – The monitoring and assessment function typically entails making sure that the project is carried out efficiently, effectively and in line with its mandate. Such function is usually carried out by the Steering Committee which comprises representatives of major stakeholders, investors and user groups. The priority for selecting the members of the committee should be first maturing and experience, and then institutional affiliation.

o *Technical Committee* – It typically comprises a group of engineers and technology experts, chaired by the Chief Information Officer responsible for MGOV, and made responsible for examining the implementation, if outsourced, or supervising any technical team established to carry out the implementation. The main role of the Technical Committee is making sure that proper infrastructure including hardware, software, networking and related ICT issues such as shared datasets, private cloud etc. are developed efficiently and on time.

o *Governance Committee* – It is responsible for overseeing the smooth cooperation between different stakeholders, particularly government and the private sector, and for making sure that the project meets the expectations of its owner – Government of Vanuatu. Two major concerns for Governance Committee are the management of public-private partnerships, and making sure that the project pays attention to the needs of citizens.

All three monitoring and management structures are depicted in Figure 9 below.
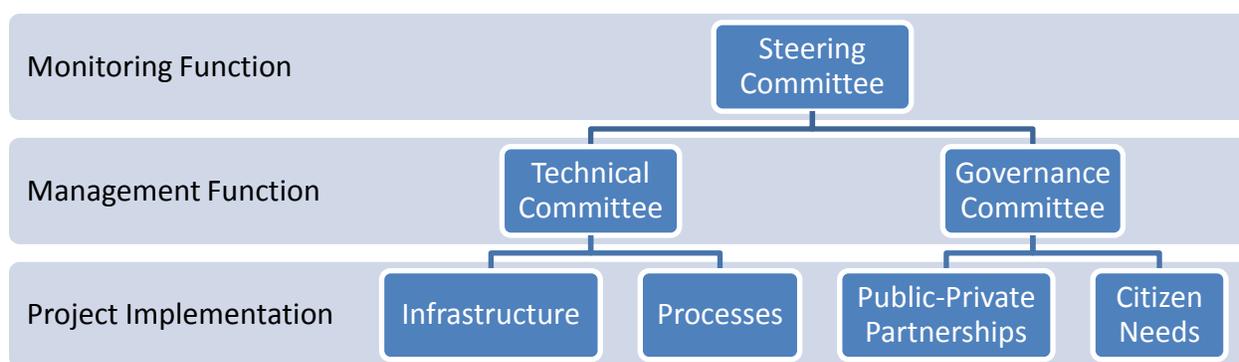
Figure 9: Recommended MGOV monitoring and management structures

5.2. Implementation Plan

This section proposes a possible implementation plan for the MGOV4D strategy as a whole, comprising the execution of individual MGOV4D projects. The plan conforms to the guidelines described above but is flexible enough to adapt to different implementation stages outlined in Section 5.1.1 as well as conditions and resources available for project implementation. The plan comprises the following steps that could be partly carried out in parallel:

1. Identify priority MGOV4D projects to be implemented in the first time period, each project treated separately and with minimal coupling, so that the outcomes of these projects (primarily MGOV applications and services) are dispatched and launched as soon as ready. This will ensure the integrity of the strategy implementation, provide quick wins required to secure public support when the implementation takes time, and consolidate experience by the local implementing teams to ensure improvements in successive MGOV applications.

2. Establish the monitoring and management structures for the strategy implementation by forming and staffing the Steering, Technical and Governance Committees.

3. Allocate the areas of responsibility for each committee. For example, assign two areas of responsibility to the Technical Committee and two to the Governance Committee:

   o *Infrastructure* – Identify infrastructure needs by the current MGOV4D projects including data servers, networking, telecommunications, information systems and others.
   o *Processes* – Identify the services and business processes underpinning selected MGOV4D projects and their expected outcomes, model them and identify detailed specifications for the technical team implementing the projects.
   o *Public-Private Partnership* – Negotiate partnership arrangements between government organizations that will own the outcomes of the selected MGOV4D projects and the companies that may be interested in providing financial or in-kind resources to support the implementation of these projects and possibly by operating their outcomes.
   o *Citizen Outreach* – Develop an outreach program to encourage and enable citizens and businesses to utilize MGOV services through training, added value, incentives, price, etc.

   The Technical and Governance Committees would work under the overall directions from the Steering Committee, which is the ultimate owner of the project implementation.

4. Prepare an action plan by the Steering Committee to include among others:

   o Timing plan including project commencement, and review and assessment milestones
   o Budget and availability of financial resources, at least for the initial project stage
   o The authority for the implementation team to be allowed to use government facilities, and to seek information and support from various government stakeholders
   o Partnership agreements between government and various private entities

5. Concurrently, the Steering Committee should plan for growth and sustainability of MGOV4D in Vanuatu, extending the program from the short term (two years) to long term (five years) and continuously monitoring the implementation and adjusting the plan accordingly.

5.3. Immediate and Ongoing Tasks

This section describes seven tasks to be carried out by MGOV4D strategy implementation, described in subsequent sections: selecting committee members (Section 5.3.1), commencing technical development (Section 5.3.2), building human capacity (Section 5.3.3), strengthening partnerships (Section 5.3.4), mobilizing resources (Section 5.3.5), raising public awareness (Section 5.3.6) and adopting mobile services in sectors (Section 5.3.7).

5.3.1. Task 1 – Selecting Committee Members

The key element in setting up administrative structures for MGOV4D implementation is the formation and member selection for the Steering Committee. Given the nature of the MGOV4D strategy and its implementation, the members of the committee should possess experience and expertise (or at least access to expertise) in a number of areas outlined below:

o *Business domain* – The expertise required in this area should include: ability to understand various business sectors especially those related to services; knowledge and expertise in financial affairs and financial analysis; entrepreneurship and investment-oriented thinking.

o *Governance domain* – The expertise required should include: understanding of governance, regulations and public services; and ability to discuss, negotiate and resolve conflicts.

o *Community domain* - The expertise required should include: knowledge of citizen and social welfare and well-being; cultural awareness and social values; community development; ability to identify development needs and provide feedback and recommendations.

o *Technology domain* – The expertise required in this area should include: software (SW) and hardware (HW), Internet and mobile, connectivity and applications; knowledge of information systems, data and system management, and design and development methods.

The selection of members to the Technical and Governance Committees would require more specialized knowledge. Figure 10 explains the relationship between competency areas required from the members of the Steering, Technical and Governance Committees.
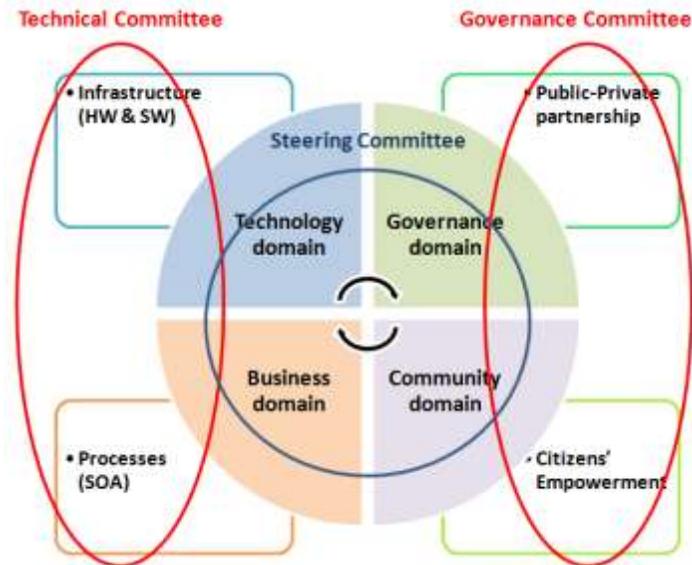
Figure 10: Competency requirements for different committee members

5.3.2. Task 2 – Enabling Technical Development

The environment for technical development includes a number of elements. In the following we focus on the adoption of standards, access to technical expertise and digital divide:

o *Standards* – The adoption of ICT-related standards across the government and by its major development partners is a key enabler for predictable and effective technical development. The benefits include: cost reductions, accelerated technology adoption, improved efficiency in the use of ICT, network effects, scalability, better response to security threats and to environmental challenges, etc.

o *Technical expertise* – A useful strategy to access technical capabilities in the countries where such capabilities are rare, like Vanuatu, is building the pool of national technical experts and arranging with their employers to be seconded from time to time to carry out specific technical tasks for national projects as experts on call. This strategy has the advantage of building ownership and closer commitment to the project across the country.

o *Digital divide* – The implementation of the Vanuatu's MGOV4D strategy should become a growing force for bridging the digital divide in the country. As such, the implementation should be socially inclusive and serve all citizens including those with disabilities and special needs, with technical development paying a special attention to the accessibility issues.

5.3.3. Task 3 – Building Human Capacity

The MGOV4D capacity building entails a platform through which capacity building activities would be delivered, and some principles for carrying out such activities.

The platform should address the following challenges: 1) government officials are often required to make decisions outside their areas of expertise and which consequences they are not fully aware of – they need training to make well-informed decisions in such circumstances; 2) citizens have a variety of education levels and needs, and require customized training to fulfil such needs at their level of education; and 3) beyond traditional class-room training, the training should be carried out in innovate ways and include, e.g. community-driven training.

To address such challenges, here are some principles for delivering capacity building activities: 1) government ministers and other senior officials should provide visible leadership and support to Vanuatu's MGOV4D strategy implementation; 2) government personnel should actively participate in implementing and monitoring the MGOV4D strategy; 3) collaboration training should be offered to support the establishment and maintenance of partnerships between government, businesses and non-profits, reaching out to communities in outlying islands; and 4) specialized training should be also offered to build the pool of national technology experts.

An action plan should be developed to guide capacity building efforts. In this plan, a priority goal should be to build and maintain a team of technology professionals for carrying out MGOV4D projects. In order to design a curriculum underpinning this training, three areas of expertise should be covered: 1) technology management to include, among others, system analysis and design, applications administration, data security over mobile channels, mobile applications development, and mobile service quality and standards; 2) change management to include, among others, mobile service awareness and adoption, and impact of social media and other forms of communication; and 3) program management – mobile communication planning and operations, and mobile technology infrastructure, services and programs.

5.3.4. Task 4 – Strengthening Partnerships

The engagement of private sector partners in the funding and implementation of MGOV4D projects may produce major benefits including the sharing of costs and risks, energy to innovate brought in by the private sector partners, and sustainability. The latter refers to continued delivery of benefits from the project beyond the point when the project stops receiving government funding. For implementing MGOV4D in Vanuatu, two categories of private sector partnerships can be identified: long-term and strategic and short-term and specific:

o A long-term strategic partnership in the MGOV4D area could be established with a major private sector company, most likely a telecom operator or an Internet service provider. The partnership is characterized by: 1) a relatively long-term nature; 2) a high level of investment; and 3) a high leverage or even control by the private sector partner over the management of the MGOV4D project and perhaps even the operation of the resulting MGOV4D service which is outsourced to it. Normally, the return on investment is not high but as it extends over a long period of time, it becomes economically viable and worthwhile. In Vanuatu, possible partners in this category could be: National Bank of Vanuatu, Telecommunications and Radiocommunications Regulator, and the Digicel company.

o A short-term, specific MGOV4D partnership could be established with any business that has specific short to medium-term interest in an MGOV application or service, and its operation. The partnership would not require a large investment figure but show a higher return on investment that the long-term partnership. Although the private sector partner may not have as much influence over the management or operation of the resulting MGOV service, the Steering Committee could grant it more leverage for the sake of the project. Such partnerships could be exploited with small and medium-size enterprises based on different islands and villages. Possible national-level candidates are: Agricultural Research Centre, Council of Women which could be a good partner for outreach operations by mobilizing women across the islands to become MGOV service users, and the Vanuatu Providence Fund to utilize existing mobile service infrastructure for MGOV service delivery.

5.3.5. Task 5 – Mobilizing Resources

Resource mobilization refers to raising financial and non-financial resources – volunteer support, material donations, staff time, etc. to support the MGOV4D project implementation. Two approaches to resource mobilization are:

o To treat resource mobilization as solely a government or a public-private partnership concern, therefore assume that the required resources are readily available and not the responsibility of the MGOV4D strategy implementation.
o To mandate the MGOV4D strategy implementation and individual MGOV4D projects to mobilize the necessary resources to supplement existing government or public-private partnership funding, and therefore to pursue sustainability.

It is recommended that the second, sustainability-driven approach be adopted. The approach should be flexible enough to accommodate changing economic situation, and take place within a resource mobilization policy developed by the MGOV4D Steering Committee.

5.3.6. Task 6 – Raising Public Awareness

The power of the customary tribal system in Vanuatu and consequently of the tribal chiefs should be utilized to the highest degree. This should entail providing the chiefs with the opportunity to learn to use mobile devices and become the MGOV users, and promote MGOV awareness and capacity building throughout the villages with help from the chiefs and a few empowered, technology-literate young people. In turn, this would raise economic opportunities and citizen participation on the village and community level.

5.3.7. Task 7 – Adopting Mobile Services in Sectors

As MGOV services and applications will start appearing and are being used by citizens of Vanuatu, they will showcase what is possible and lead the development of other mobile

services by example. In particular, other sectors of the economy and society will start adopting and adapting MGOV services and applications to their own needs and circumstances. In order to promote this trend, a special MGOV4D diffusion and adoption program could be established to promote the benefits of MGOV4D and related innovations to other sectors, and to build the capacity for MGOV application and innovation transfer within and across sectors.

5.4. Conclusions

Following the presentation of the MGOV4D strategy for Vanuatu in Section 4, this section presented a possible approach to implementing this strategy. The approach set forth: an implementation framework comprising guiding principles and a three-stage implementation roadmap; a method for managing resources and capabilities by each projects; a set of financial, development, connectivity and outreach processes part of every project implementation; investment and funding method; and the management structures comprising Steering, Technical and Governance Committees. Secondly, in line with the implementation framework, the approach proposed the implementation plan to include the selection of priority MGOV4D initiatives, formation of the respective management committees and assigning them with specific responsibilities, and taking care of sustainability issues. Finally, the section elaborated on seven implementation tasks including selection of committee members, enabling technical development, building human capacity, strengthening partnership development, mobilizing resources, raising public awareness and transferring MGOV services to different sectors.

6. Priority MGOV4D Projects for Vanuatu

After formulating the content of the MGOV4D strategy in Section 4 and providing a framework for implementing this strategy in Section 5, this section identifies a set of priority MGOV4D projects to be part of the MGOV4D project portfolio. To this end, Section 6.1 explains the reasons for defining priority MGOV4D projects; Section 6.2 presents selected MGOV4D projects based on the MGOV4D strategy and the interviews and field visits; Section 6.3 examines the requirements concerning the common technology platform upon which MGOV service and applications could be deployed; and Section 6.4 covers the issue of risk management.

6.1. Objectives

There are four main reasons why identifying priority MGOV4D projects is an important step for implementing the MGOV4D strategy. First, it helps to commence the strategy implementation with concrete projects and to use such projects to test the viability of the strategy in the real-life operating environment. Second, it makes it possible to introduce the necessary corrections to the strategy depending on the feedback received from the projects, and thus to narrow the gap between strategy and implementation. Third, the initial project portfolio can be seen as a pilot implementation, aimed at uncovering potential challenges that may be encountered when the implementation is scaled up to other applications and services. Fourth, initial high-value projects can help build public support for MGOV4D in Vanuatu.

6.2. Selected MGOV4D Projects

This section provides a list of MGOV4D projects selected based on the interviews with various stakeholders from Vanuatu. The projects are grouped into citizen-focused projects (Section 6.2.1), business-focused projects (Section 6.2.2) and top priority projects (Section 6.2.3).

Each project is associated with a specific strategy from Section 4 to which it contributes. Given the nature of the projects, almost all projects contribute to the strategy DD2 "Develop specific MGOV services in education, health, public safety, environment and other sectors and lessen the cost of providing such services to remote and rural communities" and its various sub-strategies such as DD2.2 for education, DD2.3 for health or DD2.7 for business sector. In all sections below, the projects are not listed in any specific priority.

6.2.1. Citizens-Focused Projects

This section presents the list of selected citizen-focused projects. The projects are grouped into sectors: health (Section 6.2.1.1), education (Section 6.2.1.2), employment (Section 6.2.1.3), home (Section 6.2.1.4), civil matters (Section 6.2.1.5), travel and tourism (Section 6.2.1.6), social welfare (Section 6.2.1.7), and transport (Section 6.2.1.8). They are labelled using the prefixes CH for health, CE for education, CM for employment, CO for home, CC for civil matters, CT for travel and tourism, CW for social welfare, and CD for transport.

6.2.1.1. Sector 1 – Health

ID	PROJECT	STRATEGY
CH1	Directory of hospitals and pharmacies	DD2.3
CH2	Public healthcare appointment scheduling	DD2.3
CH3	Laboratory including blood test results	DD2.3
CH4	Immunization records	DD2.3
CH5	Availability and prices of medicines	DD2.3
CH6	Smart healthcare ID issuance and renewal	DD2.3
CH7	Gathering health statistics from the field through SMS	DD2.3e

Table 22: Selected MGOV4D projects – Health Sector

6.2.1.2. Sector 2 – Education

ID	PROJECT	STRATEGY
CE1	Public school registration	DD2.2
CE2	Tertiary education registration	DD2.2
CE3	School examination dates	DD2.2
CE4	Students' grade records	DD2.2
CE5	Educational certificates and official transcripts issuance	DD2.2
CE6	School inspection reports	DD2.2
CE7	Smart education ID issuance and renewal	DD2.2
CE8	Establishment of the mobile learning platform	DD2.2a
CE9	Development of courses for mobile learning	DD2.2a
CE10	Measuring the performance of teaching	DD2.2c
CE11	Measuring the performance of learning	DD2.2c
CE12	Develop mobile platform for VEMIS (Vanuatu Education MIS) reporting	DD2.2

Table 23: Selected MGOV4D projects – Education Sector

6.2.1.3. Sector 3 – Employment

ID	PROJECT	STRATEGY
CM1	Government vacancies lookup	DD2
CM2	Government employee benefits lookup	DD2
CM3	Salary certificate issuance	DD2.7
CM4	Labor complaint submission	DD2.7a
CM5	Unemployment registration	DD2

Table 24: Selected MGOV4D projects – Employment Sector

6.2.1.4. Sector 4 – Home

ID	PROJECT	STRATEGY
CO1	Property sales contract issuance	DD2.7
CO2	Utilities connection	DD2.7
CO3	Utilities reconnection, and transfer	DD2.7
CO4	Utilities complaints submission	DD2.7
CO5	Utilities bill payment	DD2.7
CO6	Utilities disconnection	DD2.7
CO7	Property valuation	DD2.7
CO8	Address update	DD2
CO9	Municipal fees payment (individuals)	DD2

Table 25: Selected MGOV4D projects – Home Sector

6.2.1.5. Sector 5 – Civil Matters

ID	PROJECT	STRATEGY
CC1	National ID card issuance, renewal, and amendment	DD2
CC2	Birth certificate issuance	DD2
CC3	Marriage and/or divorce certificate issuance	DD2
CC4	Official documents attestation	DD2
CC5	Civil laws and regulations lookup	DD2
CC6	Death certificate issuance	DD2
CC7	Passport issuance, renewal, and amendment	DD2

Table 26: Selected MGOV4D projects – Civil Sector

6.2.1.6. Sector 6 – Travel and Tourism

ID	PROJECT	STRATEGY
CT1	Visit visa issuance, renewal, and amendment	DD2
CT2	Tourism info and hotels directory lookup	DD2.7
CT3	Foreign and national embassies and consulates directory lookup	DD2
CT4	Ministries and government entities directory lookup	DD2
CT5	Mail and Post delivery notices	DD2
CT6	Country map and point of interest locator lookup	DD2
CT7	Boat departures and arrivals to islands	DD2.7
CT8	Flight arrival and departure information lookup	DD2.7
CT9	Residence visa issuance, renewal, and amendment	DD2
CT10	Residence visa cancellation	DD2

Table 27: Selected MGOV4D projects – Travel and Tourism Sector

6.2.1.7. Sector 7 – Social Welfare

ID	PROJECT	STRATEGY
CW1	Social assistance provision	DD2
CW2	Retirement date information	DD2
CW3	Pension benefits calculation and lookup	DD2
CW4	Retirement salary certificate issuance	DD2

Table 28: Selected MGOV4D projects – Social Welfare Sector

6.2.1.8. Sector 8 – Transport

ID	PROJECT	STRATEGY
CD1	Boat schedules and marine transport information	
CD2	Driving license application and test scheduling	DD2
CD3	Driving license renewal	DD2
CD4	Vehicle registration, renewal, and amendment	DD2
CD5	Vehicle ownership transfer	DD2
CD6	Vehicle inspection and road tax payments	DD2.7
CD7	Traffic fine payment	DD2.7
CD8	Public transport ticketing/payment	DD2.7
CD9	Public taxi bookings	DD2.7

Table 29: Selected MGOV4D projects – Transport Sector

6.2.2. Businesses-Focused Projects

This section presents the list of selected business-focused projects. The projects are grouped into stages: setup (Section 6.2.2.1), operation (Section 6.2.2.2) and closure (Section 6.2.2.3). They are labelled using the prefixes BS for setup, BO for operation and BC for closure.

6.2.2.1. Stage 1 – Setup

ID	PROJECT	STRATEGY
BS1	General commercial license issuance/renewal/amendment application	DD2.7
BS2	Export license issuance/renewal/ amendment application	
BS3	Industrial business regulatory approval/renewal/amendment application	DD2.7
BS4	Healthcare business regulatory approval/renewal/amendment application	DD2.7
BS5	Food and beverage regulatory approval/renewal/amendment application	DD2.7
BS6	Tourism business regulatory approval/renewal/amendment application	DD2.7
BS7	Professional services regulatory approval/renewal/amendment application	DD2.7

Table 30: Selected MGOV4D projects – Business Setup

6.2.2.2. Stage 2 – Operation

ID	PROJECT	STRATEGY
BO1	Commercial registration information lookup	DD2.7
BO2	Business laws and regulations lookup	DD2.7
BO3	Building permit issuance, renewal, and withdrawal application	DD2.7
BO4	Municipal fees payment for properties (businesses)	DD2.7
BO5	Work permit issuance, renewal, and amendment application	DD2.7
BO6	Work permit cancellation	DD2.7
BO7	Social insurance contributions and labor related payments	DD2.7
BO8	Government contractor registration/renewal/amendment application	DD2.7
BO9	Government contractor registration cancellation	DD2.7
BO10	Public tenders notification	DD2.7
BO11	Public tender documents purchase	DD2.7
BO12	Customs duties payment	DD2.7
BO13	Agricultural consignments import permit	DD2.7
BO14	Government reporting and national statistics lookup	DD2.7
BO15	Price index lookup	DD2.7
BO16	Tax filing (businesses)	DD2.7

Table 31: Selected MGOV4D projects – Business Operation

6.2.2.3. Stage 3 – Closure

ID	PROJECT	STRATEGY
BC1	General commercial license cancellation	DD2.7
BC2	Business ownership transfer/change	DD2.7

Table 32: Selected MGOV4D projects – Business Closure

6.2.3. Top Priority Projects

In addition, a handful of top priority projects were selected based on the needs and interests observed during the field visits and expressed during the interviews. The projects are listed in the Table 33. As the projects are ordered from the highest to the lowest priority, the highest priority project is the development of various MGOV applications and services to support the working of the Civil Registry such as the issuance of the birth, marriage and death certificates, the issuance, amendment and renewal of passports, notification of civil actions and others. Priority projects are labelled with the prefix PP.

ID	PROJECT	STRATEGY
PP1	Civil registry	DD1.2
PP2	Land registry	DD1.2
PP3	Post office notification	DD2
PP4	Basic health Services	DD2.3
PP5	Basic school Services	DD2.2

Table 33: Top priority MGOV4D projects

6.3. Selected MGOV4D Projects – Business Cases

This section presents high-level businesses cases for three selected top-priority projects: Birth Registration Service (Section 6.3.1), Public Weather Service (Section 6.3.2) and Collection of Health-Related Data Service (Section 6.3.3). Each business case includes project overview, needs analysis, strategic alignment, feasibility, cost-benefit analysis and risk analysis.

6.3.1. Project 1 – Birth Registration Service

This section presents a business case for the Birth Registration Service. The case includes project overview (Section 6.3.1.1), needs analysis (Section 6.3.1.2), strategic alignment (Section 6.3.1.3), feasibility (Section 6.3.1.4), cost-benefit analysis (Section 6.3.1.5) and risk analysis (Section 6.3.1.6).

6.3.1.1. Project Overview

The project shall deliver a solution that enables birth registration based on the use of mobile devices. While initially the functionality could be based on SMS, in the second stage it could be provided through a mobile application. The solution shall enable authenticating a person or institution that requests to register a birth, to send data about a newly registered child to the Civil Registry, to interact with the system of the Civil Registry to retrieve data about newly born children, and to deliver a birth certificate to the registering party. The registration process including the declaration, registration and notifications of births and the issuance of birth certificates is depicted in Figure 11. In addition to the Civil Registrar, the notification of births can be issued by health institutions, local government authorities or community chiefs.
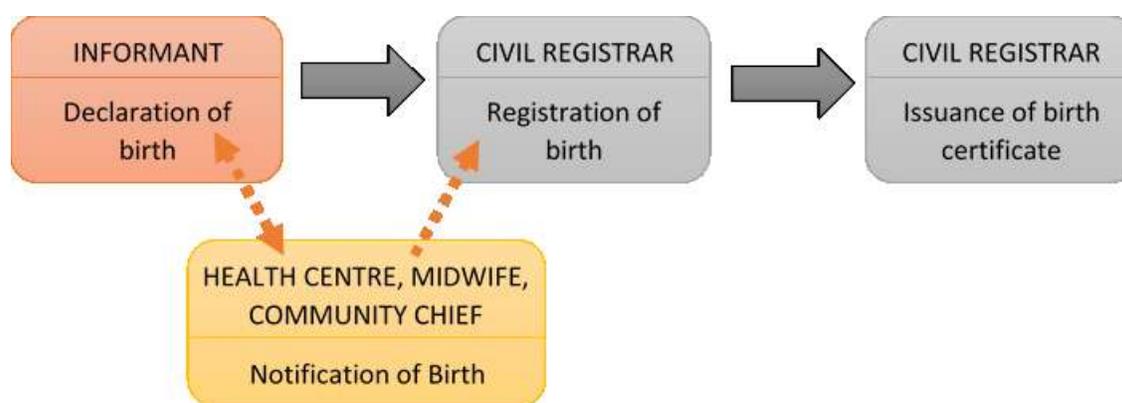

Figure 11: Birth registration process

6.3.1.2. Needs and Current Situation

The Convention on the Rights of a Child adopted by United Nations Office of the High Commissioner for Human Rights (1989) states in Article 7 "The child shall be registered immediately after birth and shall have the right from birth to a name, the right to acquire a nationality". Despite this convention, the rate of birth registration varies significantly across countries, since the infrastructure, administrative capacity, availability of funds, and access to rural population and technology all affect the coverage of the birth registration service and the type of information that can be collected. Unfortunately, for a child not to have a birth certificate may directly to the inaccessibility of health, education and other public services available to him or her. In addition, at a later age, the child can enter into marriage, labor market or even military services before the legal age (UNICEF, 2013).

In Vanuatu, available statistics about birth registration are provided in Table 34 (UNICEF, 2013). According to the table, only 43 percent of births are registered in the country; 39 percent of males and 47 percent of females are registered; and 53 percent of children in urban areas and 41 percent of children in rural areas are registered. Concerning the age of registration, only 38

percent of children are registered within the first year of their lives and the rest are registered, if any, after they are one year old. Concerning the economic status, only 27 percent of children of the poorest families and 55 percent of the richest families are registered at the age of five. Concerning the region of residence, birth registrations in the regions with the lowest and highest rates stand at 21 and 66 percent respectively.

Registered births	43%
SEX (%)	
Male	39%
Female	47%
AGE IN MONTHS	
0-11	38%
12-23	46%
24-35	44%
36-47	47%
48-59	40%
PLACE OF RESIDENCE (%)	
Urban:	53%
Rural:	41%

REGION (%)	
Highest Registration:	66%
Lowest Registration:	21%
HOUSEHOLD WEALTH QUINTILE	
Poorest	27%
Second	43%
Middle	45%
Fourth	50%
Richest	55%

Table 34: Statistics of birth registrations in Vanuatu

According to UNDESA (1995), the percentage of birth registrations in Vanuatu was 40 percent. Compared to 43 percent in (UNICEF, 2013), little progress was achieved in the last 18 years.

6.3.1.3.   Strategic Alignment

Several reasons exist for delivering the birth registration service:

o The MGOV Strategy, as any other Electronic Government strategy is supposed to deliver short-terms wins to show positive impact in the short term and help bring stakeholders onboard. The birth registration service is a small-scale project that can be delivered in short term and can produce positive impact due to the current situation described above.

o The 2012-2014 Programme of Work adopted by the Office of the Government Chief Information Officer (OGCIO) specifies a list of high-priority projects to be implemented as Components 3 and 4 of the Programme. In particular, Component 4 includes development of the National Citizen Registration System project for the Department of Civil Status.

o As a fundamental service to support the National Citizen Registration System including the delivery of birth, marriage and death registration services, OGCIO is working to develop a mobile application to collect data from the field, generally by health workers.

6.3.1.4. Feasibility

The feasibility of the project is justified based on:

o Experiences gained by other countries, for example Nigeria (UNICEF, 2014) and Kenya (World Health Organization, 2011);

o Availability of free and open-source frameworks for rapidly building scalable mobile services, for example (RapidSMS, 2014);

o Availability of good practices for carrying out administrative procedures as part of a Civil Registry System (UNDESA, 2001); and

o The support of international organizations. For example, UNICEF "is providing technical support and advocacy for the enactment of laws, policies and standards for free and universal birth registration" (UNICEF, 2013). UNICEF also promotes South-South collaboration in the development of birth registration solutions.

6.3.1.5. Cost-Benefit Analysis

Major project costs include: 1) deploying mobile devices among field workers, 2) deploying the application and 3) building human capacity. While the start-up costs of deploying mobile devices could be high, it is supposed that such devices will be used for many applications including delivery of health and other services aimed at improving socio-economic conditions of citizens in remote areas. Therefore, initial costs should be prorated among all future applications that will be using the device. Similar observation is valid concerning the cost of building human capacity, since after a field worker or government employee acquires skills in using ICT, he or she can apply those skills to operate and use other government applications. Finally, the cost of deploying the application should be reasonable considering low level of complexity and possible reliance on free- and open-software platforms.

Concerning benefits, in addition to ensuring the rights of a child and fulfilling government commitment to upheld such rights, the benefits for deploying MGOV4D applications includes enhancing the access to and the delivery of health, educational and other high-impact services to the marginalized population, thus truly contributing to their socio-economic development.

6.3.1.6. Risk Analysis

Six risks associated with the deployment of electronic Civil Registries, three identified in the literature and three by the authors of this report are presented in Table 35 below. For every identified risk, the associated mitigation plan is outlined as well.

ID	RISK	MITIGATION PLAN
1	Lack of security and confidentiality of the Civil Registry may expose children to misuse or disclosure of personal information (UNICEF, 2013)	International organizations like OAS (OAS, 2014), IADB (IADB, 2014), UNDESA (UNDESA, 2014) and others provide assistance in professional training for civil registry staff and share good practices. In addition, there are well-known standards related to IT security, e.g. (ISACA, 2012).
2	Increasing risks to vulnerable population by including personal information in their birth certificates (UNICEF, 2013)	Reducing the amount of information included in the birth certificate to the minimum required
3	Losing the content of the Civil Registry due to natural hazards and disasters (UNDESA, 1998)	Guidelines exist for backing up and preserving civil registration files (UNDESA, 1998). In addition, new approaches like cloud computing could be used to mitigate the risk.
4	Lack of human capacity for operating and using the Civil Registry system	Human capacity building should be planned and delivered as part of the project.
5	Misuse of mobile devices by field workers may affect the sustainability of the service	Guidelines should be developed for the use of mobile devices by the field workers, and taught as part of capacity building activities.
6	High costs of replacing malfunctioning mobile devices may affect the sustainability of the service	Green policies should be adopted for replacing IT equipment, including mobile devices.

Table 35: Risks associated with Birth Registration Service

6.3.2. Project 2 – Public Weather Service

This section presents a business case for the Public Weather Service including overview (Section 6.3.2.1), needs analysis (Section 6.3.2.2), strategic alignment (Section 6.3.2.3), feasibility (Section 6.3.2.4), cost-benefit analysis (Section 6.3.2.5) and risk analysis (Section 6.3.2.6).

6.3.2.1.   Project Overview

The project shall deliver a solution for the provision of informational public weather services through mobile devices. The solution may comprise a mobile application that allows users to register for the service and receive weather information through their mobile devices. The service shall provide a general weather forecast message, written within a maximum allowed length, and broadcasted at least twice per day. The information could include a general forecast for the day and emerging trend for the next four days, as well as minimum and maximum

temperatures for the next 36 hours. The information shall be updated as often as needed. In the second stage, the service could be extended to provide severe weather warnings.

6.3.2.2. Needs and Current Situation

Providing reliable and timely public weather services to citizens contributes to ensuring their safety and wellbeing. It allows people to better plan their daily activities including ways to commute to work, to care for their dependents, to travel, to spend leisure time, etc. It can also help farmers make better decisions regarding their land and crops. The Vanuatu Meteorological and Geo-Hazards Department (VMGD) is responsible for "observing and understanding Vanuatu's weather and climate and providing meteorological and related services in support of Vanuatu's national needs and international obligation" (www.meteo.gov.vu). VMGD provides various types of weather and climate services like forecast information, marine and aviation forecasts, and others. In particular, the public forecasts service is delivered as shown in Figure 12, fulfilling the service requirements defined in the previous section. Although the VMGD forecast service disseminates information through the web portal, local radio and FM stations, the radio is not available through mobile devices.

Public Forecasts
1. Four Day precise forecast for the main provincial centers, issued twice a day
2. Hourly images, uploaded on the VMGD website
3. Public Forecast via local Radio and FM station Outlets, issued every 4 hours
4. Four Day Provincial Forecast via the website, updated three times a day.
5. 7 Day forecast for provincial centres
6. Forecast Policy
7. 7 Day forecast for Weekly IPV and Independent Newspaper and daily forecast for Daily Post Newspaper

[Ref: http://www.meteo.gov.vu/VMSLinks/Services/tabid/109/Default.aspx]

Figure 12: VMGD Public Forecasts Service

6.3.2.3. Strategic Alignment

Several reasons exist for delivering the Public Weather Service:

o The MGOV Strategy, as any other EGOV strategy, is supposed to deliver short-terms wins to showcase positive impact and help bring stakeholders onboard. The Public Weather Service is a small-scale project that can be delivered in short term due to the availability of information and the existing Public Forecasts Service provided by VMGD, and can produce positive impact that can contribute to the diffusion of mobile services among the society.

o The 2012-2014 Programme of Work adopted by the Office of the Government Chief Information Officer (OGCIO) specifies a list of high-priority projects to be implemented as

Components 3 and 4 of the Programme. In particular, Component 3 includes development of the Vanuatu Emergency and Disaster Management Information Systems project for the National Disaster Management Office. The service can serve to set the stage in government and society for the delivery of more advanced services related to disaster management. In particular, the second phase could deliver severe weather warnings, perhaps in an interactive mode, to enable citizens to upload photos that can contribute to disaster management as part of Emergency and Disaster Management Information Systems.

6.3.2.4. Feasibility

The service is provided by many governments around the word. References to such services are provided in Table 36.

Service Name	Service Provider	Reference
Mobile Weather	Met Office, Government of UK	http://www.metoffice.gov.uk/services/mobile-weather
National Weather Service	National Oceanic and Atmospheric Administration, Government of USA	http://mobile.weather.gov/
Weatherzone mobile	Weatherzone, Australia	http://m.weatherzone.com.au/
Mobile Web Weather Service	Meteorological and Geophysical Bureau (SMG), Government of Macao SAR	http://mobile.smg.gov.mo/e_index.php?con=services/e_mobile.htm
Cell Broadcast Weather Information Service	SMG, Government of Macao SAR	http://mobile.smg.gov.mo/e_index.php?con=services/e_cb_intro.htm
My Observatory	Hong Kong Observatory, Government of Hong Kong SAR	http://www.hko.gov.hk/myobservatory_e.htm
Severe Weather Early Warning	Severe Warning Systems	http://severewarningsystems.com/sms_signup.html

Table 36: Examples of mobile weather services

6.3.2.5. Cost-Benefit Analysis

Since VMGD already provides the Public Forecasts Service, required information and procedures are already in place. Therefore, the major cost is associated with the development of the mobile application, which is not expected to be high. The benefits include improving the quality of life of citizens and visitors by contributing to their wellbeing and safety, and the diffusion and appropriation of mobile services and technologies across the society.

6.3.2.6. Risk Analysis

Two risks associated with weather services were identified by the authors of this report, and are presented in Table 37 below. For every identified risk, the associated mitigation plan is outlined as well.

ID	RISK	MITIGATION PLAN
1	Ensuring the accuracy and timeliness of the information.	Revising business processes seeking improvements on information accuracy and timeliness. Including service terms and conditions for the mobile platform, as are currently available when accessing the service through the website.
2	Economic factors may affect the sustainability of the service	Delivering the service through a PPP, see example of The Weather Company in Australia, recognized as the "leading commercial weather information provider… The Bureau of Meteorology (BoM) supplies weather information and The Weather Company converts this information into computer ready data, specialized forecasts, TV or web ready graphics and scripts" (http://www.weather zone. com.au/about/about.jsp).

Table 37: Risks associated with Mobile Weather Service

6.3.3. Project 3 – Collection of Health-Related Data Service

This section presents a business case for the Collection of Health-Related Data Service. The case includes overview (Section 6.3.3.1), needs analysis (Section 6.3.3.2), strategic alignment (Section 6.3.3.3), feasibility (Section 6.3.3.4), cost-benefit analysis (Section 6.3.3.5) and risk analysis (Section 6.3.3.6).

6.3.3.1. Project Overview

The project shall deliver a solution that enables capturing, communicating and retrieving health-related statistical data through mobile devices. The solution may comprise a mobile application to authenticate a person or institution authorized to update health-related statistical data, to send such data to the Health Information System platform, and to interact with the platform to, among others, retrieve health-related information about the informant's community or location. Two types of health-related data are of concern: 1) population data such as births, stillbirths, deaths, suicides and others; and 2) health service activity data such as outpatients, diseases discovered, daily admissions, cases and treatments related to notifiable diseases and others.

The service could be developed in stages. The first stage could focus on capturing population data, the second stage on capturing health service activity data, and the third stage on allowing

citizens to retrieve health- and population-related information about their community or location. Although the final stage is linked to the development status of the Health Information Systems platform, it would be advisable to enable this functionality as early as possible to deliver value to citizens. To build this functionality, the type of information to be retrieved could be staged, for example basic information provided in the early stage and more comprehensive information in subsequent stages.

6.3.3.2.   Needs and Current Situation

According to (ODE and AusAid, 2009), health service delivery system in Vanuatu comprises five hospitals; urban health facilities including eight municipal dispensaries – five in Port Vila and three in Luganville; and the rural health care comprising 32 health centers, 89 dispensaries and 181 aid posts. A reliable data collection process is needed to record various events taking place at such institutions to enable evidence-based planning of health policies.

Located at the Ministry of Health, the Health Information System Unit (HISU) is responsible for providing "reliable and timely statistical and epidemiological data to monitor health status and guide programmatic interventions, decision-making and policy formulation" (Takoa, 2009). However, according to On et al. (2009), the reporting responsibilities are not clearly defined at various levels of the health care system, and there are no endorsed policies or standards for data collection. In addition, a 2009 evaluation of the Vanuatu's health sector (ODE and AusAid, 2009) concluded that the health information system has low coverage, and lacks management data to allow reporting on the KPIs. More details about the challenges and current situation in health-related data collection are provided in (On et al., 2009).

Despite the lack of data management, health centers possess statistical data. For example, health centers and dispensaries maintain the registers of (On et al., 2009): 1) children under 5 years old, 2) stillbirths, 3) maternity report books, 4) antenatal report books, 5) delivery and births, 6) inpatients, 7) pharmacy ordering forms, 8) deaths and suicides, 9) outpatients, 10) home and school visits, 11) transfers to other facilities, and 12) various kind of forms for notifiable diseases. To communicate such data, several instruments have been implemented, like the health centers' and dispensaries' monthly Health Information System report, the aid post monthly report, and the hospital registers and monthly statistics. However, the data collection and communication processes present some weaknesses, for instance On et al. (2009): a) the nurses are required to complete three copies of the reports; b) the reports are too complicated, so the nurses keep additional copies to calculate data on a daily basis; c) the reports present inconsistent formatting and do not provide clear definitions; d) the reports try to collect two different types of data – population data and health service activity data, which adds complexity to the instrument; e) transmission of the forms to HISU is problematic and the delivery mechanism lacks standardization; and f) due to lack of time, sometimes nurses copy data from the previous month instead of providing accurate figures.

The proposed service contributes to addressing all weaknesses in data collection and communication described above.

6.3.3.3.   Strategic Alignment

Several reasons exist for delivering the Collection of Health-Related Data Service:

o   The 2012-2014 Work Programme adopted by the Office of the Government Chief Information Officer (OGCIO) specifies a list of high-priority projects to be implemented as Components 3 and 4 of the Programme. In particular, Component 3 includes the development of the Health Information System (HIS) platform project for the Ministry of Health and the Statistics Management System project for the National Statistics Office.

o   The Health Sector Strategy (HSS) (2010-2016) specifies as the first service strategy "Improvement in health status of all the people of Vanuatu will be achieved through a strengthened evidence-based public health". To achieve evidence-based public health, there is a need to reliably and timely capture data at the source of health-related events.

o   There are government regulations that mandate data collection about notifiable diseases (On et al., 2009).

o   Making available reliable health-related statistical data is particularly important for the growing private health care sector in Vanuatu (On et al., 2009).

6.3.3.4.   Feasibility

Many examples of mobile applications that collect and transmit data are available, for example OpenData Kit (http://opendatakit.org/), fulcrum (fulcrumapp.com), EpiCollect (http://www.epicollect.net/) and many others. There are also specific examples for the health sector, e.g. eMocha (http://www.emocha.com/). In addition, data to be collected is available in health centres as explained in Section 6.3.2.2.

6.3.3.5.   Cost-Benefit Analysis

The major project costs are associated to the following tasks: 1) defining requirements for data collection, i.e. what data should be collected and how; 2) developing the application; 3) deploying mobile devices to health organizations and centers; and 4) building human capacity. The costs of the former two tasks are also associated with the costs of implementing the HSS, therefore can be shared with the Ministry of Health. Collaboration with international organizations with expertise in health data management could help with defining requirements for the data collection process, which may contribute to lowering such costs. The costs of the latter two tasks could be prorated, as explained in Section 6.2.2.5, with other government applications, since government investment in mobile devices and human capacity building will serve many initiatives.

To balance the costs, two major benefits should be pointed out: 1) alignment between the MGOV and HSS strategies, i.e. showcasing how the implementation of the former could

contribute to the latter and how it could add value to the health sector; and 2) considering this service as one early component of the whole HIS platform to be delivered as part of the Component 3 of the 2012-2014 OGCIO Work Programme.

6.3.3.6.   Risk Analysis

Five risks associated with the collection of health-related data, two identified in the literature and three by the authors of this report, are presented in Table 38 below. For every identified risk, the associated mitigation plan is outlined as well.

ID	RISK	MITIGATION PLAN
1	Lack of accurate data due to the work overload of the health care staff, who do not consider data collection as important (On et al., 2009).	Awareness about the relevance of accurate health-related data collection should be raised through human capacity building activities. When possible, data collection tasks should be assigned to an administrative staff.
2	Poor information culture which undervalues the information collected (On et al., 2009).	Awareness about the relevance of information management, particularly to evidence-based health policies should be raised through human capacity building.
3	Lack of punctuality for sending collected data	SMS warnings could be implemented as part of a mobile application to remind recipients about the need to send collected data.
4	Lack of human capacity for collecting and reporting data	Human capacity building activities should be planned and delivered as part of the project.
5	Since deploying the service requires high expertise in both health management practices and technology, project execution may heavily rely on external stakeholders (e.g. consultants and international organizations) and the associated risk could be their lack of performance or delivery	Project agreements that clearly define project governance structures, project deliverables, milestones and other project features should be established and signed between implementing partners. Standards for managing third party entities as part of IT projects are available, e.g. COBIT 5.0.

Table 38: Risks associated with Collection of Health-Related Data Service

6.4. Technology Platform

A technology platform for MGOV applications and services comprises the combined run-time and design-time environment, including device-sensitive software, enabling such applications and services to be designed, developed, deployed and executed. At least for the reasons of

standards and interoperability, such a platform must be selected as the technical infrastructure underpinning the entire MGOV development and operation.

However, given the rate of new mobile technologies and upgrades to existing technologies appearing in the market, agility is a major factor in selecting the MGOV technology platform. Lacking agility towards technology development, the operations of MGOV applications and services would be limited in time and functionality, which could undermine their reputation and the reputation of MGOV in general. In addition to technological agility, other requirements to be fulfilled by the selected MGOV technology platform include:

o The platform should enable developers to produce applications that could access data on different mobile platforms such as iOS, Android and others.
o The platform should enable developers to produce applications that could be initiated on, say a mobile device, and continue on a desktop or another device if the user wishes to.
o The platform should be able to capture user preferences and history between different invocations of MGOV applications and services, to optimize usage and time.
o The platform should support the use and maintenance of the cloud infrastructure to integrate and provide uniform access to data and software from different sources.
o The platform should enable the development of application able to interact with sensors and other smart devices to obtain access to real-time, GPS and other kinds of data.

As an illustration, Table 39 provides some examples of cross-platform mobile development tools. Decision criteria for choosing the most appropriate cross-platform tool for mobile applications development is presented in (Dalmasso, et.al, 2013).

Name	Description	Reference
Appcelerator	Enables developers to create rich native apps for every major platform from a single JavaScript code base	http://www.appcelerator.com/platform/appcelerator-platform/
MoSync SDK	An open-source native mobile app development for multiple platforms using a single code base	http://www.mosync.com/sdk
RHOMOBILE SUITE	A platform that enables developers to write, integrate, deploy and manage applications that work across platforms	http://www.motorolasolutions.com/US-EN/Business+Product+and+Services/Software+and+Applications/RhoMobile+Suite

Table 39: Examples of cross-platform mobile development tools

Finally, as in any ICT environment, security is a major concern for any technology platform running MGOV applications. Since current mobile platforms, e.g. Android, iOS or Symbian, resemble operating systems of personal computers, they face similar security threats as those

affecting personal computers (Delac, Silic and Krolo, 2011). A model that describes security threats for mobile devices was proposed by Delac, Silic and Krolo (2011). The model includes three dimensions: 1) motives of attack, 2) attach vectors and 3) mobile malware. According to this model, motives of attacks include: a) collecting private data – as mobile devices turn more sophisticated, they also become the main storage of personal information, such as contact lists, emails, photos, videos, SMS or personal documents, and such attacks target such information as well as the subject's location information; b) utilizing computing resources – as mobile devices possess more powerful processors and storage capacities, they become attractive targets for the deployment of botnets, i.e. "collections of Internet-connected programs communicating with other similar programs in order to perform tasks" (Wikipedia, http://en. wikipedia.org/wiki/Botnet); and c) harmful malicious actions aimed at malfunctioning of a device, e.g. loss of data or exhausting of batteries. The attach vectors in mobile platforms include: mobile network services, Internet access, Bluetooth, and USB and other peripherals. The most common malware includes: trojan horses, botnets, worms, rootkits. The model of security threats proposed by Delac, Silic and Krolo (2011) is depicted in Figure 13 with the aim of providing a graphical representation to facilitate the identification of the main security elements to be addressed in technology platforms for mobile applications.
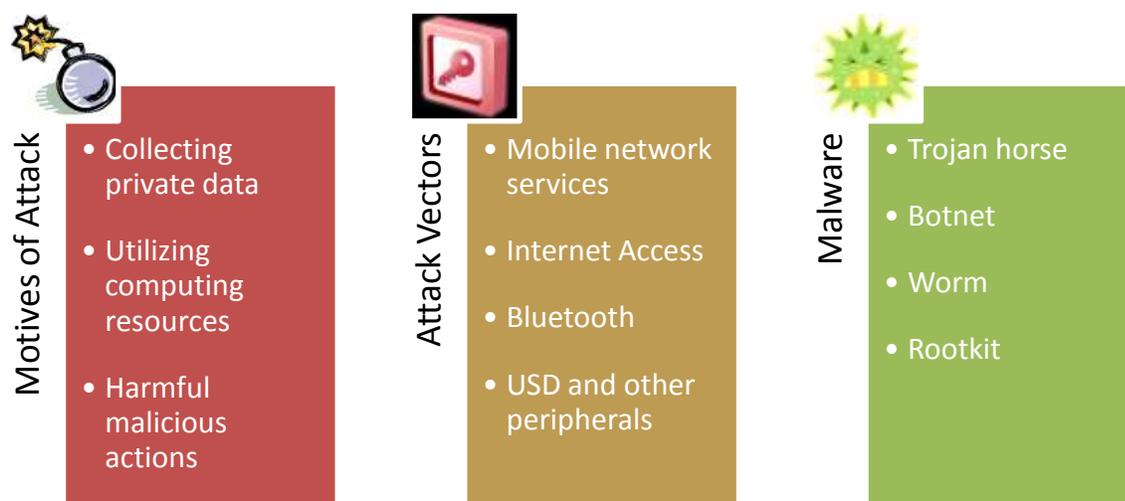

Figure 13: Security threats for mobile platforms

6.5. Risk Management

The general principles for risk management include: 1) seeking preventive risk analysis and not waiting for problems to occur; 2) carrying out continuous monitoring and analysis of operations and discussing the findings periodically; 3) documenting and sharing the lessons learned; and 4) maintaining a close relationship between Governance and Technical Committees.

Concerning the risks for MGOV4D in Vanuatu, lack of financing or the absence of legislation are major factors. Another risk factor is bureaucratic noise or intervention, which could be harmful to the MGOV4D initiative as a whole. As MGOV may well increase transparency and openness thus reducing the opportunity for corruption, this may well cause resistance among those persons who benefit from corruption, which could affect the successful execution of the MGOV4D projects and the resulting MGOV applications and services. To address this risk, the Steering Committee should be vigilant to possible interventions from the administrative system and make sure that the working of the Technical and Governance Committees and that the operations of the resulting MGOV4D applications and services are protected. Clear, agreed upon and government-approved terms of reference for different MGOV4D committees constitute one measure against intrusion to MGOV4D development and operations.

7. Conclusions

Based on the MGOV4D Strategy Knowledge Based for Small Island Developing States (Henning and Janowski, 2014), this report presented a systematic process of developing the national Mobile Governance for Development (MGOV4D) strategy for Vanuatu, and the intermediate and final outcomes of this process. Among intermediate outcomes of this process is the MGOV4D Strategy Knowledge Based localized to Vanuatu.

Due to the nature of the process, the same exercise could be repeated for other countries in order to develop MGOV4D strategies that accurately respond to their goals and circumstances. The final deliverable of this project captures this process in the form of an MGOV4D toolkit (Estevez and Janowski, 2014) that could be used by other countries, particularly by Small Island Developing States, in their efforts to develop national MGOV4D strategies.

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