SDG Advisor: A Decision Support Tool to Accelerate the Implementation of SDGs and the Samoa Pathway

Overview

The United Nations Sustainable Development Goals (SDGs) establish a 2030 Agenda based on 17 goals [1]. This major agenda, supported by all 193 countries, is a road map that builds on the success of the Millennium Development Goals [2] that was signed by 173 countries in 2000. SDGs focus on economic, social and environmental issues facing the 5 billion population of "have-nots" with the objective of "No One Left Behind". United Nations is strongly supporting SDGs through a large number of global initiatives and partnerships. Digital services, also known as ICT (Information and Communication Technologies) services, have been specifically identified for progress towards SDGs. For example, major reports, conferences, and websites sponsored by Cisco, Ericsson, the International Telecommunications Union (ITU), the United Nations, Columbia University, the World Bank and others have highlighted the role of ICT for SDGs [3, 4, 5].

Table1 lists the 17 SDGs and also identifies a few ICT services that could significantly advance the core SDG priority areas. In addition to SDGs, we want to support additional goals specified by SIDS. For example, the Samoa Pathway document, signed by all SIDS, highlights the role of ICT: " (We need 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;*" (Source: Samoa Pathway Document, Para h, Section 109 [8].

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

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
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. 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.
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.

5. Achieve gender equality and empower all women and girls	Through Digital Hubs located in different locations that are equally available to all genders.
6. Ensure availability and sustainable management of water and sanitation for all	Promotion of digital water initiatives and extensive use of IoTs, Big Data and sensor enabled smart water pumps and sanitation outlets
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
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
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
10. Reduce inequality within and among countries	Digital hubs, interconnected to other hubs, available to all countries and to all populations
11. Make cities and human settlements inclusive, safe, resilient and sustainable	Smart cities, Iot4D, Big Data and IBM Smarter Planet Initiatives
12. Ensure sustainable consumption and production patterns	Explore new enterprise systems for production, inventory management and for supply chain improvements
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
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
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
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
17. Strengthen the means of implementation and revitalize the global partnership for sustainable development	Establish communications between hubs by using latest developments in B2B and G2G services

The SDG Advisor, designed and developed by NGE Solutions (www.ngesolutions.com), attempts to accelerate the implementation of UN Sustainable Development Goals (SDGs) through ICT at local, regional and national levels. Specifically, the SDG Advisor is designed to answer the following questions:

- What is the status of my country/region as calculated by the SDG indicator (good/bad)
- What type of services could improve the needed status
- What are the costs versus benefits of launching a service and how exactly can a service be launched quickly and inexpensively within the local context

The SDG Advisor, shown in Figure 1, is a working prototype that begins to answer these questions by systematically walking the users through a three-step process displayed in Figure 1. These steps are described in more detail below.

Figure 1: Conceptual overview of the SDG Advisor

STEP 1: Select a country/region and initiate the process

The user selects a country/region and the SDG Advisor fetches all open information about the location from sources such as the World Bank, UN Department of Statistics, World Economic Forum, and others.

STEP 2: Select an SDG for status and service recommendations

The user selects an SDG and the SDG Advisor shows how well the country/region is doing based on SDG indicators. Figure 2 displays a screenshot of the SDG Advisor that shows the following:

- The user selected SDG3 (Health) for Jamaica as a country.
- The Advisor shows status of Jamaica based on UN-specified SDG indicators for healthcare such as number of physicians and hospitals per 1000 people.
- The status is indicated as red, yellow and green to show if the status is below, OK, or above the desired levels. As shown in Figure 2, Jamaica needs to improve its status in terms of the number of physicians and hospitals per 1000 people while life expectancy at birth for male as well as female is quite good.
- The Advisor also recommends a number of ICT-based services that could improve the status. This recommender feature is based on our knowledgebase of business patterns and heavily

utilizes analysis performed by well known studies such as the ITU-CISCO, Columbia-Erickson, and others. We are constantly updating our database.

- The user can select any of the displayed services and perform basic cost-benefit analysis to make an initial judgement if the service is worth pursuing. Ideally, the users should select the services that are low cost but high benefit and impact.

- If the user believes that the service is worth pursuing, then the user presses the Explore button that is processed in Step 3.
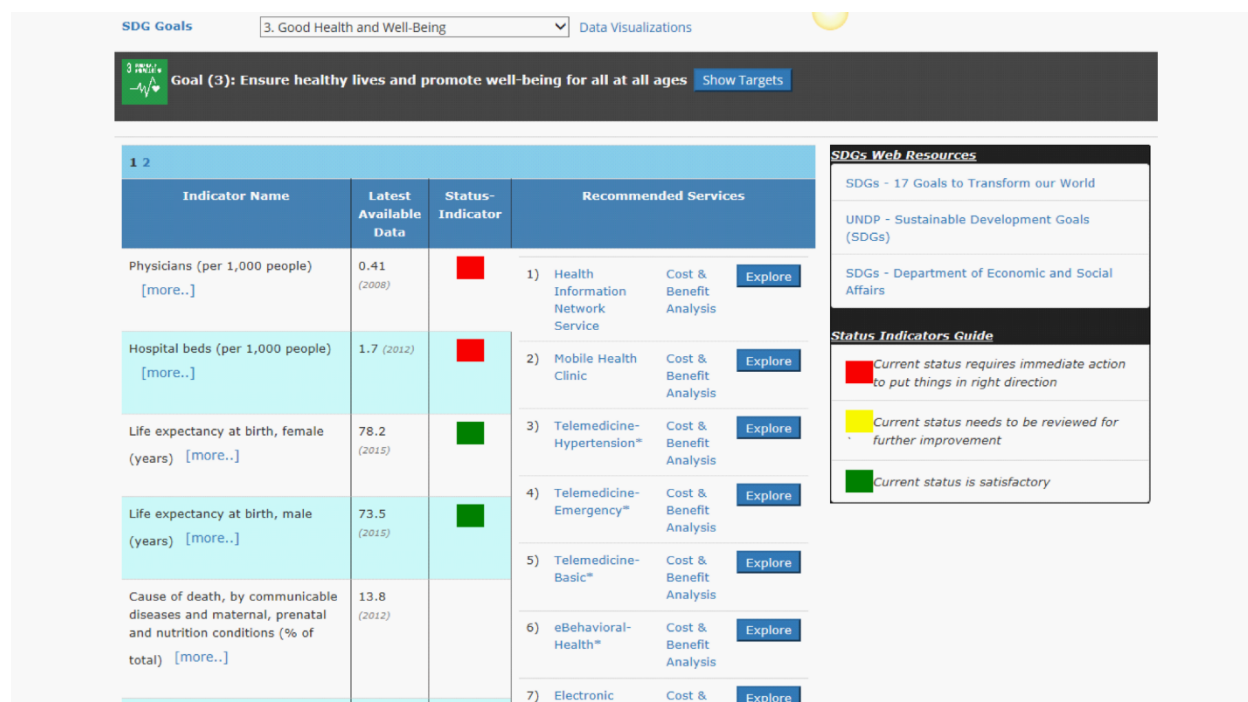

Figure 2: Screenshot of the results produced by step 2 of the SDG Advisor

STEP 3: Exploration and launching/implementing needed services

The SDG Advisor goes beyond recommendations, to enable implementation of the needed ICT-based services through the SPACE computer aided planner. The launched services are Samoa Pathway compliant ICT hubs that directly support SDGs in Health, Education, Public Safety and Public Welfare services through ICT. The SPACE e-Planner conducts a feasibility study and generates extensive reports such as a strategic planning report to show the overall vision and architecture with business/technical justification and standardized RFPs (Requests for Proposals) that can be used to attract vendors for bidding. A very important feature of SPACE is that it automatically generates a sample portal that can be quickly converted to an actual working system. All these outputs and the working portal can be used to initiate a free pilot project with ICT4SIDS Partnership or any other organization to implement the needed services quickly. The following section presents a quick tour of using SPACE to launch a service.

Figure 3 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 3. These advisors invoke the games, patterns, and other resources to generate the plan (the outputs) shown in Figure 3. 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.
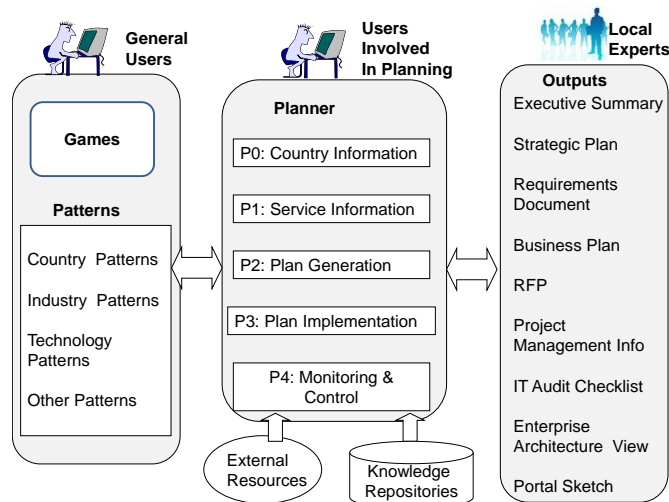
Figure 3: SPACE Architectural View

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.

References

[1] UN Sustainable Development Goals, Report 2016, http://unstats.un.org/sdgs/report/2016/The%20Sustainable%20Development%20Goals%20Report%202016.pdf
[2] United Nations, The Millennium, Development Goals, Report 2009, UNDP (2009)
[3] Sustainable Development Solutions Network, "ICT and SDGs: How Information and Communications Technology Can Accelerate Action on the Sustainable Development Goals", Columbia University and Ericsson Report, May 11, 2016, Link: www.unsdsn.org/resources/publications/ict-and-sdgs/
[4] ITU and Cisco Report: "Harnessing the Internet of Things for Global Development", (https://www.itu.int/en/action/broadband/Documents/Harnessing-IoT-Global-Development.pdf), Jan 19, 2016.

[5] Infodev, a World Bank initiative on Innovation and Entrepreneurship, site http://www.infodev.org/

[6] ICT4SIDS Partnership, UN Registered Partnership No:8005, Website: http://space4ict.com

[7] SPACE – A Computer Aided Planning, Engineering & Management Environment, developed by a startup. Website: www.space4ict.com

[8] Samoa Pathway Document, http://www.sids2014.org/index.php?menu=1537

[9]Umar, A., and Zordan, A., "Enterprise Ontologies for Planning and Integration of eBusiness", *IEEE Transactions on Engineering Management*, May 2009, Vol. 56, No. 2, pp. 352-371.

[10] Umar, A., "Computer Aided Planning, Engineering and Management of IT Services", IEEE International Technology Management Conference, Dallas, June 2012.

[11] World Hypertension Action Group Telemedicine Center, Link: www.whag4all.org

[12] Rosenfeld, E., "After all this…. Why Do Projects Fail?", http://www.adaptivepartners.com/projfailb.htm.

[13] Dada, D., "The Failure of e-Government in Developing Countries", EJIDSC, Vol 26, no. 7, 2006, link: http://www.ejisdc.org/ojs2/index.php/ejisdc/article/viewFile/277/176.