SDG Advisor to Accelerate the SDG and Samoa Pathway Agenda

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Executive Summary

The overall objective of the SDG Advisor is to accelerate the adoption of UN Sustainable Development Goals (SDGs) through ICT at local, regional and national levels especially in SIDS and LDCs. Specifically, the SDG Advisor will support SDG17 by providing the following computer aided services to SIDS and LDCs:

- Status and Progress Checking towards SDGs
- Recommendations of needed services based on the status
- Launch a needed Service by using the SPACE computer aided planning platform

Introduction

eGovernment, eBusiness, and eCommerce initiatives, collectively referred to as ICT (Information and Communication Technology) services in this paper, have been identified as the key enablers of health, education, public safety, public welfare, and other vital sectors for the developing countries and other underserved populations around the globe. These ICT services have been specifically highlighted for SIDS (Small Islands and Developing States) by the Samoa Pathway and the UN Post 2015 Agenda. For example, a two hour Panel Discussion on "ICT and E-Government in SIDS: Responding to the Samoa Pathway Call for Action" [12], was held at the United Nations on Nov 14, 2014, to exclusively discuss and elaborate on the role of ICT for SIDS. This conference and other publications identify the vital ICT services for SIDS that can enable disaster recovery, tourism, fisheries, telemedicine, mobile apps for the underserved population, and Big Data for health and human services. These ICT services are also at the core of the UN Post 2015 Agenda and SDGs (Sustainable Development Goals) with the objective of "No One Left Behind".

While the know-how about the needed ICT services is available in the form of knowledge platforms and best practices, the *major challenge is: how to make this know-how available quickly, economically, and globally so that no one is literally left behind.* This short paper discusses the approach adopted by the ICT4SIDS Partnership to specifically address the aforementioned challenge by answering the following questions

- What role can ICT play in accelerating the adoption of Samoa Pathway and SDGs for SIDS
- What is the Vision of ICT4SIDS Partnership in achieving these goals
- What are the challenges and the approaches adopted to overcome the challenges
- What are the results so far and what are the lessons learned

What is the Role of ICT in Rapid Adoption of Samoa Pathway

The Samoa Pathway document highlights the importance of Capacity Building in Section 109 and clearly specifies the role of ICT in Para h (Section 109): "*To establish national and regional information and communications technology (ICT) platforms and information dissemination hubs in small island developing States to facilitate information exchange and cooperation, building on existing information and communication platforms, as appropriate;*". Figure1 shows the ICT vision as suggested by the Samoa Pathway, i.e., several collaborating ICT hubs at rural, regional and national levels for health, education, public safety, public welfare, and other vital sectors. We will show that collectively these hubs also support the SDG (Sustainable Development Goals)

related services at all levels. In addition, the objective of ICT4SIDS Partnership is to support these collaborating ICT hubs as shown in Figure1.

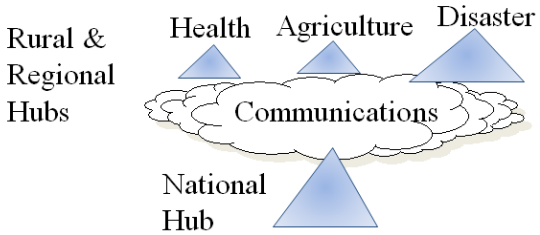

Figure1: Basic Vision of ICT Hubs as Proposed by the Samoa Pathway

What is the Role of ICT for SDGs

ICTs and digital innovations can have a profound impact on SDGs as documented in major reports, conferences, and websites sponsored by Cisco, Ericsson, the International Telecommunications Union (ITU), the United Nations, Columbia University, the World Bank and others [3, 4, 5, 9, 10, 11]. Figure 2 illustrates how the wide range of ICT services cut across all sectors of value to the SIDS instead of one sector. The technologies include Web Technologies, Mobile Technologies, Sensors, Artificial Intelligence Techniques, Analytics, Big Data, Wireless Technologies, Integration Technologies, IOTs (Internet of Things), WOTs (Web of Things), and Computer Aided Planning Tools. Figure 2 also shows the specific sustainable development goals that are supported by these technologies in sectors such as economic development, health, education, public safety, public welfare, agriculture, transportation and others. A more detailed view of how different digital technologies can support the 17 SDGs is shown in Table1.

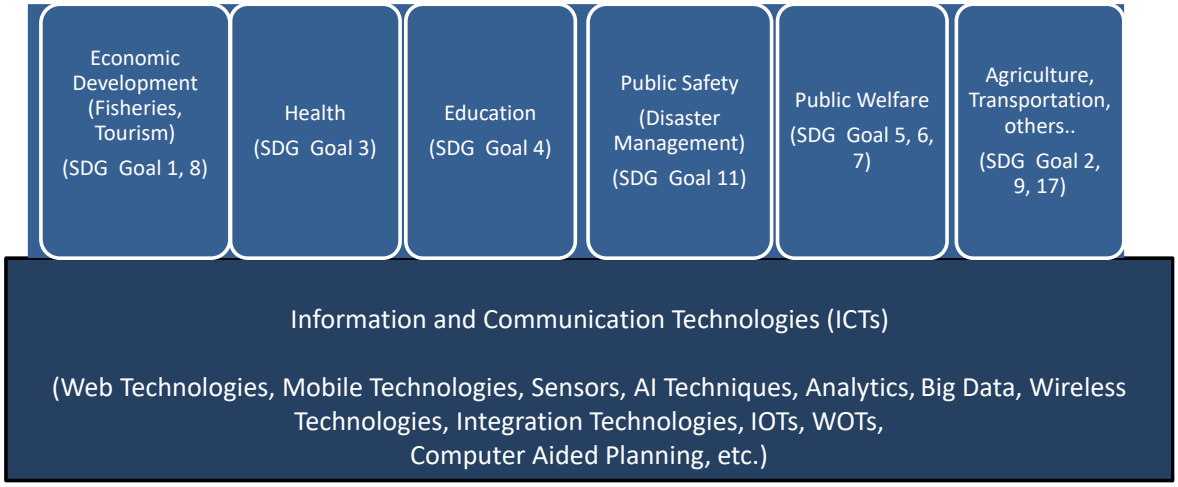

Figure 2: How the ICTs can Impact Different Sectors and SDGs

Although almost all ICT services are of value to SDGs, we are particularly interested in the following innovative areas:

- **Big Data Applications** in healthcare, sanitation, food safety, fisheries, climate change, energy and disaster management are of fundamental importance to SIDS. Numerous Open Big Data sources are available from providers such as the World Bank [6], UN [7], conferences [8] and numerous other agencies around the globe to support these applications. In addition, business intelligence and analytics tools are readily available to analyze Big Data, discover trends and predict consequences of overloads, failures and mistrials in different scenarios.

- **IoT (Internet of Things)** offer a tremendous opportunity for the underserved populations to bridge the digital divide. Specifically, Cisco and the International Telecommunications Union (ITU) has published a report, "Harnessing the Internet of Things for Global Development", that outlines how IoT can rapidly accelerate the rate of global development to achieve the UN Sustainable Development Goals (SDGs). The report [4] describes 20 projects that are showing that affordable IoT devices in developing countries can significantly improve quality of life for the underserved populations by playing a key role in health, education, public safety, public welfare and other vital sectors in the developing countries.
- **Smart services and intelligent systems** have tremendous opportunities for SIDS in many different sectors. For example, Artificial Intelligence (AI) applications are helping the disabled and disadvantaged populations in remote areas and "Smart SIDS" can provide a set of coordinated smart services in health, education, public safety and public welfare to its citizens. Instead of intelligence on one topic area, Smart SIDS would need strategic intelligence that cuts across multiple sectors [9, 16].
- **Management and governance** of networks of interconnected systems. For example, in cities, health and crime issues can reduce tourism, traffic congestion impacts the environment and wastes energy, communications problems can affect public safety issues, and water pollution can cause health problems. Modern versions of these interconnected systems will add sensors, monitors, video surveillance, RFID and other devices that enhance their capability and capture volumes and volumes of data. Unfortunately, it is extremely difficult to make sense of any of this data. Strategic intelligence and management will be needed to understand how their core systems are inter-related and how the issues cut across multiple topic areas [16, 18].

- **Computer Aided Planning, Engineering, and Management Platform**s to plan the complex systems that involve multiple interconnected systems with mobile devices and social media especially for small islands and underserved segments. Besides the coordination and management of services that require multiple services from multiple sectors, these platforms should also support capacity building in health, education, public safety and public welfare sectors [13, 14, 15, 16].

Table1: How Digital Innovations Can Support the SDGs – High Level Examples

(Note: This table needs refinements)

Sustainable Development Goals	How Digital Innovations Can Help
1. End poverty in all its forms everywhere	eCommerce hubs to support cottage industries and microfinancing support and entrepreneurship hubs for economic development [5, 11]
2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture	Agriculture hubs in rural areas with precision agriculture and food safety capabilities. Also use of IoT technologies to increase, protect, and optimize crop production, as well as improve the storage and distribution of food [3, 4, 5]
3. Ensure healthy lives and promote well-being for all at all ages	Healthcare Advisory Hubs for aging and disabled populations in remote areas and hypertension telemedicine hubs in rural areas. Healthcare services that integrate e-learning, e-health and e-administration to offer inexpensive healthcare to remote populations; gamification for training of nurses and healthcare officials on needed areas [3, 4, 5, 11, 16]
4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	Education Hubs for adult education provided through community centers and colleges and use gamification for capacity building [3, 5, 11]

5. Achieve gender equality and empower all women and girls	Through Digital Hubs located in different locations that are equally available to all genders [3, 4]
6. Ensure availability and sustainable management of water and sanitation for all	Promotion of digital water initiatives [10] and extensive use of IoTs, Big Data and sensor enabled smart water pumps and sanitation outlets [3, 4]
7. Ensure access to affordable, reliable, sustainable and modern energy for all	Extensive use of IoTs, Big Data and wireless sensor networks to manage and control energy consumption [3, 4]
8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	Extensive use of ICT to support tourism, fisheries, entrepreneurship and cottage industries in different geographical areas [4, 5]
9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	Aggressively exploit innovative applications of artificial intelligence and other ICTs to support entrepreneurship and cottage industries [4, 5]
10. Reduce inequality within and among countries	Digital hubs, interconnected to other hubs, available to all countries and to all populations [4]
11. Make cities and human settlements inclusive, safe, resilient and sustainable	Smart cities, Iot4D, Big Data and IBM Smarter Planet Initiatives [9, 16, 18, 4, 5]
12. Ensure sustainable consumption and production patterns	Explore new enterprise systems for production, inventory management and for supply chain improvements [4, 5]
13. Take urgent action to combat climate change and its impacts	Use sensors to detect and measure changes in ocean waves and weather conditions, and detect earthquakes by using BI and Big Data [3, 4]
14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development	Use interconnected sensors in various scenarios that upload the information to government authorities via satellite for using Big Data analytics [3, 4]
15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt & reverse land degradation and halt biodiversity loss	Use connected alarm systems across high density urban areas to quickly notify residents of fast-moving fires [3, 4]
16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	Use the IBM Smarter Planet model in which several agencies interact with each other and support proper monitoring and controls for improved governance [9, 3, 4]
17. Strengthen the means of implementation and revitalize	Establish communications between hubs by using latest developments in B2B and G2G services [3. 4. 5]

the global partnership for sustainable development	

What is the Unique Vision of ICT4SIDS Partnership

Figure3 shows the ICT4SIDS Partnership vision that is designed for rapid adoption of the Samoa Pathway and SDG initiatives. This vision shows several rural and regional hubs that support SDG services but are interconnected to a larger national hub that consolidates and disseminates vital information to other users. A Global ICT4SIDS Center, located at Harrisburg University, provides central administration, analysis and subject matter training and consultation services to all the hubs in the network. The individual hubs may be combined into highly effective community centers for remote villages and may be physical (e.g., rented rooms in a school) or completely virtual (e.g., portals located somewhere in the "Cloud"). Examples of ICT hubs are eSeva Centers in India that allow rural populations to pay bills and buy bus tickets, Telemedicine centers in Africa, and Community Centers for adult education by Faith-based organizations. The hubs provide the following SDG (Sustainable Development Goals) related services at rural, regional and national levels as shown in Table1.

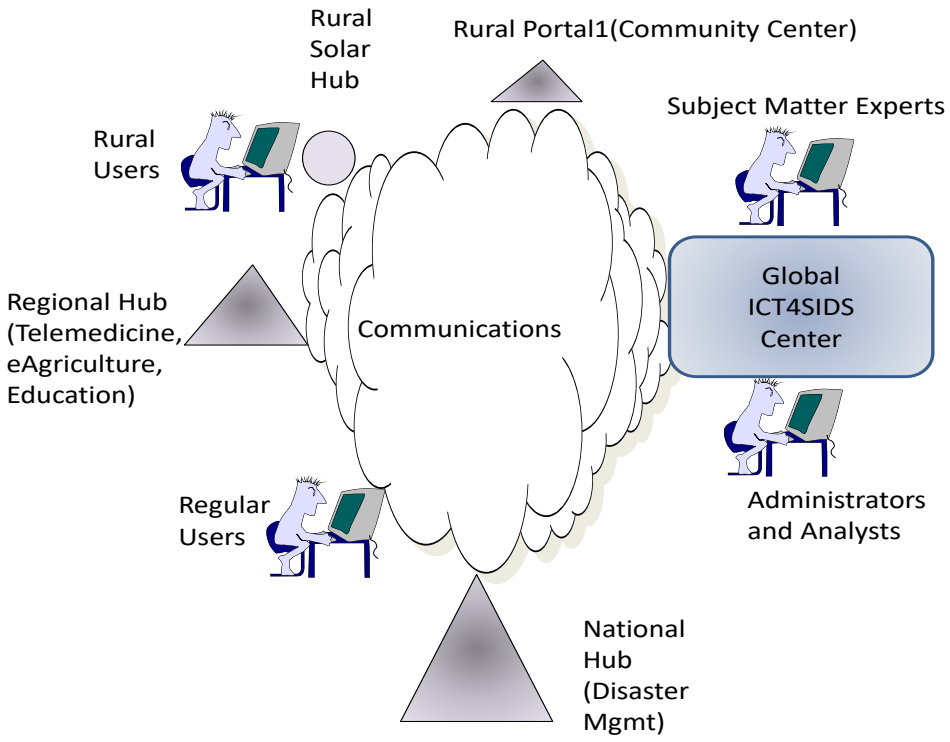

Figure3: ICT4SIDS Vision

We are currently using a computer aided planning methodology, described later, for quick design and deployment of about a dozen ICT Hubs at rural, regional and national levels in 7 countries. Examples of these hubs are:

- Three regional Telemedicine Hubs for providing healthcare to remote populations
- A regional Education Hub for educating high school teachers in ICT
- A national Anti-Corruption Hub to fight corruption
- Five rural and regional Community Centers for health, education and agriculture
- A national Strategic Intelligence Center for decision support at national level

- A Global ICT4SIDS Center for providing administrative, decision support, planning and training services mentioned previously

How Does the SDG Toolkit Accelerate the SDG and Samoa Pathway Agenda

Here is a suggested usage scenario for an official from Jamaica who wants to accelerate the adoption of Samoa Pathway and the SDG implementation agenda:

- Use the SDG Advisor that shows the progress of countries towards the various SDGs
- The SDG Advisor also suggests the ICT services needed (this recommender feature is based on a knowledgebase that heavily utilizes Table1).
- The SDG Advisor also allows a country to launch the needed tools and services through SPACE. For example, a user can invoke a BI (business intelligence) tool to view the various dashboards and invoke the patterns repositories to view the best practices.

Suppose that after investigating different options, the official feels a telemedicine center is needed in a rural area in Jamaica, then the official invokes the ePlanner from the SDG Advisor. Figure 4 shows how the SPACE Environment can be used to generate such a plan by using the ePlanner. The ePlanner is a family of intelligent "advisors" (expert systems) that collaborate with each other to cover five phases (P0 to P4), shown in Figure 4. These advisors invoke the games, patterns, and other resources to generate the plan (the outputs) shown in Figure 4. The plan plus a working portal are generated in less than an hour and are 70-80% complete. These outputs can be customized by local experts.

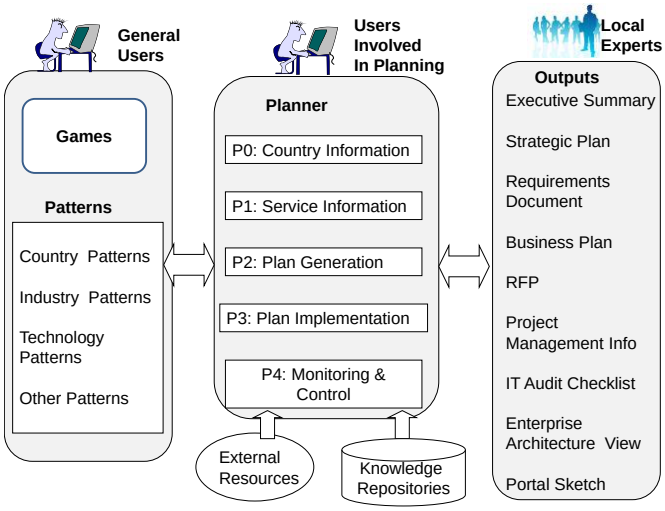

Figure 4: SPACE Architectural View

To start, P0 helps the user to capture Nigeria specific information and P1 helps in specification of the eLearning service. P2 generates a customized plan based on P0 and P1. P3 generates the information for RFP and requirements and integration. P4 generates outputs to support project management and governance. The outputs produced can be further customized by the users or local experts manually or by invoking specialized games and simulations.

The ePlanner fetches, uses and customizes extensive information from a set of Knowledge Repositories that provide links to a wide range of case studies and educational materials, and Big Data from UN Public Administration Network (UNPAN), World Economic Forum (WEF), and World Bank Institute initiative on Open Data. Rules in different phases of the ePlanner retrieve needed data and use it to produce outputs and/or modify decisions.

Concluding Comments

The SDG Toolkit, being developed on top of SPACE, is potentially a very valuable set of tools for rapid acceleration of SDGs and Samoa Pathways. The SDG toolkit is being finalized right now but SPACE is fully operational at present as a Beta (test) site and is being used by more than a dozen developing countries and 20 small to medium businesses. SPACE is also being used by more than 15 universities to support graduate courses in strategic planning and enterprise architectures and is being used for hands-on workshops for the CITO (Certificate for IT Officials) Program for developing countries.

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