# Computer Aided Strategic Planning, Architecture, Controls & Education (SPACE)

## Conceptual Overview

### Executive Summary

ICT (Information and Communication Technology) services have resulted in tremendous economic development, improvements in quality of life, and operational efficiencies around the globe. However, 50-80% of these initiatives fail due to re-invention of the wheel, especially in developing countries and the underserved sectors of the developed countries (e.g., local governments and small to medium businesses). Best practices for success are well known but the main challenges are:

- How to make the knowledge available quickly, economically and universally
- How to do more (i.e., more services to more users) with less (i.e., less time, less failures, less staff).
- How to transform knowledge of best practices into *actual* practices where the knowledge is used routinely in daily practices.

SPACE (Strategic Planning, Architecture, Controls, & Education), is an intelligent decision support environment that has been developed to address these challenges. SPACE is a spinoff of the United Nations eNabler Project that has been extended to support smart services, cities, governments and enterprises. This environment -- endorsed by more than 100 countries -- quickly produces highly customized plans and other support documents by using the latest thinking in the field. In fact, SPACE is a Platform for ICT management (very much like MS Office is a platform for office work -- you use different tools for different type of work). It significantly reduces failures due to trial and error and consists of many well coordinated tools, displayed in Figure a.

SPACE is a one Stop Shop that covers the entire Learn-Plan-Do-Check cycle instead of one activity. It consists of access to Big Data sources, patterns, games, online courses, and planning tools that can be used as a computer aided consulting platform. In less than an hour, SPACE produces a Strategic IT plan, executive summary, requirements documents, business plans, RFPs, sample prototypes, governance plans, IT audit lists, project management guidelines, and enterprise architecture views. These outputs displayed in Figure b, may take almost a year to produce manually.

Figure a: SPACE Capabilities

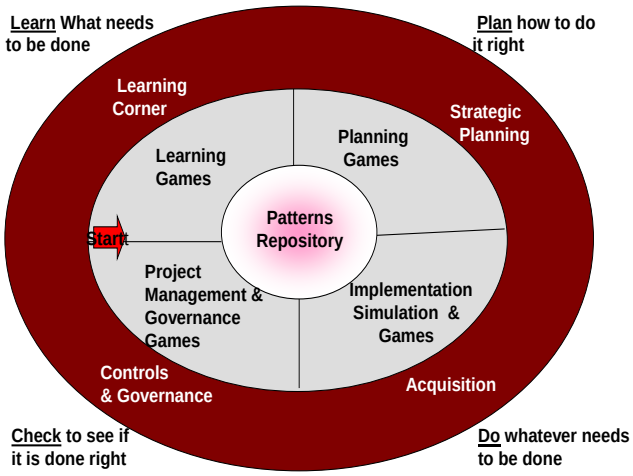
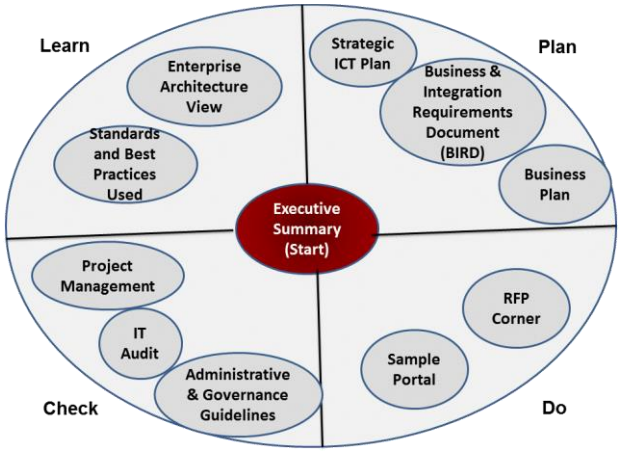



Figure b: SPACE Outputs



## 1. Overview and Motivation

ICT (Information and Communication Technology) initiatives have resulted in tremendous economic development, improved quality of life and operational efficiencies around the globe. Newer initiatives in smart services (e.g., smart health and smart police departments), smart cities (e.g., Smart Amsterdam), and smart countries (e.g., Smart Rwanda) are creating new opportunities for the citizens. Unfortunately, 50-70% of ICT initiatives fail , i.e., they are never used by the intended users as stated by the Standish Group Chaos Report. In addition, failures in developing countries are much higher (up to 85%, according to Dada [27]). Failures in developed countries are also quite high in the underserved public and private sectors (e.g., local governments and small to medium businesses). Failures are repeated due to re-invention of the wheel throughout the system life cycle (Learn-Plan-Do-Check cycle) and not one isolated problem. For success, the entire life cycle activities must be executed properly with complete knowledge of best practices and standards – a difficult task for developing countries and underserved segments (see Exhibit 1).

SPACE (Strategic Planning, Architecture, Controls, & Education) is a smart decision support environment that supports smart services, cities, governments and enterprises. It is a "one-stop shop" that supports the entire Learn-Plan-Do-Check cycle instead of one narrow area, as explained in Exhibit 1. SPACE provides extensive informational, educational and management resources by using the following three capabilities displayed in Figure 1:

**a)** **Patterns Repository** that contains core knowledge about 150+ countries, 100+ services from more 12 sectors (e.g., health, education, public safety, public welfare, transportation) and technologies (e.g., network technologies, computing platforms, security and integration technologies).

**b)** **Games and Simulation Tools** that provide links to a wide range of games and simulations, case studies and tools needed by the users who want to explore the various resources in more detail.

**c)** **Decision Support Tool – The Planner** for the specialists and officials in governments and the private sectors who need to actually plan, implement, and manage the needed ICT initiatives. The Planner produces detailed strategic plans for a wide range of egovernment services based on best practices and standards. The Planner can be used very effectively to educate as well as assist the government officials of developing countries to accelerate progress in crucial areas. Besides strategic planning, the Planner offers capabilities for acquisitions through RFPs and project management.

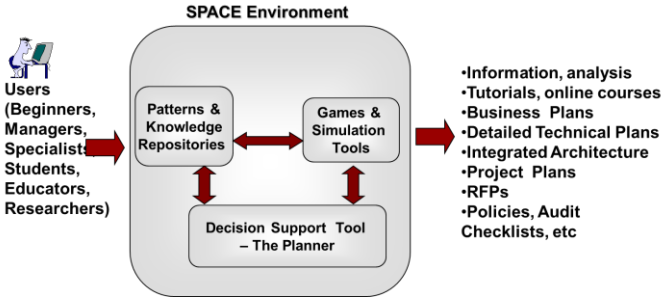


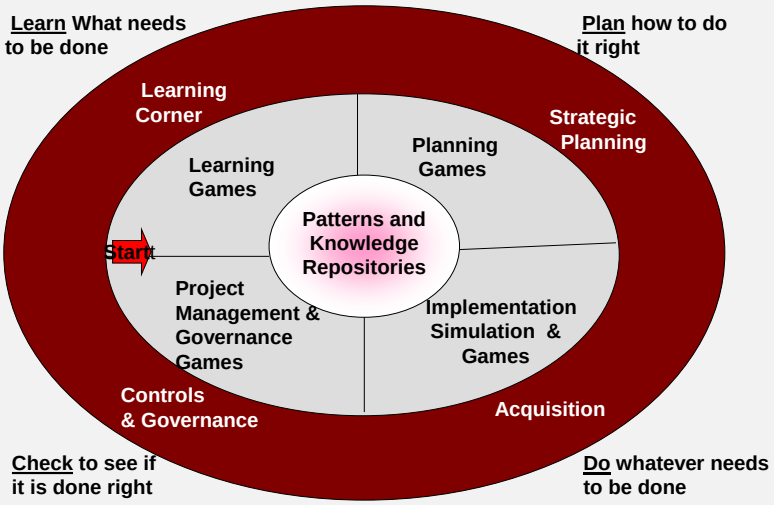

*Figure 1: Conceptual View of the SPACE Environment*

**Smart Decision Support for Smart Services and Enterprises**: SPACE has been extended to support the smart services that can *detect* a problem quickly, *adjust* rapidly to address the problem and *learn* from past experiences to better predict and avoid the problem in the future. We agree with the IBM definition that Detection, Adjustment and Learning (DAL) are the three core capabilities of a smart service, system, city, government or enterprise. SPACE itself exhibits smart capabilities by *detecting* problems early, *adjusting* to the situation quickly by automatically invoking the needed advisors thus addressing the shortage of skilled staff issues, and *learning* to better handle similar situations in the future.

## Exhibit 1: Supporting the Learn-Plan-Do-Check Cycle

The Lean-Plan-Do-Check cycle, displayed in the following figure, has been used for several years to develop new systems and improve the existing ones. The idea of **Learn** what needs to be done, **Plan** how to do it right, **Do** whatever needs to be done, and **Check** to see if it is done right, is common in disciplines such as continuous quality improvements. Individuals involved in launching an eservice (e.g., mobile health clinic) face many Learn-Plan-Do-Check challenges: "how do I understand the basic issues, policies, and approaches", "how do I develop a customized plan that is specific to my country", "how do I successfully execute the developed plan", "how do I monitor and evaluate the progress being made", and "how do I do everything without re-inventing the wheel - what tools and solutions are available that I could use?" The individuals wonder if there is a "one-stop shop" where one could find answers to all such questions.

SPACE provides a one-stop shop that concentrates on the aforementioned challenges and addresses the entire Learn-Plan-Do-Check cycle. It systematically guides the users through all phases to eliminate the chances of oversights and redundancies. The core capabilities of SPACE consist of a) Patterns Repository that contains core knowledge about several countries, industries and technologies; b) Games that support different aspects of the life cycle; and Planner (the outermost circle) that supports the strategic planning, acquisition, governance and educational needs.




## 2. The SPACE Environment – A Quick Tour

A user of the Planner selects a service (e.g., mobile health clinic) for a given country (e.g., Nigeria) and quickly generates the following reports (see Exhibit 2 for more details about these reports):

- Business plans that can be used for obtaining funding
- Detailed Planning Reports (DPRs) that show the architecture, the needed policies, and enabling technologies for the chosen service
- Standardized RFPs (Requests for Proposals) that can be used to attract the needed vendors through an open bidding process
- Project management, disaster recovery and governance guidelines for monitoring and controlling the development activities
- Education, training and public awareness campaigns needed for success

Let us briefly review how these outputs are produced by using Figure 2 which shows a more detailed view of the Planner. *Simply stated, the Planner is a set of intelligent apps ("advisors") that are integrated around common resources.* These advisors collaborate with each other to cover five phases (P0 to P4), shown in Figure 2. These advisors invoke the games, patterns, and other resources to generate the outputs shown in Figure 2. These outputs can be further customized by local experts and/or end users. Suppose that a user wants to develop the strategic plan for an eLearning service in Nigeria. 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 & 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. Our goal is to produce the outputs that require less than 30% of local modifications.

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

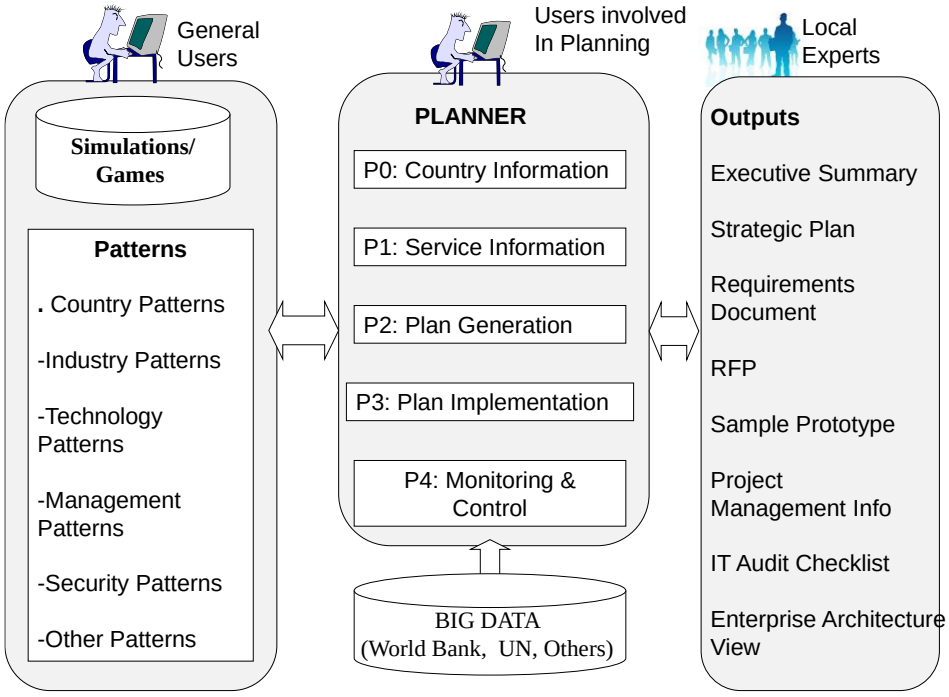



Figure 2: A More Detailed View of SPACE

## Exhibit 2: The Outputs Produced by the Planner -- The Checklist

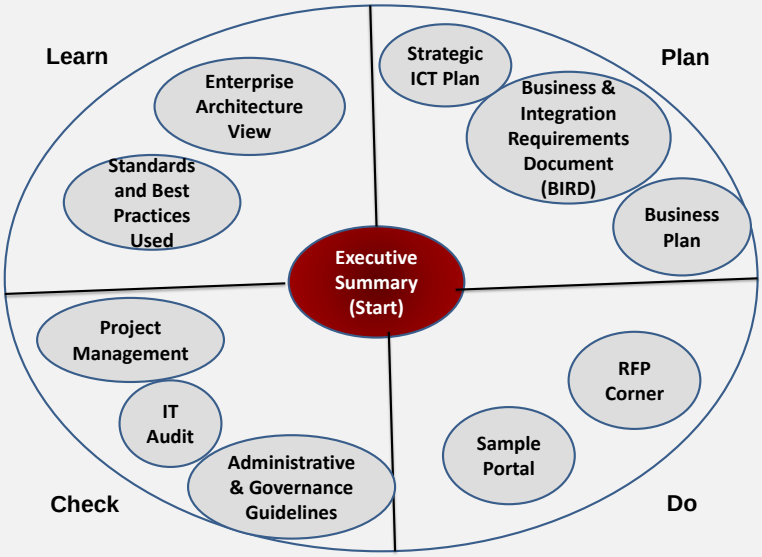
A user of the SPACE Environment selects a service (e.g., mobile health clinic) for a given country (e.g., Nepal) and generates the following outputs:

- Strategic Planning Report that shows the overall vision and architecture with business/technical justification
- Requirements documents for system development

- Business plans that can be used to obtaining funding
- Standardized RFPs (Requests for Proposals) that can be used to attract vendors for bidding
- Project management, policies and procedures, disaster recovery and needed governance guidelines
- Education, training and public awareness campaigns needed for success
- Enterprise architecture (EA) views for overall governance
- Suggested standards and best practices

These outputs, displayed graphically below, cover the entire Learn-Plan-Do-Check cycle, are produced *in less than an hour (it takes almost a year to produce similar outputs manually).*

As indicated by Gawande [28] in his best selling book "The Checklist Manifesto: How to Get Things Right", a checklist is a very powerful tool for successful execution of projects. The information contained in these reports can serve as a massive checklist that can help the users to succeed.




## 3. An Example – Using a Systematic Methodology

Figure 3 shows a conceptual view of the SPACE methodology that systematically guides the users through different phases of the Plan-Do-Check cycle for given eservices. This figure illustrates the flow of planning phases P0 (initialization), P1 (information gathering), P2 (strategic planning), P3 (detailed planning), and P4 (monitoring and control). The first two phases (P0 and P1) capture country and service specific information. Phase 2 generates a customized plan based on P0 and P1. P3 supports execution of the plan and phase P4 supports monitoring and control with heavy emphasis on project management and quality controls. Big Data, business patterns and intelligent rules are used in all phases of this methodology. Given a strategic project (or an initiative), this methodology identifies the main alternatives, the key business/technical issues involved in each alternative, and helps in evaluation and selection of the most viable alternatives *before* initiating the project.

The methodology shown in Figure 3 can be used manually. SPACE provides computer aided support in all phases of this methodology and can produce results within an hour instead of months. It also offers many additional benefits such as the following:

- hide technical details and thus can be used by people with different backgrounds
- introduce and enforce the same standards and best practices quickly and uniformly across all users
- be accessed by people living anywhere and thus level the playing field between developed and developing countries
- be used as a training and educational tool

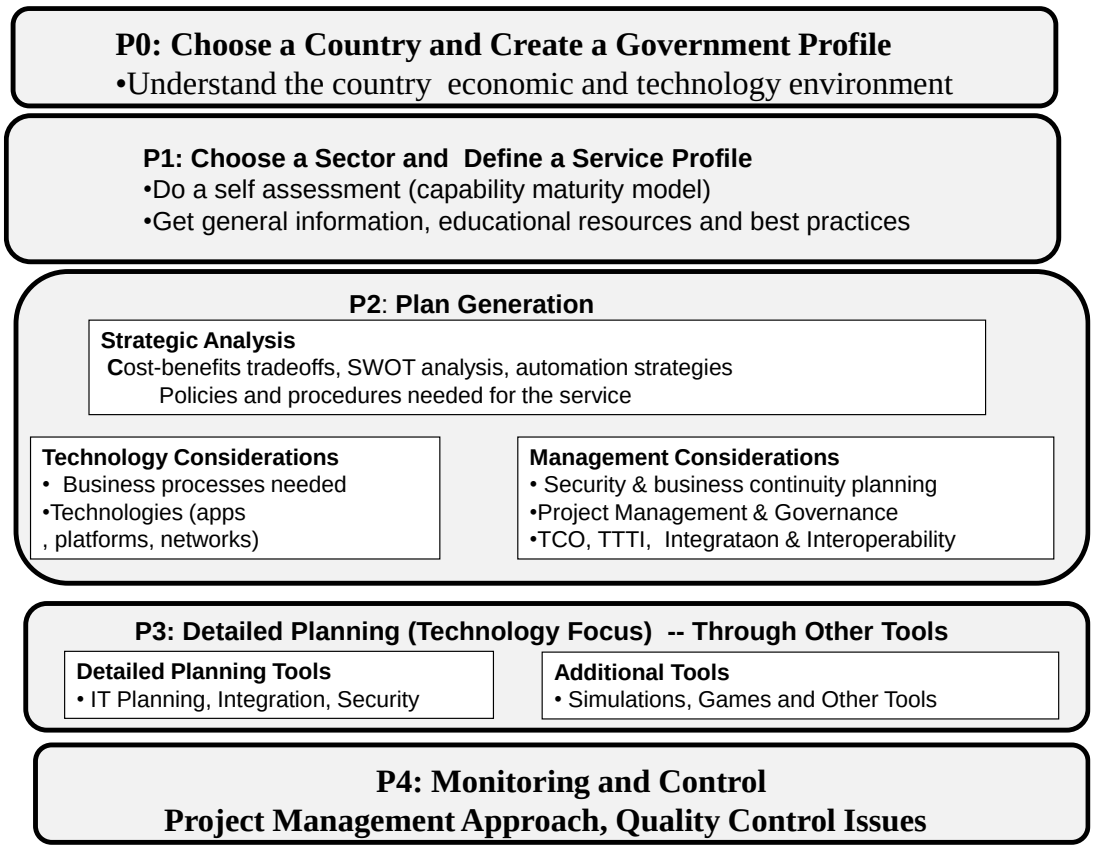



*Figure 3: Systematic Methodology Used by the SPACE Planner*

How is the SPACE Planner actually used in practice? The following example illustrates the overall flow of the Planner to introduce an ICT-based *Disaster Management (DM)* service in a rural area. The purpose here is to help an agency widely provide DM services to its constituents. The following description shows the flow of the Planner, as displayed in Figure 3:

- In the P0 phase, the user chooses a country (e.g., Nigeria) or a region within a country. The Planner automatically fetches the most appropriate information about the country/region (e.g., population sizes, terrain, etc. This saves a tremendous amount of time and effort to the users.
- In the P1 phase, the user selects a service to be deployed (DM) and decides the types of technologies to be used for DM. SPACE consults Big Data to make sure if the needed technologies are available in the selected country/ region and gives warnings if the selected technologies are not available. SPACE then goes through self assessment (i.e., need analysis) about the DM service and automatically accesses the general information, educational resources and best practices available from the UN, the World Bank, and other Big Data sources to help the self assessment of DM service, say, in Nigeria.

- In the P2 phase, the user is led through strategic analysis (buy, rent, outsource) and cost-benefits tradeoffs associated with the DM service. The user is also guided through policies and procedures needed for the DM service.
- In the P3 Phase, the detailed planning environment can be developed through an extensive IT Planning, Integration, Security and Administration (PISA) tool, part of SPACE. Detailed IT plans can be developed easily by PISA for many sectors such as healthcare, manufacturing, education, telecommunications, retail, finance and others. The user may choose other simulations, games and decision support tools for detailed planning.
- In the P4 Phase, the progress of the project is monitored and controlled through project management techniques. In this phase, the quality of the results produced is evaluated by using the best practices in quality control.
- The final phase, not shown in Figure 3, displays the outputs produced in a well organized manner and also produces a sample prototype that can be expanded by local experts into an actual working system.

This short example highlights the main flow of the planning environment. Best practices are being used in all phases of the Planner to introduce ICT services quickly and effectively in developing countries. Our goal is to go beyond the websites that contain marketing materials or portals that serve as document repositories with search capabilities. Instead, we aim to provide a comprehensive computer aided planning, engineering and management environment with the following distinguishing features:

- Step-by-step guidance based on best practices and standards
- Quick warnings, based on Big Data, help in needs analysis and self assessment
- Automation of the planning steps through a family of intelligent tools
- Recommendation of solutions based on best practices as patterns (core knowledge that can be specialized and customized)
- A set of intelligent decision support tools that are integrated around a common knowledgebase, instead of yet another standalone and fragmented tool
- Games and simulations for experimentations and what-if analysis
- Remote planning support (anyone from anywhere can use this system)
- Solution of important but complex problems (e.g., strategic planning, system integration, disaster recovery) through a family of advisors

## 4. From Small and Simple Services to Large and Complex "Service Bundles"

The ability to select large number of services for different countries and regions is a very powerful capability of SPACE. Specifically, the users of SPACE can do the following:

- Select a single service (e.g., a mobile health clinic) within a sector (e.g., healthcare)
- Combine different services from one or more sectors to construct "service bundles" that may represent large initiatives (e.g., Smart Cities) or interagency and B2B services (e.g., healthcare exchanges and supply chains between multiple suppliers and consumers).

Basically, a SPACE user may select an individual service or construct a service bundle for large and complex situations. Based on the choices made, the Planner automatically walks the user through the most appropriate steps and then generates very powerful outputs. Thus the Planner adjusts its behavior based on the type of service selections. Figure 4 shows a high level view of the services provided, bundles supported and outputs generated. These capabilities are described briefly.

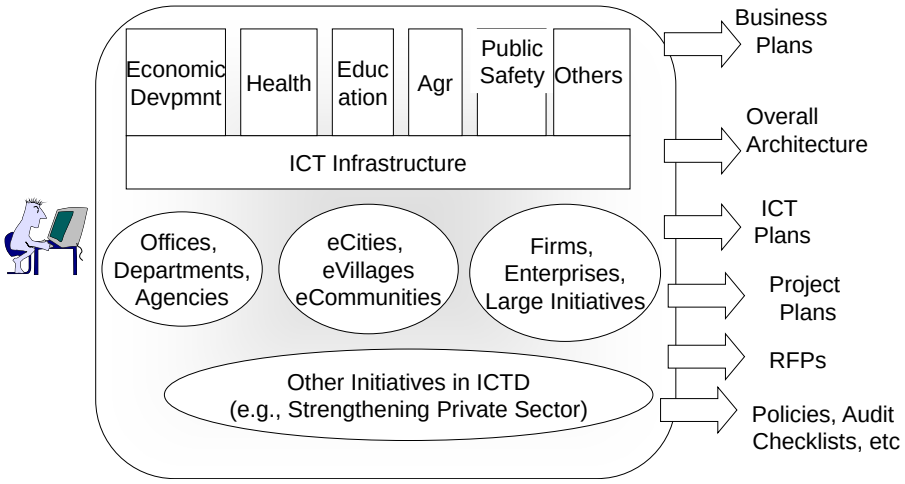



*Figure 4:Service Types in SPACE*

### *4.1 Individual Services and Sectors*

The overall environment is organized into sectors and services within each sector. For example, Figure 4 shows sectors such as economic development, healthcare, education, and e-government. These "vertical sectors", shown as vertical bars, are supported by a horizontal sector (ICT Infrastructure) with services such as network access and mobile computing that support all vertical sectors. Each sector provides many individual services. For example, healthcare sector provides patient care and administrative services. Appendix A shows the individual services that are available in the SPACE Environment at the time of this writing (we are constantly developing new services).

### *4.2 Enterprise-Wide Service Bundles (e.g., Offices, Cities and Firms)*

A user can combine different individual services into enterprise-wide service "bundles" that are managed by one organization. These service bundles, shown as circles or ellipses in Figure 4, can be used to model departments, government agencies, firms or business units, This capability of the Planner to combine several individual services from different sectors to form new service bundles is a very powerful feature that can be and has been used to represent the following real-life situations:

- Business divisions or complete enterprises in the public or private sectors such as healthcare, education, transportation, manufacturing, telecom, and others
- eCity and eVillage Initiatives that provide a wide range of ICT services that span public safety and welfare in addition to economic development and education sectors.
- Millennium Development Goals (MDGs) that span economic development, education, and other sectors.
- Mobility Initiatives that focus on introducing mobile apps and location based services in one or multiple agencies.
- Government specific initiatives at local as well as national levels in different countries (e.g., the Digital Britain Initiative).

The Planner treats each enterprise service as a single organizational unit (enterprise unit) that is managed by a central authority that can introduce and enforce common policies and procedures. This simplifies several inter-system communication problems. The interagency problems that require collaboration and coordination between multiple independent agencies are discussed next.

### *4.3. Inter-Enterprise and Inter-Agency (B2B, G2G) Service Bundles*

In addition to individual services and centrally managed initiatives in domains such as healthcare and economic development, the Planner can be used to represent large and more complex service bundles that include multiple independent agencies and organizations. The Planner provides a "Composer" that takes different services and composes them into larger and more complex service bundles such as the following (see Figure 5):

- A document exchange network between different government agencies
- A B2B marketplace with numerous buyers and sellers
- A supply chain system consisting of several consumers and suppliers
- A government/business network such as a health information network (HIN)

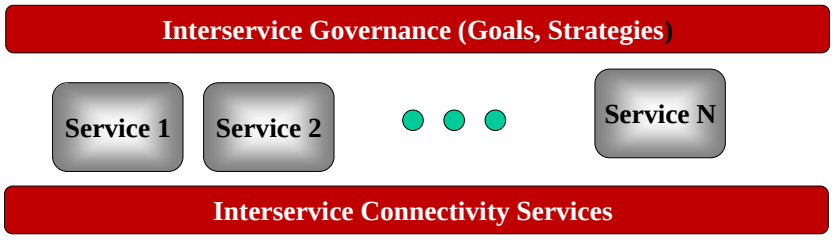



*Figure 5: Building a Large Service from Smaller Ones*

The focus here is on inter-enterprise problems that require collaboration/coordination between multiple independent agencies. The Composer treats each service developed in a session as an individual service (a reusable component) and composes large and complex servicebundles from these components by using SOA (Service Oriented Architectures). It then suggests approximate configurations with details about the governance, information exchange models (e.g., NIEM and PIP), and infrastructure components.

The type of management and technical solutions needed depend on the organizational composition and other parameters such as the number of participants (organization units), volume of transaction handled by the composition, value of transactions handled, security and trust level between the partners, etc. For example, the collaboration between partners in a health information network requires different types of considerations than a supply chain of household products.

**Exhibit 3: Case Study -- Launching a Mobile Health Clinic Initiative by Using SPACE**

Mobile Health Clinics (MHCs), combined with the mobile computing technologies, have been highly effective in combating HIV and malaria, improving maternal health, and reducing infant mortality in Peru, South Africa, Uganda, and the Philippines. In particular, location-based text messaging applications have been highly effective to attract young people to mobile clinics that provide informational, testing, and/or clinical services. While there are many success stories about mobile clinics, numerous failures have occurred due to logistical issues (e.g., running out of supplies in the middle of nowhere), technology issues (no wireless signal in the area), procedural problems (healthcare professionals could not get visas on time), and social issues (some parents did not like their children to be invited to a clinic without parental consent).

A *Mobile Clinic Support System* is needed to address the people, process and technology issues and thus assure repeatable success of these clinics. The following figure shows a conceptual view of a support system that leverages the latest ICT developments to serve the physicians, the patients, the healthcare facilities, the suppliers of materials and the regulating authorities. Such a support system could profoundly impact the delivery of healthcare to different parts of the World because it can be offered with minimal technologies or sophisticated web and wireless support. In addition, this support system could be

devoted to a single service provider or support multiple suppliers, healthcare facilities and physicians as a B2B network. How can the aforementioned Learn-Plan-Do-Check cycle be used to assure success? To gain some insights, let us go through the SPACE Planner capabilities.


*Overview of a Mobile Health Clinic Support System*

- **Learn:** A user (government agency or NGO) starts by first visiting the Directory and the Knowledge Repositories for case studies and information on different aspects of mobile health clinics.
- **Plan:** Go beyond case studies and actually use the Strategic Planner to generate a country and situation specific plan. The Planner guides the users through the maze of decisions in cost-benefit analysis, business process modeling, technology selection, system integration, disaster recovery, and information security that is specific to the country in which the mobile clinic is supposed to operate.
- **Do**: The generated plan serves as a solid starting point for the implementers to refine and operate mobile health clinics for different situations in different regions of the world. A wide range of simulations and business games could be used to create and exercise some what-if scenarios.
- **Check**: The operation of the mobile health clinics can be monitored through project management techniques such as "management dashboards". The lessons learned could then be used to reiterate, refine and improve the deployment of future mobile health clinics.

## 5. Enterprise Architecture Approach and Standards Used

The Strategic Planner strongly supports enterprise architecture (EA) principles and is aligned with The Open Group Architecture Framework (TOGAF). The main phases of the planner (P0, P1, P2, P3, P4), follow the TOGAF building blocks and use a wide range of tools, techniques and standards in all phases, as shown in Table 1. Additional information about EA support is provided in Exhibit 4.

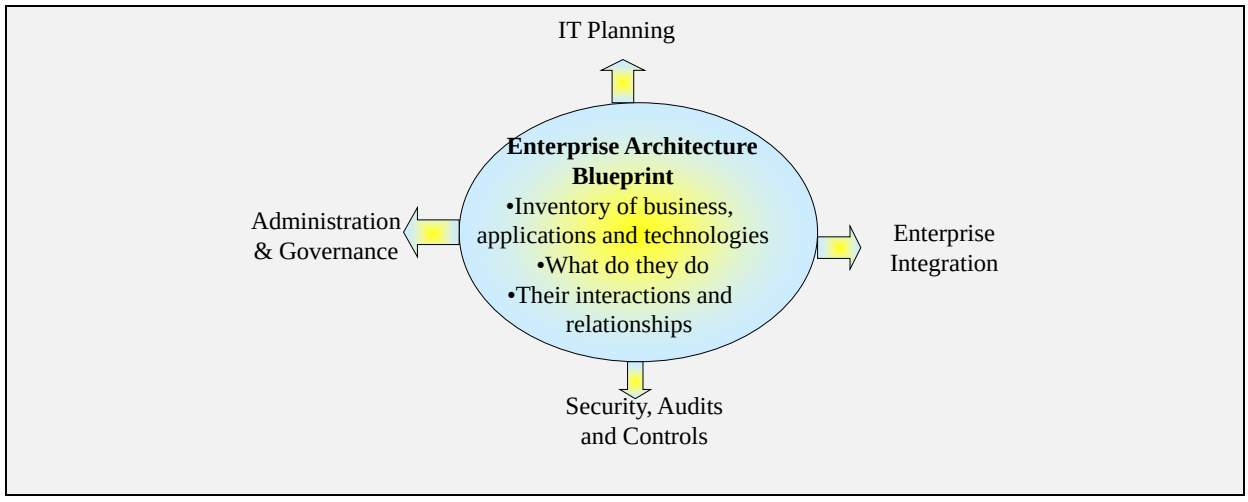
*Table 1: Computer Aided Strategic Planner – An Enterprise Architecture View*

| Planning Phases | Activities Performed | Tools, Techniques & Standards Used |
|---|---|---|
| **P0 (Government Modeler) Choose a Country and create a Government Pattern** | S1: Define the country Profile and specify the level of use for the ICT | Fetch and use various indicators from sources such as World Economic Forum, UNPAN, ITU |
| | S2: Create a government pattern for the chosen country | Use the Patterns Repository to fetch and display a generic government pattern |

| | | |
|---|---|---|
| | S3: Customize the pattern based on user inputs | Defaults for the patterns are based on external data sources |
| **P1 (Initializer): Choose an Area (Domain) and Do Information Gathering** | S1; Define a service in different areas that support the MDGs (e.g., healthcare, education, economic development) | The services are based on the government pattern and use the ITIL (IT Infrastructure Library: www.itil-officialsite.com |
| | S2: Get general information, educational resources and best practices | Extensive literature from diverse sources is accessed and displayed. |
| | S3: Do a self assessment of the PMO (present method of operation) and FMO (Future Method of Operation) | Uses the Capability Maturity Model (CMM) measures (0 to 5) for assessment. |
| **P2 (Strategic Planning): High Level Planning (Management Focus)** | Cost-benefits tradeoffs | Uses the McFarland Model |
| | Strategic analysis (buy, rent, outsource) | Uses an intuitive decision model based on time, in-house expertise, |
| | Policies and procedures needed for the service | Policies from different sources are fetched and displayed. Oracle Policy Automation |
| | Business Architecture (i.e., business processes needed) | The Open Group Architecture Framework (TOGAF), Zackman model and US-FEA (Federal Enterprise Architecture) |
| | Application and Technology Architecture (apps, platforms, networks) | OAG (Open Application Group) Website: www.oag.org, TOGAF, W3C (www.w3c,org), Cisco guidelines |
| | Security planning | SSI (System Security Institute), and ISO 9000 (for quality mgmt) |
| | Business Continuity Planning (BCP) | BCP best practices |
| | Interoperability and Integration Considerations | SOA, SPOCS(large European initiative for interoperability – http://www.eu-spocs.eu/) |
| **P3 (Detailed Planner): (Technology Focus) -- Through Simulations** | Consolidated Report that shows:<br>- Summary of the interactions<br>- Requirements (RFP) format<br>- Standards used (with explanations) | Requirements document is based on IIBA (International Institute of Business Analysis) Website: www.theiiba.org |
| | Detailed Planning & Implementation Tools | Games, simulations, planning tools, |
| **P4: Monitoring and Control (Quality Focus)** | Detailed project management for monitoring and controls with quality focus | PMBOK (Project Management Book of Knowledge) by Proj Mgmt In.(PMI)<br>COBIT (Control Objectives for Information), CMMI (Capability Maturity Model Integration) |

**Exhibit 4: Enterprise Architecture Support in SPACE Planner**

An enterprise architecture (EA), as shown below, is basically a repository of information that can be used to plan, manage, secure and integrate an enterprise. The SPACE Planner captures and uses this information during its phases, as shown in Table 1, and generates powerful reports to support the administration, planning, integration and security activities of an enterprise.




## 6. Concluding Comments and Next Steps

In its mature prototype (Beta) mode, the SPACE Environment is available at www.space4ictd.com and can also be accessed from the UN-Gaid eNabler site (www.enabler4mdg.org). Potential users can choose more than 100 individual services spanning health, education, agriculture, public welfare and economic development and generate detailed planning reports that contain business plans, policies, requirements, technologies and project management recommendations. In addition, SPACE fully supports composition of these individual services into enterprise-wide and inter-enterprise services. The eBusiness capabilities are provided through a similar environment called PISA (Planning, Integration, Security and Administration) available at www.ngepisa.com.

We have learned several invaluable lessons in this project. The key positive finding is the significant reduction of time (from 4-5 months to 2-3 days) and increased chance of success due to consistency of processes and quick availability of common practices. This reduces cost and reduces expensive retries and thus could possibly lead to equality at a global level. The major challenge is training of the practitioners in the underserved sectors. To address this challenge, we have been improving the training and educational capabilities of the SPACE environment and have reorganized the SPACE website so that different user types are exposed to different sections of SPACE.

Our long range goal is to make the SPACE environment a very powerful tool that can play a crucial role in advancing eGovernment and eBusiness initiatives in underserved segments around the globe. Some of the future directions are:

- Expand the "Learn and Replicate" capabilities by extensively using a social network between the users of the system. This will help the users to exchange ideas, views, experiences and lessons learned.
- Significantly expand the games and simulation capabilities. Most of the SPACE advisors at present are implemented as Web Services so that they can be invoked from another advisor or from a game.
- Support more complex services that span multiple agencies (e.g., multiple government agencies from multiple countries). This is currently operational but we want to expand it more.
- Expand the intelligence capabilities of the inference engine by improving the reasoning and learning features through use of recent developments in machine learning, fuzzy logic and case-based reasoning.

## Acknowledgments

The computer aided planning environment is being developed solely by the NGE Solutions team (Kamran Khalid, Nauman Javed, Adnan Javed, Abdul Qadir, and Hannan Dawood). We have also greatly benefitted by the feedback provided by our user communities in Bahrain, Cambodia, Liberia, Macedonia, Myanmar, Nepal, Nigeria, Rwanda, and others.

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## APPENDIX A: A Closer Look at Services Supported by the SPACE Environment

The following table shows the services supported by SPACE in sectors such aseconomic development, education, healthcare and others. In addition, the ICT infrastructure is a horizontal sector that supports all vertical sectors. These services can also be combined into "Service Bundles" that represent composites such as villages, communities, cities and B2B marketplaces.

| Economic Development | Education | Healthcare | Law Enforcement & Safety | Transportation & Agriculture | Public Welfare & Environment Services | Common Services |
|---|---|---|---|---|---|---|
| Entrepreneurship<br>Micro-Entrepreneurship<br>Micro-Financing Information Systems<br>e-Employment<br>e-Tourism<br>e-Library (public) | Educating Primary School Teachers<br>e-learning for the handicapped<br>e-Learning Support System<br>e-Library (school) | Mobile Health Clinic<br>Electronic Health Records<br>Emergency Medical Service<br>m-Health (General)<br>Hospital Information System<br>Patient Information System<br>Decision Support for Health<br>Telemedicine<br>e-Behaviourial Health | Police & Fire Services<br>Police Crime Investigation Services<br>Social Network Services for Governments<br>Additional Law and Order Services<br>Weather Alert and Travel Warning<br>Food Quality and Drinking Water Purity<br>Disaster Management and Recovery Services | Optimal Route Planner<br>Alert Systems<br>Automobile Licensing<br>e-Agriculture 2.0<br>E-Agriculture Phone2SMS<br>Eservices for Food Safety<br>Precision Agriculture<br>eServices for Agriculture | Social Services<br>Citizen Welfare Services<br>Public Healthcare Service<br>eLearning for Needy Children<br>Assisted Living<br>eCare for Aging Populations<br>Entrepreneurship Welfare Programs<br>Clean Air<br>Environmental Monitoring<br>Environmental Analytics | Business Intelligence (BI) Service<br>Corporate Management Services<br>Customer Services<br>Marketing Services<br>Sales Services<br>e-Payment<br>EFT – Electronic Fund Transfer<br>Credit Card Detection System<br>e-Banking System |
| ICT Infrastructure Services (Horizontal)<br>- Broadband Access, Network Management, Social Networking (*e-Participation, e-Voting), Cloud Computing | | | | | | |
| **Enterprise-Wide Service Composite (Service Bundles that Combine Many Individual Services)**<br>- Offices, Departments, Initiatives (e.g., MDG, Mobility, Telemedicine, Aging Population) Services, Firms, Business Units, eCities, eCommunities, Government Specific Initiatives | | | | | | |
| **Inter-Enterprise Service Composites (Service Bundles for B2B and G2G Integrations)**<br>- G2G Services (Interagency Exchanges), Supply Chain for Food Distribution, Health informational Networks, Educational Networks, Entrepreneurial Networks, B2G Services | | | | | | |

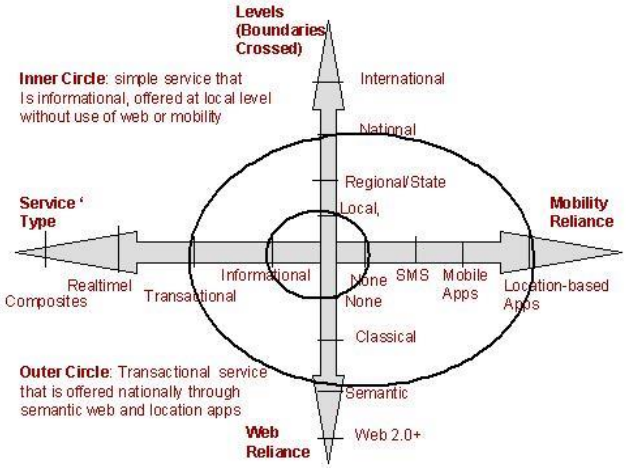
At a simple level, the users make the following selections and decisions in a Planner session.

**Country/Region Selection:** The users choose a country and/or a region within a country from a list of about 190 countries. We have developed government patterns and fetch other data about all countries from sources such as WEF (World Economic Forum) and UNPAN (UN Public Area Network).

**Service Selection**: The users choose a service from domains such as healthcare, education, public safety, economic development and others. These "vertical services" are supported by several horizontal services that belong to the "ICT Infrastructure" domain. Table 2 shows a sample of the services that are available in the SPACE Environment at the time of this writing (we are constantly developing new services).

**Service Offering Decisions.** A given service can be offered at different levels and through different delivery mechanisms. For example, a tourism service can be offered through a tourist information center that just provides pamphlets to a sophisticated tourism portal that provides online booking of tours and packages with flights, hotels and car rentals. Naturally, the ICT plan for the tourism portal would be more complex than that of a walk-in tourism center. The view presented in the following figure illustrates the main idea in terms of four dimensions:

- Service Type: a service can be informational only (e.g., provide information about different tours), transactional (e.g., make bookings for tours), real-time (e.g., inform tourists about cancellations), and composites (combination of multiple services from multiple agencies). Each service type introduces unique considerations in planning.
- Levels (Boundaries Crossed): a tourism service, as an example, can be offered locally within a city, in a region/province, in a country, or internationally (across countries). Each boundary level also has its own unique challenges.
- Web Reliance: The tourism service may just rely on pamphlets, may use simple informational websites based on static content, or may use dynamic sites with Web 2.0+ features. Higher Web reliance supports more sophisticated services but also introduces more complex technical and management considerations.
- Mobility Reliance: The services may rely on simple handsets for text messages to sophisticated location-based devices with sensor networks. Increased mobility reliance also enables more powerful services but requires more complex infrastructure.




Thus a given tourism service can be represented as a circle shown here. Similarly, an entrepreneurship service can be offered by a government at informational, transactional, real-time or comprehensive level for a local, national or international agency by using different types of web and wireless technologies. The circles in the figure depict two sample service offerings. As illustrated in the diagram, some services may be very simple (depicted as inner circle) or more sophisticated (outer circle). The outermost circle, not shown, would represent extremely powerful international services that require extensive planning. We have built rules that suggest plans of a service based on the four dimensional view presented in this figure.

**Building Composites from Individual Services.** Many real life situations in eBusiness and eGovernment involve multiple services within a sector (e.g., public safety services), across sectors (e.g., communications between department of health and department of public safety), or across countries (e.g., the EU services for the European Union countries). Building composites from individual services is a non-trivial task with many policy, regulatory and technical implications. The Planner has been designed so that the users can make the choices clearly based on the following factors:

- If all services are centrally controlled, then they can be modeled as a large initiative within one sector and can be analyzed by using the EAI (Enterprise Application Integration) methodologies.
- If multiple services belong to multiple agencies with no central control, then they can be modeled as a B2B or G2G initiative where each agency/business is treated as a separate business. Such composites can be analyzed by using the B2BI (Business to Business Integration) methodologies. For G2G services, models such as NIEM (National Information Exchange Model) can be used.
- If multiple services belong to multiple countries, then they can be modeled as an N2N (Nation to Nation) initiative where each nation is treated as a completely independent entity (naturally). Such composites can be analyzed by extending the G2G services because good models for N2N communications are not readily available at present. We are currently investigating to see how NIEM with its completely decentralized approach can be used for N2N communication.

## APPENDIX B: SPACE Architectural Components -- A Quick Look

The following figure shows an overall architectural view of the SPACE Environment. It shows the key components of SPACE and its interactions with external components. Specifically, SPACE supports public (government) as well as private industry sectors by interacting with a wide range of components such as PISA (see www.ngepisa.com), GEZA (see www.ngegeza.com) and PARIS (a pattern repository, not visible externally). More detailed description of SPACE architectural components can be found in the Planner Learning Corner (http://www.space4ict.com/pages/learningcorner.aspx), Stage2, Stage3 and Stage4 documents.