Strategic Planning, Architecture, Controls & Education (SPACE)

User Guide

SPACE QuickStart Experiments for the First Time Users

SPACE (Strategic Planning, Architecture/Acquisition, Controls, and Education) is a computer aided planning, engineering and management environment that supports the entire life cycle activities of digital enterprises. SPACE provides a one-stop shop that systematically guides the users through all phases to eliminate the chances of oversights and redundancies. The core capabilities of SPACE, as displayed in Figure 1, consist of Pattern and Knowledge Repositories, Games and Simulations to support eBusiness and eGovernment decisions, decision support tools such as a Simple Planner and an Extensive Planner, and a set of Specialized Initiatives and Tools that are built on top of the SPACE environment. These components, to be explained more in this document, collectively provide very powerful computer aided planning, engineering and management environment.

Suggestion: Please use the ePlanner in your first Experiment because it automatically brings in all other components on an as needed basis. The next experiments can explore other capabilities.

Suggested Experiment1: Develop an IT Plan of a Small Company by using ePlanner

- **Signon** to SPACE by using your ID-PW.
- **Create a scenario** for a service (let us say an educational service for high school teachers)
- **Control Panel** is the nerve center of the system. It will lead you through various advisors by using a red arrow**.**

The Methodology Used by ePlanner

The SPACE ePlanner covers five phases (P0 to P4) and the Control Panel guides the user through all phases. Each phase is supported by an advisor that provides phase specific guidance. The first two phases (P0 and P1) capture country and service specific information. P2 generates a customized plan based on P0 and P1. P3 supports execution of the plan and P4 supports monitoring and control with heavy emphasis on project management and quality controls.

The ePlanner integrates and aggregates the external information already available in knowledge portals and Open Big Data Sources. In addition, it provides access to useful educational and training materials in different steps of P0, P1, P2, P3 and P4 to educate the users as they develop the plans.

Main Outputs Produced by ePlanner

As shown in Figure2, the ePlanner produces

- Extensive Strategic IT plan with an executive summary, and essential support documents such as requirements documents, business plans, RFPs, governance plans, IT audit lists, project management guidelines, and enterprise architecture views.
- A working prototype (in the form of a portal or portlet) that can be used to demonstrate and implement the plan quickly

Hints and Suggestions

- It is best first to create a rough model and then create a more detailed model.
- The tool is self-contained. It includes an extensive 'Explain' capability that serves as an online tutorial. The Explain is accessed by clicking on the '?' button on any screen (usually top right).

Figure 1: SPACE Capabilities

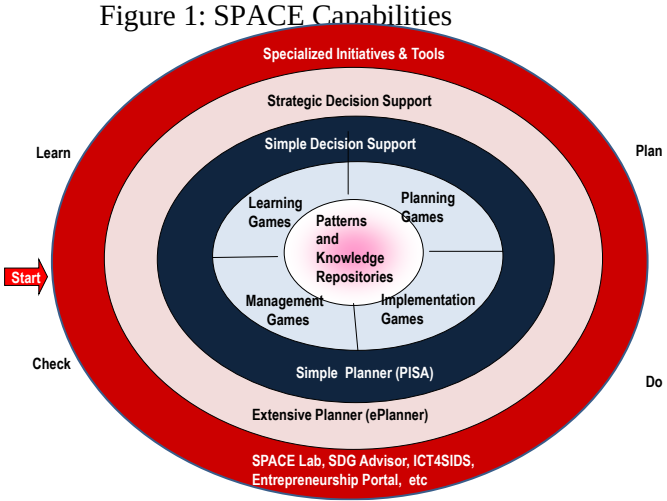
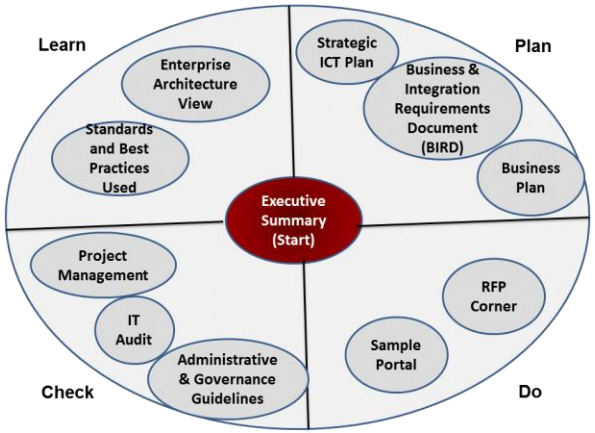


Figure 2: SPACE Outputs



Suggested Experiment 2: Establishing a Mobile Health Clinic in a Developing Country by Using SPACE

The Opportunity: Mobile Health Clinics, 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. 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).

The Challenges: A Mobile Clinic Support System (MCSS) is needed to address the people, process and technology issues to assure repeatable success of these clinics. However, such a support system raises the following challenges:

- What services are most urgently needed where
- What are the costs and benefits of such a clinic at a high level
- What type of ICT plan will be needed to support such clinics
- How will the MCSS service be actually provided by a portal

How SPACE Can Address These Challenges:
We can using SPACE to help plan mobile health support systems for remotely located populations. Specifically, the following capabilities of SPACE can be used:

- The SPACE patterns can be used to understand what type of services are needed. For example, the Patterns Repository (accessible through the Samples Section of the SPACE Site) can be used to browse through different type of healthcare services available in the Patterns Repository.
- The SPACE Games can be used to better understand the cost-benefits of an MHC service and also to develop very quick plans for the MHCs.
- The ePlanner can be used to develop to generate plans for MHCs and MCSS. As discussed in Experiment1 and illustrated in Figure3, the SPACE ePlanne covers five phases (P0 to P4), where each phase is supported by an advisor that provides phase specific guidance.

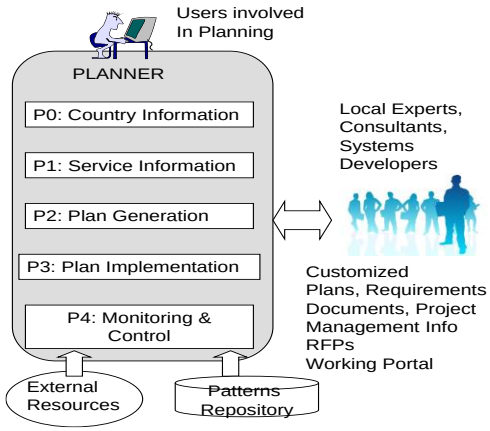


Figure 3: Planner Methodology at a High Level

As shown in Figure 3, the ePlanner produces an extensive plan plus a working portal that can implement the plan.

Additional Suggested Experiments:
SPACE capabilities can be used to handle diverse scenarios. Figure 6 shows four possible categories of simple to large and complex application scenarios in terms of services and service providers with short examples.

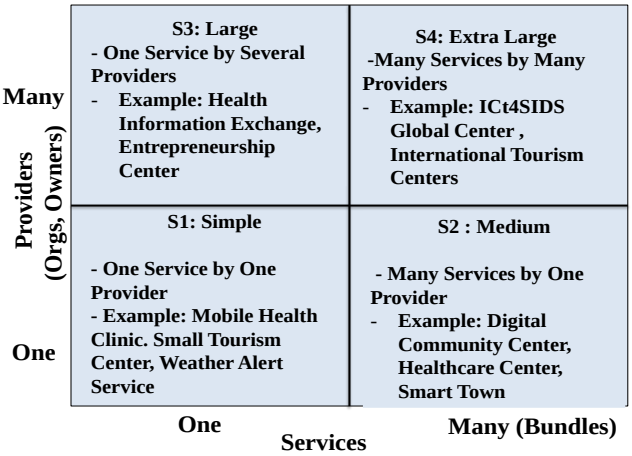


Figure 6: Application Categories from Simple to Extra Large

SPACE USER GUIDE

1. Introduction

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:

- *Patterns Repository for Industry Sectors (PARIS)* that capture the core knowledge needed by SPACE (more than 100 services in more than 10 sectors such as healthcare, education, public safety, public welfare, transportation and others). Additional information about PARIS can be found in Appendix A.
- *Games and Simulations* that support decisions in strategic analysis, mobile services planning, interagency integrations and health exchanges, application migration versus integration tradeoffs, risks and failure management, and quality assurance. Additional information about Gamification in SPACE can be found in Appendix B.
- *Simple Planner (PISA)* that can be used to quickly build real life business scenarios for small businesses and then guide the user through IT planning, integration, security and administration tasks by using best practices. Additional information about PISA can be found in Appendix C.
- *Extensive Planner (ePlanner)* that can be used for small to large scale government and the private sectors who need to strategically plan, architect, integrate, and manage the needed IT initiatives quickly and effectively by using the best practices. Additional information about ePlanner can be found in Sections 2-5 of this document.
- *Specialized Initiatives and Tools* that are built on top of the SPACE environment. Examples of these tools are the SPACE Lab, a UN SDG (Sustainable Development Goals) Advisor, the ICT4SIDS (ICT for Small Islands Developing States) Partnership, and an Entrepreneurship Portal. More tools and initiatives are always being added to this layer. Additional information about SPACE initiatives and specialized tools can be found in Appendix D.

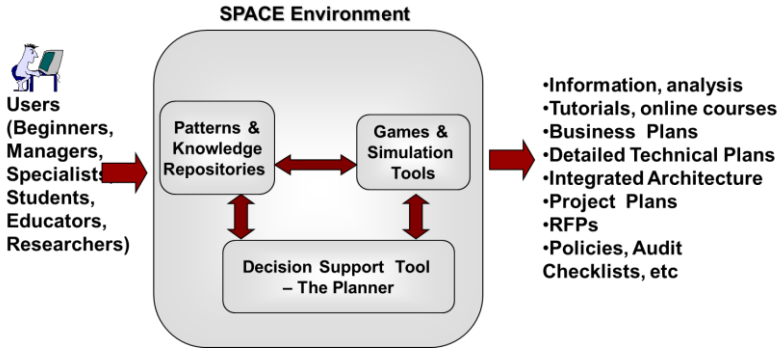


Figure 1: Conceptual View of the SPACE Environment

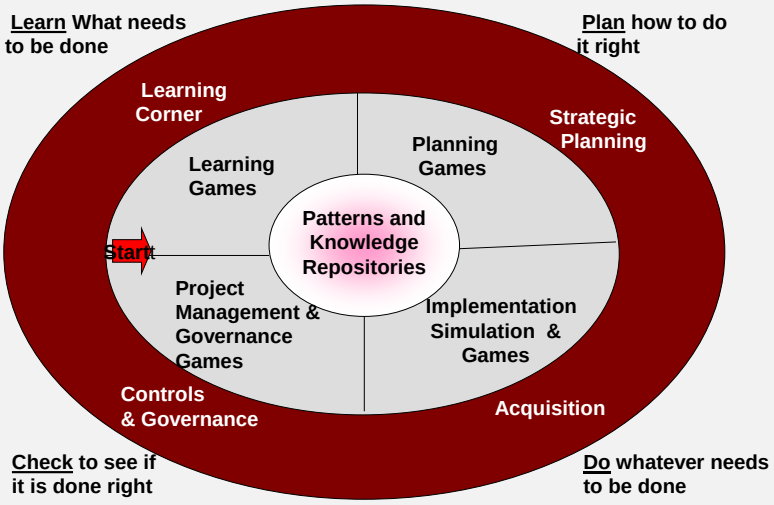
Smart Decision Support for Smart Services and Enterprises: SPACE has been extended to support the smart services that can *detect* a problem quickly, *adjust* rapidly to address the problem and *learn* from past experiences to better predict and avoid the problem in the future. We agree with the IBM 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 ePlanner 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.

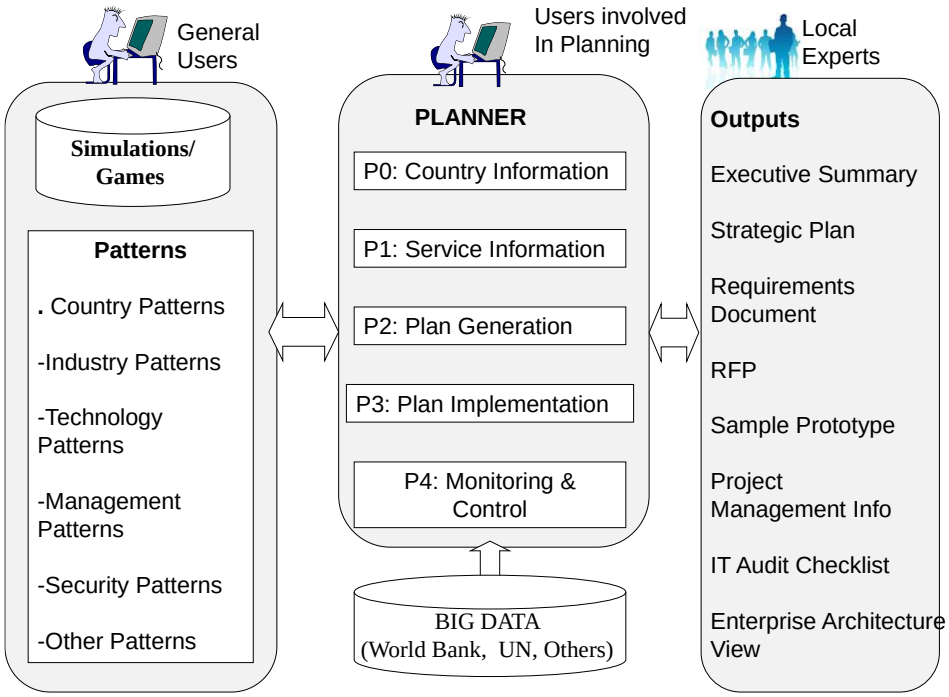


Figure 2: A More Detailed View of SPACE

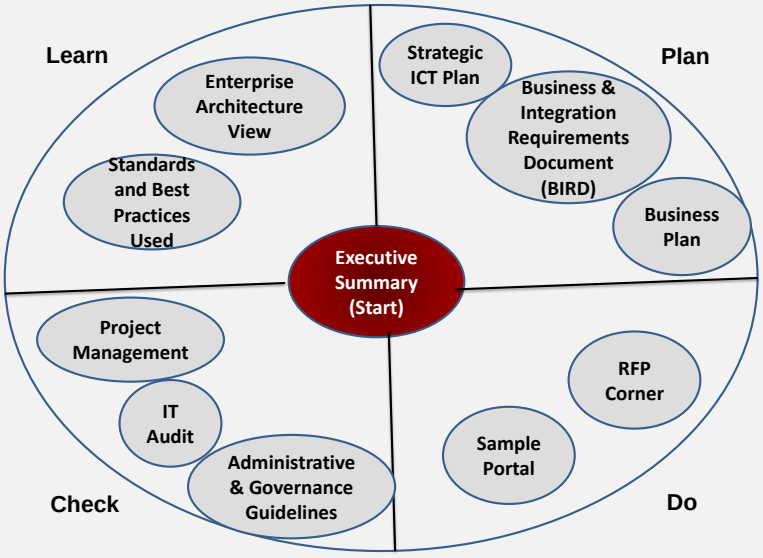
Exhibit 2: The Outputs Produced by the Planner -- The Checklist

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

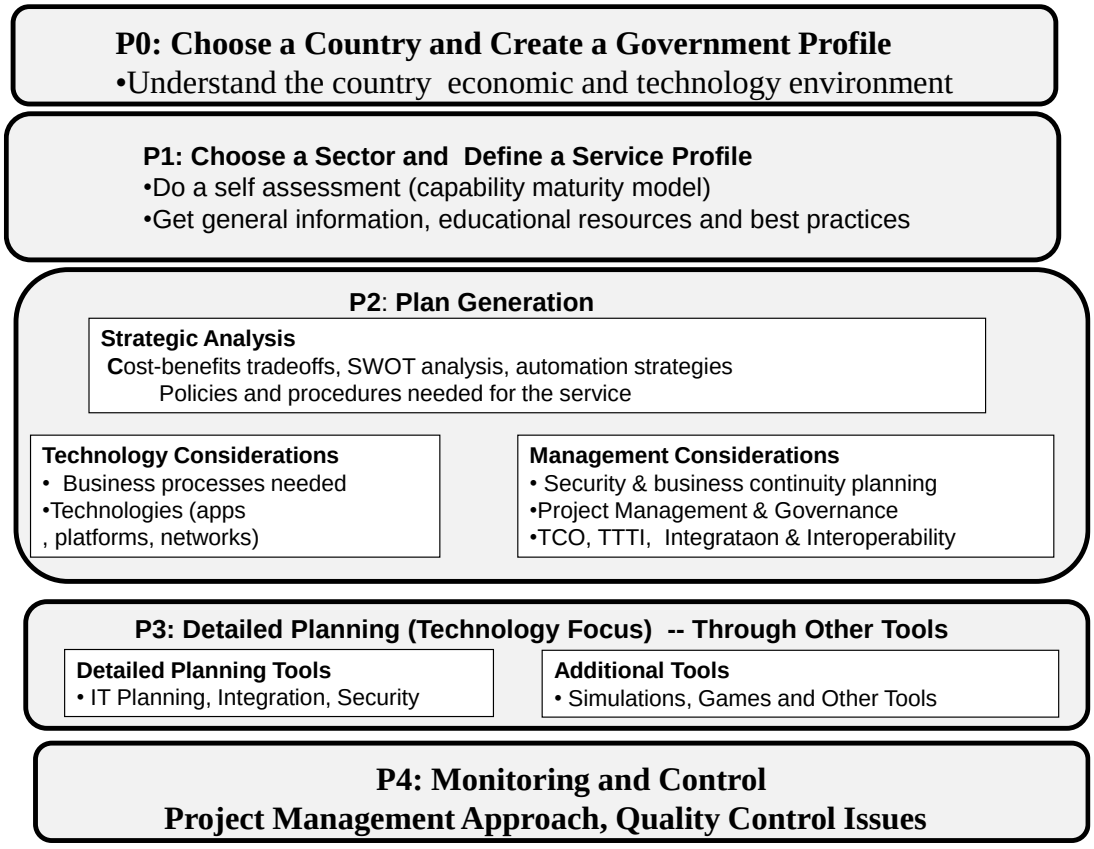


Figure 3: Systematic Methodology Used by the SPACE Planner

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.

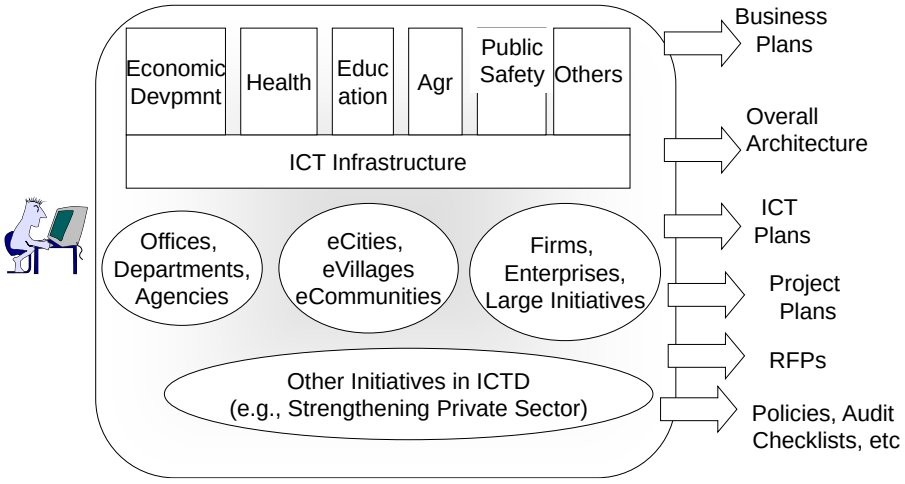


Figure 4:Service Types in SPACE

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)

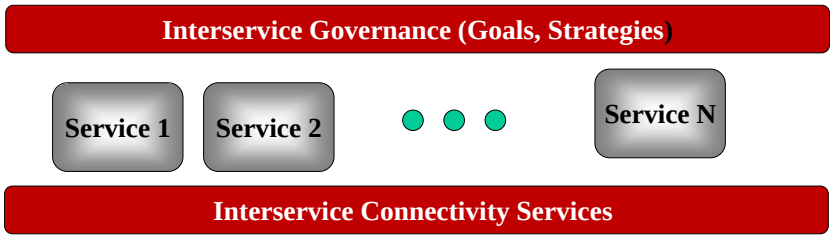


Figure 5: Building a Large Service from Smaller Ones

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.

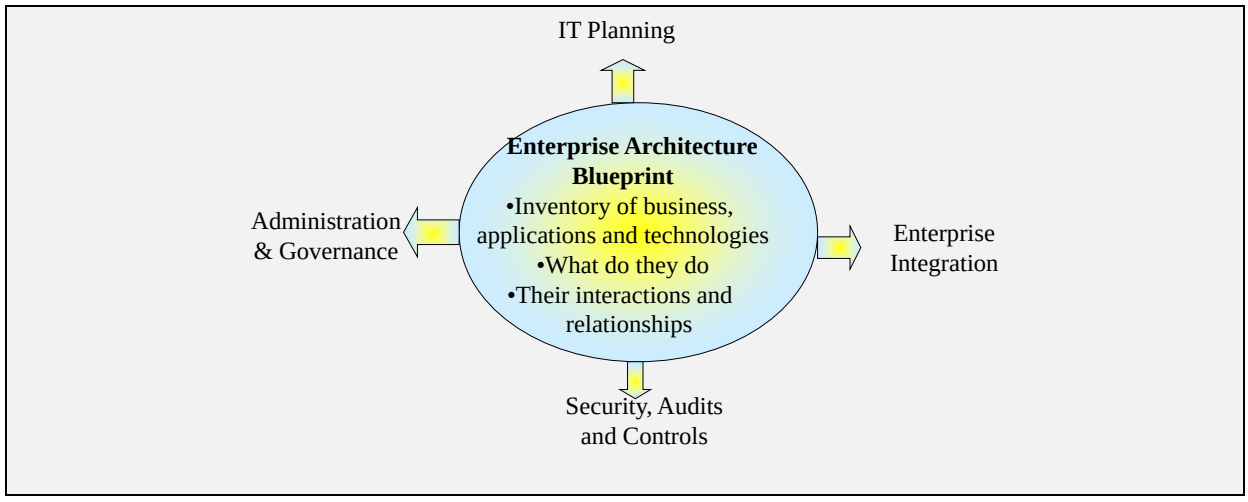
Table 1: Computer Aided Strategic Planner – An Enterprise Architecture View

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: - Summary of the interactions - Requirements (RFP) format - 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) 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.

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Appendix B: Gamification in SPACE

The Patterns Repository for Industry Sectors (PARIS) captures the core knowledge needed by SPACE (more than 100 services in more than 10 sectors such as healthcare, education, public safety, public welfare, transportation and others).

Patterns are a well-known format for capturing engineering knowledge. The idea was introduced by Christopher Alexander, a civil engineer, who observed that well accepted buildings have common structures. Based on this, he devised a set of rules for architects to construct such buildings. The "Gang of Four" extended the pattern format to software design. Since then, patterns have been used extensively in software design and have been extended to e-business patterns, requirements patterns, architecture patterns, integration patterns, security patterns, and others. See the website (www.hillside.net/patterns) for extensive discussion, tutorials, and articles on patterns.

At a very basic level, a pattern *T* is a template *T(p, c, s)* where *p* is the problem to be solved, *c* is the context (under what conditions the pattern holds, i.e., why the problem needs to be solved), and *s* is the solution (what works in practice). Additional information such as examples and limitations can also be added to a pattern to help the designer. In addition, each pattern is assigned a name. Exhibit 1 shows a simplified example of a Business Pattern for retail store. We have developed such business patterns for a very large number of public and private sectors and stored them in PARIS.

Exhibit 2 shows a few sample patterns of ICT Services and Enterprises supported by SPACE. The samples patterns are listed from sectors such as Economic Development, Education, Healthcare, Law Enforcement and Safety, Transportation, Agriculture, Public Welfare, and Environment Services Common Services.

Exhibit1: Business Patterns

Business patterns provide a powerful tool for representing a wide range of enterprises in different industry segments. Given a business pattern that has been modified for a specific enterprise, the main task of the enterprise management is to find the best service providers (SPs) that can support the critical BSs shown in Figure 2. In addition, a company can expand and transform its business by adding new BSs from new SPs. For example, a wired telephone company can add a wireless service provider, a manufacturing company can add a retail outlet provider, etc. In addition "service bundles" can be created by different SPs to meet user needs and to compete for user business. For example, a user may add, delete, change and merge SPs that provide the best services for a city. After identifying the needed business services, the user needs to make the following decisions:

- Decide which business services/processes take place at each location of the business.
- Include business outsourcing, i.e., determine which BSs/BPs take place at the outsourced sites.
- Assign employees to sites. The number of employees at each site helps determine the type and "intensity" of work performed at each site. Outsourcing reduces the number of business employees.

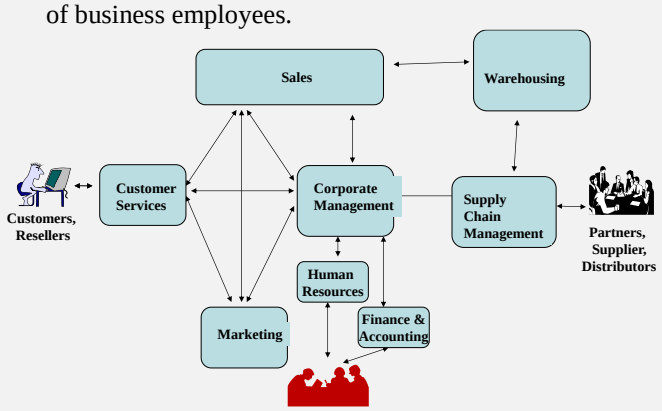

Figure 2: Sample Business Pattern of a Retail Store

Appendix B: Gamification in SPACE

Gamification is the use of game design techniques to solve real life problems and engage audiences. It typically involves applying game design thinking to non-game situations and make them more fun and engaging. The basic premise of gamification is that adding game features to regular processes such as studying a procedures manual gets the players involved in the process so that they repeat it over and over again to win. The end result is that the players learn a great deal about the process. Consider, for example, the idea of training a nurse on how to take blood pressure by playing a game where the nurse competes against a machine to take blood pressure. This exercise is much better than having the nurse read the procedures manual and then taking a test. See Exhibit1 for a short tutorial on Gamification.

Games and Simulations in SPACE support decisions in strategic analysis, mobile services planning, security planning, interagency integrations and health exchanges, application migration versus integration tradeoffs, risks and failure management, and quality assurance. SPACE games are of two type:

- Simple Games that are designed to support the Learn-Plan-Do-Check Cycle
- Composite Games that combine multiple games with SPACE Advisors

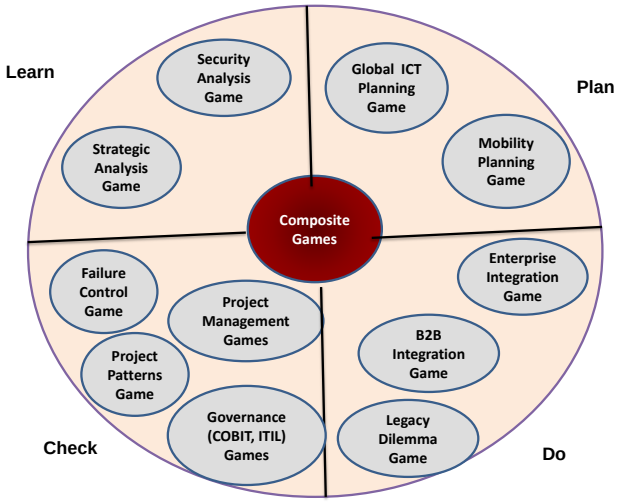

Figure 1: SPACE Games at a Glance

Figure 1 shows the following business games at the time of this writing that support the Learn-Plan-Do-Check cycle:

- Learning Games: Cost-Benefit Analysis and Security Analysis Game
- Planning Games: Global ICT Planning Game and Mobility Planning Game
- Enterprise Architecture and Integration Games: Enterprise Integration Game, B2B Integration Game, Legacy Dilemma Game
- Project Management Games: Failure Control Game, Project Patterns Game, Governance (COBIT, ITIL) Games, Project Management Games

Exhibit1: Gamification– A Short Tutorial

Gamification is in fact a popular "nudging" tactic to encourage specific behaviors, and increase motivation and engagement. For example, a well known gamification initiatives is the Musical Stairs at the Odenplan sub-way in Stockholm, Sweden [Bates 2009]. Each step of the staircase in the subway was setup to play a musical note when it was stepped on. At the end of the campaign, the results showed that 66% more people used the musical stairs over the escalator. This is a good example of gamification, and is used commonly by companies to illustrate benefits of gamification. Besides being used for marketing, gamification is now being implemented in many educational programs to make learning more fun. The main objective is to narrow the gap between knowledge and actual practice.

Gamification can lead to behavior modification, increased loyalty and increase of knowledge. The common gaming models used in gamification are that they are played between opponents or between an expert and a learner with the goal of winning, scoring points, having fun, and/or learning to do better. AI and psychology are used heavily to keep the players engaged. Specifically, the following approaches are used to engage the users in a learning process by using gamification:

- Scores and Bonus points
- Competition and Community Collaboration
- Ownership

The main limitation of gamification is that its *image* is fun and not work. Thus many government agencies do not allow government employees to use gamification because government employees should not have fun at taxpayer's expense! In addition, some games use too much graphics but the content itself is shallow. For example, some business gamifications use fancy graphics that are built on top of simple Excel spreadsheets.

Gamification developers need a platform with features such as the following: flow and control, decision making, animation, sound, and others (e.g., collaboration). The following possible approaches can be used:

- Simple games can be developed by using Powerpoint, HTML5, or simple tools such as Twine (http://twinery.org/)
- Serious games can be developed by using C# and Unity3D, and many specialized platforms.

Appendix C: The Simple Planner (PISA)

PISA (Planning, Integration, Security, Administration) is an intelligent decision support environment that helps businesses plan, integrate and secure their IT (information technology) systems. At present, PISA is intended for small to medium businesses (SMBs) but can also be used for offices and divisions of larger businesses.

The PISA environment, conceptually shown in Figure 2, provides a family of automated consultants ("advisors") that support all stages of IT planning, integration and security projects (e.g., enterprise modeling, application planning, network planning, security planning, project planning, architecture analysis, solution evaluation). At the heart of PISA, as shown in Figure 2, is the knowledgebase (KB) that contains an extensive patterns repository. The KB is used by the PISA advisors which are segmented into three modules (see Figure 2):

- **PlanIT (Planner for IT)** concentrates on IT planning projects and develops a plan at the enterprise level.
- **SAM (Security and Administration Module)** provides guidance for security, project management and governance issues.
- **Architecture and Integration Module (AIM)** focuses on how SOA (Service Oriented Architecture) can be used to architect and integrate the various components to form a functioning system.

Figure 1 shows an expanded version of the PISA pie. Extensive information about PISA can be found at the PISA website (www.ngepisa.com).

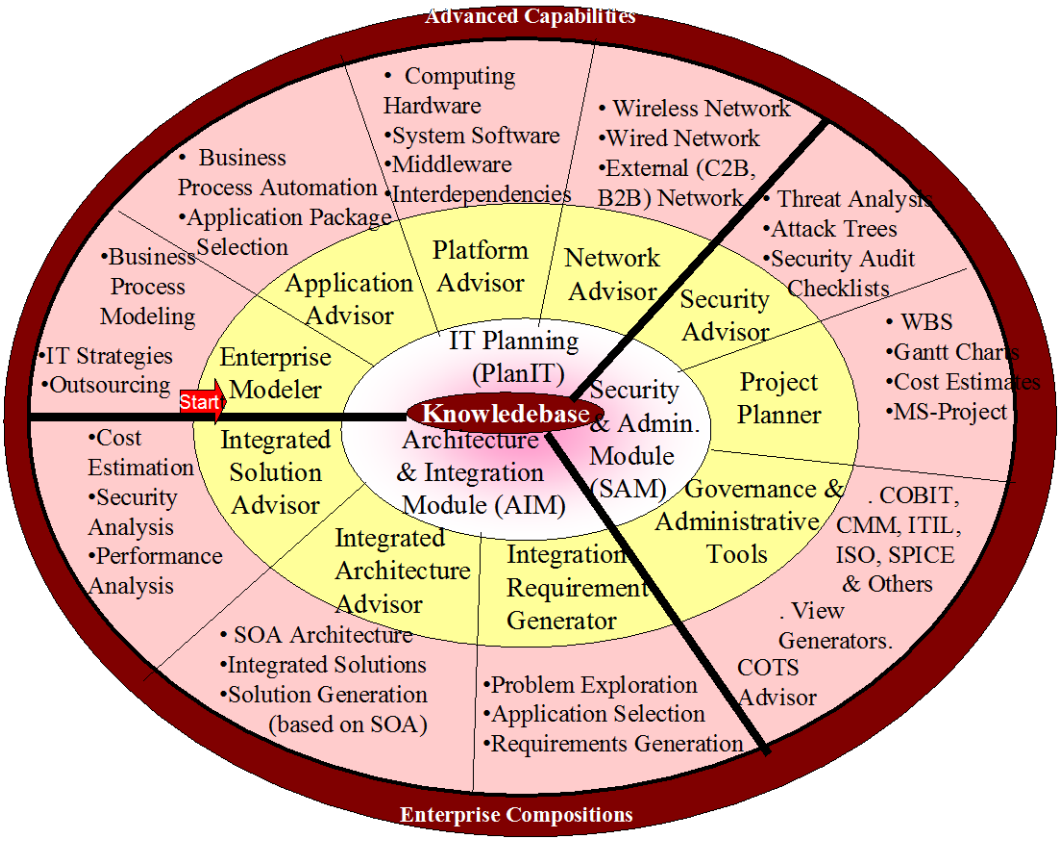

Figure 2: Conceptual Model of PISA

Appendix D: SPACE Initiatives and Specialized Tools

Specialized Initiatives and Tools are built on top of the SPACE environment. Examples of these tools are the Entrepreneurship Portal, an SDG Advisor, the ICT4SIDS Partnership, and the SPACE Lab. Specifically:

- The Global Entrepreneur Zone for All (GEZA) is a portal for entrepreneurs who want to form a new company. The GEZA portal provides a set of services that can be invoked by the users. These services include Business Solutions (guidelines on how to start a business, conduct business over the Internet, how to get funding, etc), Business Portal Yellow Pages (a comprehensive directory of SME Portals that contain extensive information on starting, running and managing a business), IT Solutions (access to SPACE tool for IT planning, Integration, security & administration), and Outsourcing Center (allows small businesses to advertise their services, provides matchmaking and advice for buyers and sellers). More information about GEZA can be found at www.ngegeza.com.
- The ICT4SIDS Partnership was formed during the Samoa Conference in 2014 (United Nations ID#8005), between Small Islands and Developing States (*SIDS*), UN organizations, academic institutions (Harrisburg University and Oklahoma University), and startup industries (e.g., NGE Solutions). The partnership has grown since then to include companies such as IBM and NGOs such as Colleagues in Care (CIC). Our objective is to use ICT for rapid adoption of the Samoa Pathway and UN 2030 Agenda for Sustainable Development. We are actively using SPACE to quickly develop a large number of ICT Hubs that collaborate with each other at rural, regional and national levels for health, education, public safety, public welfare, and other vital sectors. ICT4SIDS site (www.ict4sids.com) provides additional information on this initiative.
- The SDG (Sustainable Development Goals) Advisor is very useful tool for checking the status of United Nations SDGs. The UN SDGs Agenda with its 17 goals with focus on health, education, public safety, public welfare, agriculture, transportation and other vital sectors is an area of high importance to most developing countries. The SDG Advisor not only checks the status of the progress but also optionally initiates a session with SPACE Planners to help the countries make rapid progress.
- SPACE Lab currently supports graduate courses in enterprise planning, architectures and integration s at more than 12 universities. The SPACE Lab is organized into several stages of learning that allow the students to progress gradually. Each stage provides many short tutorials and quizzes on different aspects of SPACE. This site also provides a set of online courses that can be taken by the users to develop background in enterprise planning, architectures and integration at their own pace. The SPACE Lab is also being prepared to offer CITO (Certificate for IT Officials) Program for developing countries.

SPACE is a unique environment for computer aided planning and gamification of eBusiness and eGovernment at global levels. Due to its diversity, new initiatives and tools will always be added to this layer of SPACE.