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Smart Hubs for Rapid Adoption of Sustainable Development Goals (SDGs)

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Abstract

Information Communication Technologies (ICTs) including e-government are recognized as very important tools for delivering public services and supporting progress towards the SDGs. Specifically, digital innovations are needed to ameliorate the persistent digital divide and other unique challenges facing the developing countries. We are primarily focusing on innovations such as smart hubs for rural areas that collaborate with each other over very slow networks, an SDG Advisor that can help the countries to assess their SDG indicators quickly and select appropriate courses of action, a computer aided planner that provides location specific solutions, and an extensive decision support dashboard for monitoring the smart hubs. Specifically, the smart hubs provide highly specialized region and population specific services in health, education, public safety, public welfare and other SDG-related sectors. These smart hubs must be designed to collaborate with each other for rapid regional growth. Based on working with SIDS (Small Islands and Developing States) and LDCs (Least Developing Countries), we feel that our approach of using smart hubs and the associated toolset can ameliorate the digital divide and significantly accelerate the progress towards the SDGs. We intend to expand our pilot projects and the needed tools to offer first rate training and decision support services in 2017.

Overall Objective and Vision

The basic objective of the ICT4SIDS Partnership is to accelerate the adoption of SDGs through innovative smart hubs that collaborate with each other at local, regional and national levels. Instead of focusing on large scale smart cities, we are proposing smart hubs located in small towns and isolated communities to provide most appropriate location specific services that are of high value to the rural populations. All smart hubs must:

- Provide highly specialized region and population specific SDG-driven services in health, education, public safety and public welfare (for example provide a hypertension telemedicine clinic in areas with high incidents of hypertension and offer adult job training and micro-entrepreneurship training in areas with high unemployment)
- Collaborate with each other, as specified by the Samoa Pathway, for a region wide impact through information exchange and cooperation between various smart hubs (for example, a hypertension hub located in one area collaborates with another specializing in diabetes)
- Be aware of the local information technology and energy constraints and be customized accordingly (for example, do not offer cloud-based services to small islands that do not have access to the cloud)
- Be supported by a powerful portal that has prefabricated plug-ins for collaboration, business intelligence, decision support, and security so that a smart hub located in the remotest possible locations can equally participate in the government decision making and citizen engagement processes.
- Provide a pathway to add cognitive services as local capacities of populations improve accordingly.

Due to experience with smart hubs in more than 10 countries, half of them were SIDS (Small Islands and Developing States), we strongly believe that this *distributed* approach is more effective than the centralized large smart city approach. Specifically, we have developed the architectural vision, displayed in Figure 1, that shows:

- All Smart Hubs fully support the UN initiatives such as the UN SDGs (Sustainable Development Goals) that address poverty reduction, hunger, health, education, gender equality, disaster recovery, economic development and other vital issues.
- A large number of collaborating Smart Hubs are specialized to support different SDGs at different locations for local, regional and national needs and are managed by a Global Center, as shown in Figure1.
- The Global Decision Support Center is located at Harrisburg University and resides on an IBM donated machine. The Decision Support Center, as shown in Figure 1, houses large databases and coordination centers. It also includes planning, administrative, analytics, and training tools that provide central support for the smart hubs at rural, regional and national levels. These capabilities, explained later, serve as the central decision support dashboard.

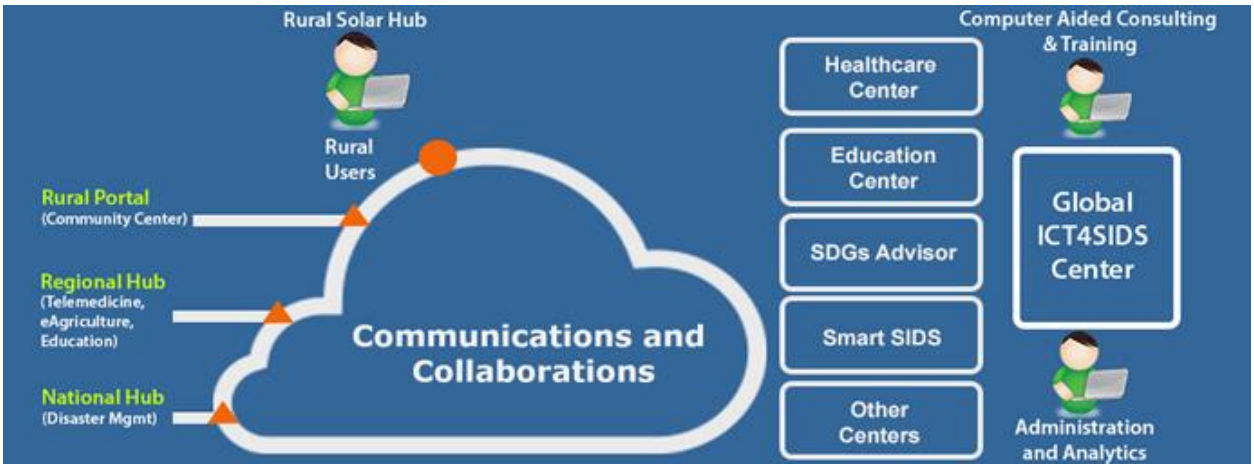

Figure 1: Overall Architectural Vision for Smart Hubs and the Global Decision Support Center

Implementation of the Vision

Figure 2 shows an implementation of the Global Decision Support Center that serves as the "Command and Control Center", developed by the ICT4SIDS Partnership (www.ict4sids.com). This site also serves as a Center for Collaboration and Decision Support between all hubs, and provides the following capabilities:

- *Collaboration Matrix* that supports different collaboration scenarios between different hubs and global centers. For example, telemedicine centers in Samoa and Solomon Island can exchange information with each other and also with a Nursing Education Center located in Aruba.
- *World Hypertension Center* located in Harrisburg can be used to store hypertension data from Haiti, Jamaica, Tanzania, and other countries for across-country analysis and advice to populations in these islands. This center is being operated by the World Hypertension League, part of the World Health Organization (WHO), and a healthcare NGO (Colleagues in Care).
- *Education Center* is available as the central repository of education and training for capacity building of different regions, especially in ICT. We are currently working with Tanzania to educate school teachers for effective use of computers in classrooms.

- *Smart SIDS* is a new initiative that is using the SDG Advisor and Computer Aided Planning to develop Smart SIDS. We are currently working with Solomon Islands on a Smart Samoa Pilot Project. This concept is also being expanded to Smart towns and isolated communities.
- *Business Intelligence Center* is a new capability that will be used by any of the hubs for analytics so that even the remotest villages can also participate and benefit from simple analytics.
- *Disaster Recovery* Center is currently not operational and is being designed for disaster situations.
- Additional centers on food safety, Micro-Grids, AI applications, and IoTs are being investigated at present.

In addition, the following tools and a computer aided methodology support the Global Center:

- *SDG Advisor* is available to all hubs and the Global Center users for quickly checking the SDG indicator for their regions/countries, receiving recommendations for the services that can improve the needed status, and even launch the needed services through a Computer Aided Planner.
- *Computer Aided Planner* is a very sophisticated toolset, called SPACE that conduct detailed feasibility studies and produces a strategic plan plus a highly customized working portal for a proposed hub within hours.

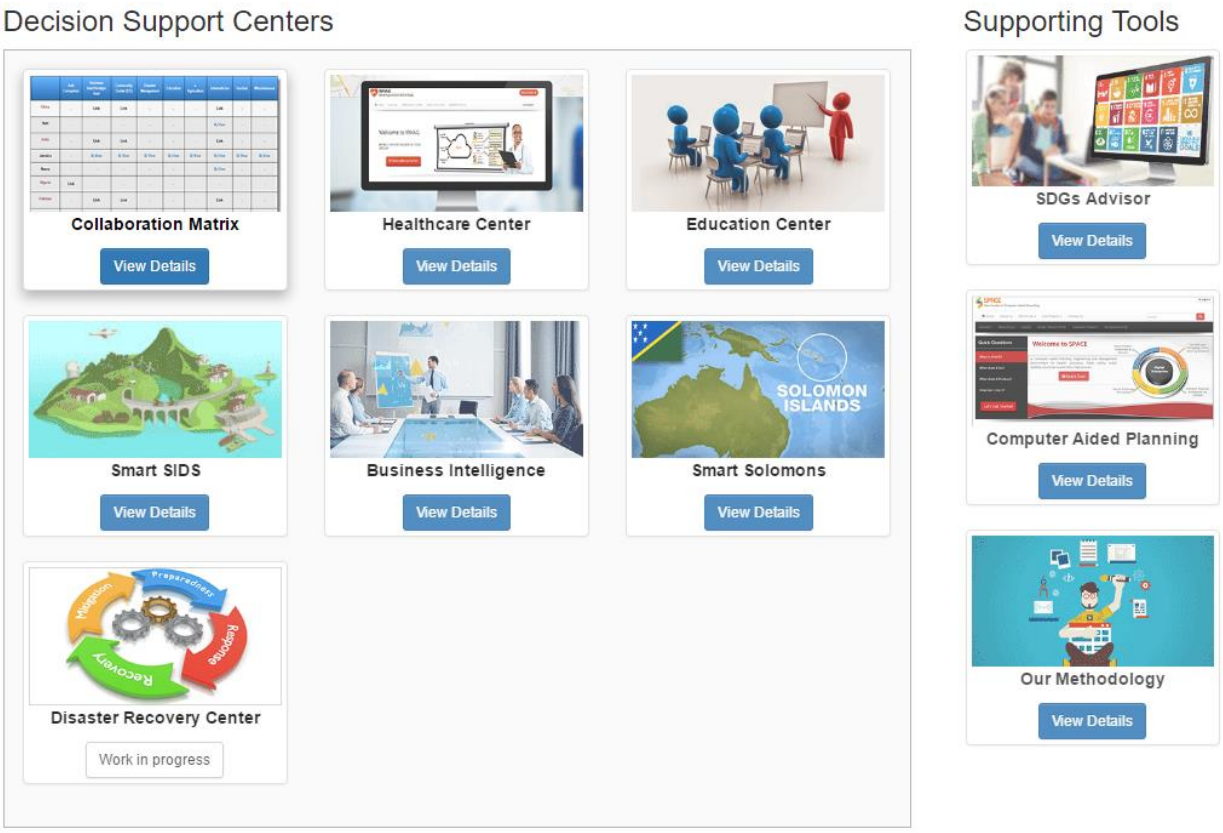

Figure2: Screenshot of the Global Decision Support Center for SDGs (Website: www.ict4sids.com, section: Global Center)

The Methodology Used

The vision presented so far is promising, but implementing this vision at a massive scale is a non-trivial task due to the technical, management and logistical challenges summarized in Figure 3. These are

serious barriers that must be crossed systematically. Unfortunately, many ICT projects are not carefully addressing these challenges and are re-inventing the wheel leading to a failure rate of 60-85% due to expensive retries, especially in developing countries. Smart Hub projects are no exception. We have developed a careful methodology, discussed below, that is supported by the integrated set of tools shown in Figure3 to do more (provide more services to more customers) with less (time, money, trained staff).

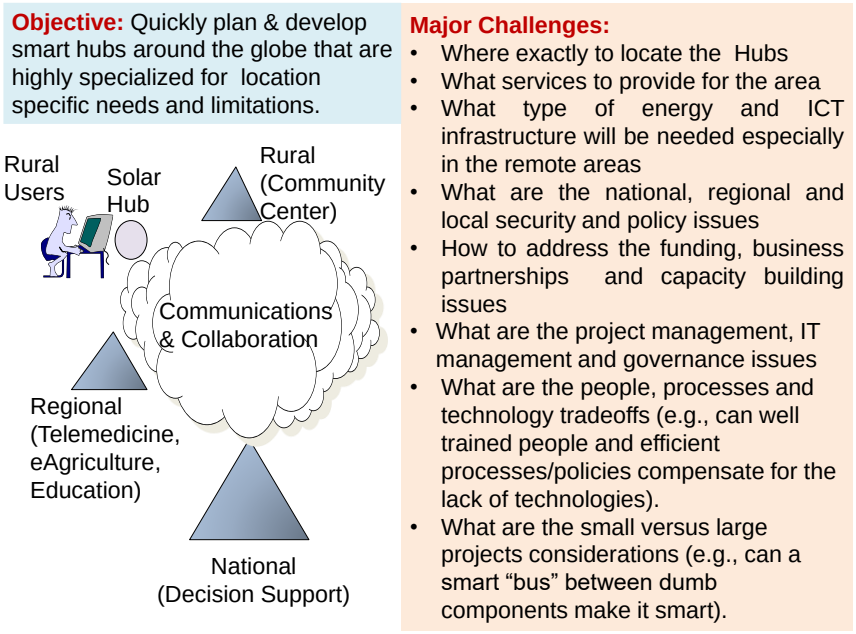

Figure 3: Summary of Challenges Facing Large Scale Planning and Deployment of Smart Hubs

We have developed and are actively using a systematic computer aided planning methodology, displayed in Figure 4, to address these challenges. This methodology relies heavily on a powerful computer aided planning and decision support environment, called SPACE (Strategic Planning, Architecture, Controls and Education) and other tools. The SPACE environment (www.space4ict.com) addresses the challenges faced in Figure 3 and produces a highly customized portal to support different smart hub configurations within hours. Most importantly, SPACE supports individual services that can be combined into complex "*service bundles*" to represent offices, community centers, corporations and even cities. This allows us to plan and architect very simple to very large and complex scenarios for smart hubs. This methodology has been used in more than 10 countries and will be refined and used in the proposed study. The methodology consists of the following phases:

- Phase1: We invite potential users to join a Smart Pilot Project that implements Smart Hubs to support health, education, public safety, public welfare, and other SDGs for the community. We ask the interested users to use the SDG Advisor tool (part of SPACE) to help them assess their needs and determine which SDGs should be addressed in the Pilot Project.
- Phase2: A Hub vision is proposed and a Pilot Project is initiated by a user and a Point of Contact (POC) is appointed by the target community. The POC is trained to use the SPACE computer aided planning tool to conduct an extensive feasibility study and produce a strategic plan, a funding proposal and a working prototype of the selected Smart Hub(s) – all within a day.
- Phase3: The results of the feasibility study are studied/revised and a final Smart Hub is created in collaboration with the POC and local experts. The final hub is "registered" in a Collaboration Matrix and also in the appropriate Global Center (e.g., a hypertension hub is registered in the World Hypertension Center). These capabilities are explained better below.

- Phase4: The produced portal is refined for a production version as a repeatable asset. The results are published in a Donor Portal for attracting funding sources, business partners and system builders. Funding models accessible by this process include, public, private, or even "crowd sourcing" which allows individuals to contribute to specific projects. A production version of the hub portal is launched at the end of this phase.

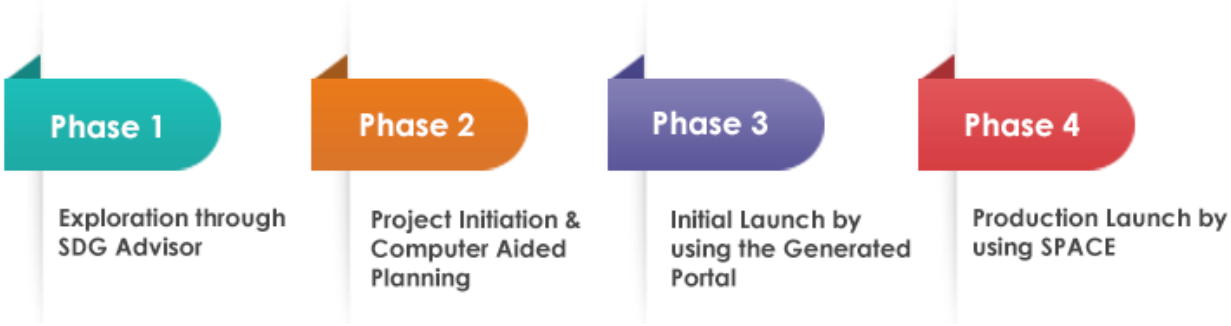

Figure 4: Computer Aided Planning, Engineering and Management Methodology

Results So Far and Future Directions

Under the umbrella of UN ICT4SIDS Partnership, a small team of 5 people in a startup, with help from advisors from IBM and other advisors, has launched 11 pilot projects that involved 6 SIDS and 5 Least Developed Countries (LDCs). We have learned that our methodology can save $50K to $70K per Hub, plus time (almost a year) and significantly reduce retries, errors and failures. Our approach improves decision-making, harnesses innovation to improve outcomes, and engages citizens to meet evolving needs. We have also gained significant insights about how this project can be scaled for larger undertakings with immediate results on the ground. We are planning to do the following in 2017:

- Replicate and expand our network of smart hubs to 3 more SIDS countries plus 3 LDCs
- Encourage young entrepreneurs from rural areas to become POCs and help them start their own businesses.
- Expand the collaboration scenarios where small smart hubs collaborate with larger hubs for economic development and improved public service.
- Expand the training and capacity building capabilities of SPACE for government officials because it allows hands-on planning and decision support experiments.
- Improve the SDG related decision making capabilities of SIDS officials by using the SDG Advisor because it invokes many other tools in a sequence for rapid acceleration of SDGs and Samoa Pathway implementations. Appendix A gives a detailed example of how the SDG Advisor operates as a decision support tool.
- Keep refining and expanding the SPACE Environment and the associated methodology based on lessons being learned and the needs of the local governments.

Future reports will summarize the results from these experiments and provide clear guidelines and recommendations to the SIDS based on lessons learned.

APPENDIX A: Example -- Using the SDG Advisor for Decision Support

The overall objective of the SDG Advisor is to accelerate the adoption of UN Sustainable Development Goals (SDGs) and the Samoa Pathway Document through ICT at local, regional and national levels. Specifically, the SDG Advisor concentrates on SDG17 (Implementation) by answering the following questions:

- What is the status of my country/region as calculated by the SDG indicator (good, ok, 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

The SDG Advisor, shown in Fugure5, is a working prototype that attempts to answer these questions by systematically walking the users through a three step process displayed in Figure 2. These three steps are described in more detail below.

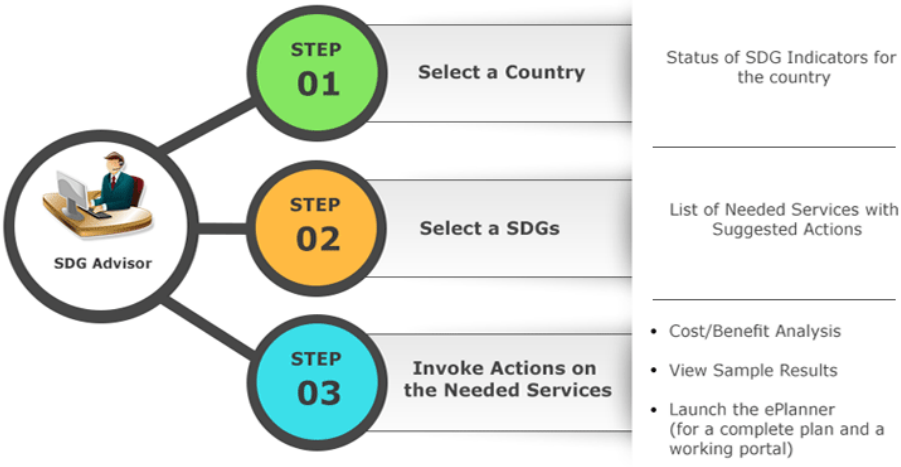

Figure5: Conceptual Overview of the SDG Advisor

STEP1: 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 the6World Bank, UN Department of Statistics, World Economic Forum, and others.

STEP2: 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. Figure6 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 Figure6, Jamaica needs to improve its status in terms of 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-Ericcson, 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 Step3.

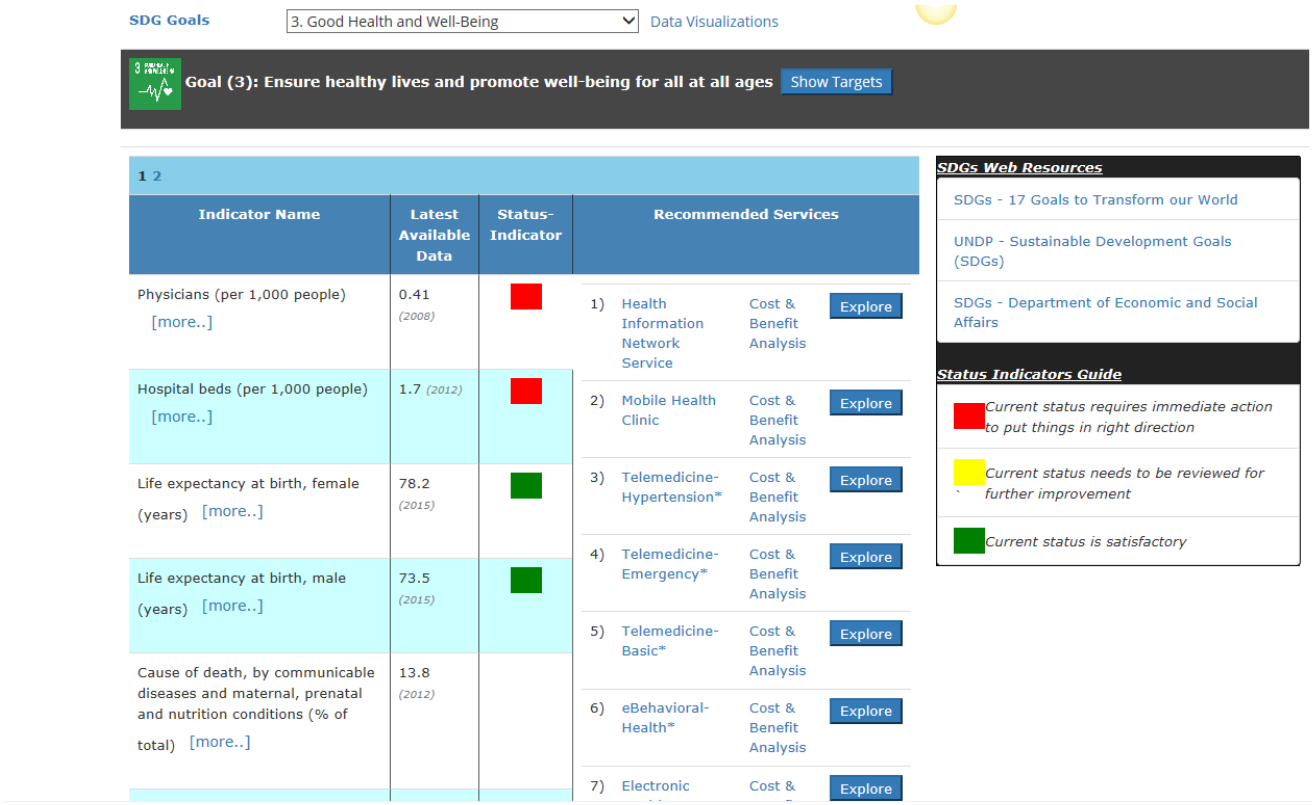

Figure 6: Screenshot of the Results Produced by Step2 of the SDG Advisor

STEP 3: Exploration and Launching/Implementing Needed Services

The SDG Advisor goes beyond recommendations and helps 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 ePlanner conducts a feasibility study and generates extensive reports such as 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. For more information about the Free Pilot Projects, please visit www.ict4sids.com.