(Draft for Discussion)

Certificate for Information Technology Officials (CITO)

ICT Leadership Education for Developing Countries based on Online and Hands-On Workshops

Many ICT (Information and Communication Technology) services at present are making life more comfortable for the people who are already living very comfortable lives. The Certificate for IT Officials (ITOs) is being offered to address the challenges faced by the underserved population of our society (i.e., the 5 Billion "have nots" out of the 7 Billion people in the World). Specific challenges are:

- High demand for ICT services in health, education, public safety, public welfare and other vital sectors (less than 20% of the vital services have automated support in the underserved segments)
- Extremely high (around 85%) failure rates of ICT projects due to skilled staff shortages
- Inability to hire expensive consulting services due to severe financial resource shortages

This Capacity Building Program will enable current and aspiring ITOs (e.g., CIOs, IT managers, project managers, development managers, IT planners, enterprise architects, systems analysts, and business analysts) to develop the skills and knowledge needed to address the aforementioned challenges. The student can also earn partial credits towards an MS degree from a recognized university.

Unique Features of the Program

- Based on the UN eNabler Project that is addressing the major challenges faced by the "have nots" (70% of the world population).
- Designed to benefit all IT officials in developed as well as developing countries.
- Students can pursue own interests through a Capstone Project course.
- Instead of the typical lecture model, relies heavily on hands-on experiments with a computer aided environment for ITOs, called SPACE, that has been developed to address the aforementioned challenges.
- Emphasis is on how to do more with less by using the best practices and tools throughout the Learn-Plan-Do-Check cycle.
- Heavily relies on real life case studies from different countries for a global perspective and to assure mastery of ITO skills in addressing practical problems.
- Most of the learning comes from hands-on experiments with business games, simulations, decision support tools, and an extensive ePlanner – all part of the SPACE environment.
- Each course requires one project that the attendee first solves by hand, then through the SPACE environment, and finally a self-assessment for practical insights.
- All attendees will collaborate with each other through a social network for an enriching experience.

Program Highlights

- The CITO Program consists of three core courses, and a capstone.
- The courses are priced for developing countries and the student can get academic credit from an accredited university (e.g., Harrisburg University -- HU). These courses can also be used towards an MS degree from HU (see sections 5 and 6 for details).
- SPACE (Strategic Planning, Architectures, Controls & Education) environment will be made available to all students for hands-on learning plus real problem solutions (see Section 7 for details on SPACE).

Contents

1. CITO Program Overview

This Online Program is intended to educate IT Officials (ITOs) in the public as well as private sectors especially in the underserved segments. The Program consists of a series of short online courses that emphasize the use of emerging technologies in eGovernment and eBusiness. Comprehensive online resources will be used for hands-on experiments and investigations. The attendees will be able to lead the eGovernment and eBusiness initiatives by using the extensive resources provided by the Online Program.

Key Features of the Program:

- All courses are offered completely online. In-Class and Hybrid delivery methods will be made available on demand.
- The Program consists of three core courses (C1, C2, C3), and one capstone.
- The core courses cover the Planning (C1), Engineering (C2) and Management (C3) principles that are essential for ICT managers.
- Each course (12 hours of instruction) is divided into four sessions (3 hour each).

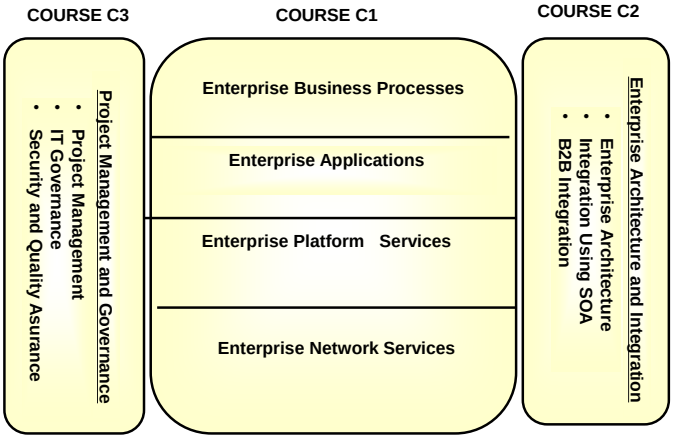
Overview of the Program Curriculum

The following framework illustrates the key building blocks of the certified ITO program.

- Core IT service functions, such as business processes, applications, and computing-communication platforms represent the basic building blocks of modern enterprises and are shown as horizontal organizational layers.
- Interdisciplinary, cross-cutting management practices and governance activities such as communications, planning, management, and security enable and support the horizontal layers (IT service functions) and are emphasized in the CITO program.

The curriculum addresses this framework by using examples, case studies, and best practices.

- The first course (C1) sets the context by introducing the program and providing an overview of the entire framework using examples of eGovernment and eBusiness from around the globe. It primarily concentrates on the horizontal layers (IT service functions).
- The other two courses (C2 and C3) concentrate on vertical layers that cut across all horizontal layers. C2 concentrates on the very important area of enterprise architectures and integration issues at global levels. C3 covers the governance, project management and security aspects of eBusiness and eGovernment.



The Vision

CITO Program has been prepared by the NGE Solutions Team in collaboration with Harrisburg University of Science and Technology (HU) and UN[1]. We share a common vision – bridge the digital divide through education and technology. Collaborations with other academic institutions, international organizations, government agencies, NGOs and private industries are being explored.

[1] NGE Solutions is a startup that has developed the SPACE Environment—a spinoff of the UN eNabler Project. Harrisburg University is a "startup" university that is focusing on STEM (Science, Technology, Engineering and Mathematics) for the underserved sectors. We started this work with UN-GAID (Global Alliance for ICT Development) and are currently working with three different UN groups.

2. Course C1: Strategic Planning, Architectures and Management Practices in the Digital Age

This extensive course will show how to strategically plan, architect and administer the complex information systems that support and drive the current and future digital enterprises. The first part of the course will review the emerging features of current and future enterprises (e.g., service orientation, reliance on web and mobile services, globalization, and agility). The second part will explicate the role of IT to enable and drive such enterprises and will explain the building blocks of the modern information systems that span business processes, enterprise applications, databases, computing platforms, and network services. The final segment explores how the needed IT systems can be planned, engineered/re-engineered, integrated, secured and managed by using the systems engineering principles. Extensive case studies and hands-on experiments will be used throughout the course.

Prerequisite**:** Basic background in ICT or permission of the instructor

Learning Objectives of Course:

After this course, the students should be able to:

- Develop strategic IS plans that are based on people, processes and technologies)
- Identify the layers (building blocks) that form the modern enterprises and understand the role of IT to enable modern enterprises
- Understand the fundamentals of business process analysis and how the enterprise applications support the business processes
- Apply the basic concepts of knowledge management and AI to business decisions in global enterprises
- Lead the planning initiatives by using the extensive array of resources provided by the Online Program

About Hands On Experiments

- Most of the learning comes from extensive projects that require hands-on experiments, simulations and self-assessments.
- The attendees will first develop, by hand, a strategic plan and an enterprise architecture of a company of their choice.
- They will then redevelop the plan and architecture by using the SPACE computer aided environment and do self-assessment through extensive hands-on experiments.
- All attendees will collaborate with each other through a social network for an enriching experience.

Course C1 Outline

C1M1: Executive Summary: Strategic Planning, Architecture and Management in The Digital Age

- Global eBusiness and eGovernment
- Strategic Planning: Preparing for the Next Generation Enterprises

C1M2: Business Strategies and Management

- Business Strategy and Organizational Management
- Competitive Models (e.g., Porter)
- Cost-Benefit and SWOT Analysis

C1M3: Applications in eBusiness, eCommerce and eGovernment

- Business Processes and Enterprise Resource Planning (ERP) Applications
- Decision Support and Expert Support Systems

C1M4: Emerging Technologies, Platforms, Databases and Networks

- Platform and Database Systems
- Internet and Web Technologies
- Mobile Computing and Wireless Systems

C1M5: Architecture and Planning

- Enterprise Architectures
- Enterprise and Inter-enterprise Planning

3. Course C2: Enterprise Architecture and Integration Practices in the Digital Age

Modern digital enterprises are characterized by increased automation, mobile services, extended B2B operations with global business partners, and on-demand business services. The main issue in such enterprises is to architect and integrate a very wide range of services quickly and effectively. This course presents a 'systems' perspective based on service oriented architecture (SOA) that combines processes, people and technologies and highlights the role of information and communication technologies, enterprise models, and emerging SOA standards in developing flexible and integrated business architectures. Within the conceptual framework, the topics continually evolve as new technologies, techniques, methodologies and standards emerge.

Prerequisite: Course C1 or permission of the instructor

Learning Objectives:
After this course, the student should be able to:

- Develop architectures for globally integrated enterprises with business as well as technical details
- Effectively use the concepts of architecture frameworks, business process modeling and reengineering in enterprise integration projects
- Develop enterprise and B2B integration strategies using SOA
- Understand the role of SOA, Classical Web, the Semantic Web, XML technologies and Web 2.0 in enterprise integration
- Lead the integrated architecture initiatives by using the extensive array of resources provided by the Online Program.

About Hands On Experiments

- Most of the learning comes from extensive projects that require hands-on experiments, simulations and self-assessments.
- The attendees will first develop, by hand, an integrated enterprise architecture of a company of their choice.
- They will then redevelop the integrated enterprise architecture by using the SPACE computer aided environment and do self-assessment through hands-on experiments.
- All attendees will collaborate with each other through a social network for an enriching experience.

Course Outline

C2M1: Executive Summary: Enterprise Architecture and Integration
- EA (Enterprise Architecture) Principles
- Common Frameworks (TOGAF)
- Integrated Architectures and SOA

C2M2: Business and Application Architectures in eBusiness, eCommerce and eGovernment
- Business Architectures
- Application Architectures
- Examples and Case Studies

C2M3: Web Technologies and SOA
- Semantic Web and XML
- Service Oriented Architectures (SOA)
- Examples and Case Studies

C2M4: Enterprise/Inter-enterprise Integration
- EA and Integration B2B Integration
- B2B and Interagency Integration
- Overview of eNabling Technologies
- Examples and Case Studies

C2M5: Management & Governance Issues
- PMI Integration Processes
- SOA Governance – Best Practices
- Examples and Case Studies

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4. Course C3: Governance, Project Management and Security Practices in the Digital Age

Project management, governance and security management are key to the success of any initiative in the public or private sector. The first part of this course presents the fundamentals of governance with focus on IT governance and how it is being used in the public as well as private sector. The second part concentrates on project management and the best practices in project management as specified by the Project Management Institute. The last part covers the essentials of security management and quality assurance for managers. Topics include risk analysis, security policies, main security technologies, and security audits. Instead of one narrow aspect of management, this course emphasizes the strategies and best practices needed to manage, secure and control the IT initiatives at a global level.

Prerequisite: Course C1 or permission of the instructor

Learning Objectives:
After this course, the student should be able to:

- Fully understand the role of management in successful initiatives
- Apply the concepts of IT governance in the public as well as private sectors
- Learn the best practices in project management for successful projects
- Develop security management policies and procedures for projects
- Establish quality assurance guidelines and controls for projects
- Apply the strategies and best practices needed to manage global projects

About Hands On Experiments:

- Most of the learning comes from extensive hands-on simulations in project management, governance and security.
- The attendees will first develop, by hand, a management strategy for an initiative and then redevelop the strategy by using the SPACE computer aided environment
- The students will also engage in self-assessment through hands-on experiments.
- All attendees will collaborate with each other through a social network for an enriching experience

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Course Outline

C3M1: Executive Summary: Project Management and Governance
- The Roles of Governance and Project Management in Modern Organizations

C3M2: Governance
- IT Governance versus Enterprise Governance
- IT Governance Frameworks
- Examples and Case Studies

C3M3: Project Management
- The PMI Framework
- Tools for Project Management
- Examples and Case Studies

C3M4: Security Management
- Security and Privacy Principles
- Key Security Technologies
- Security Policies and Risk Analysis
- Examples and Case Studies

C3M5: Quality Assurance Issues
- Quality Assurance Principles
- IT Audits for Quality Assurance
- Quality Assurance Frameworks
- Examples and Case Studies

5. Capstone and Administrative Information

This Certification for IT Officials (CITO) is being offered to specifically address the unique challenges of public and private sector IT executives in the underserved segments of our society.

The Administrative Information:

- **Flexibility:** The students may pursue their own personal and professional needs by choosing capstone topics that build upon the core courses (C1, C2, C3).
- **Academic Credit:** Qualified students may get academic graduate credit from Harrisburg University (HU) for a Graduate Course (e.g., ISEM500) based on a review of student background and performance This will require additional fees and an exam.
- **Qualifications for CITO Program:** Candidates should possess the following criteria to be accepted into the program: (1) applicants work for the public or private sector, preferably in a developing country. However, applicants from "underserved" segments (e.g., small to medium businesses, local government or NGOs) from developed countries may also apply (2) they must have a minimum of 2 years of work experience in information technology (3) candidates must have a Bachelor's degree with courses in information technology. Other candidates with exceptional academic and industrial experience will be considered.
- **Students with Insufficient IT Background:** An intensive hands-on "bridge" course on IT Principles is offered to bridge the gap (see the Course C0 in next column for details). exceptional academic and industrial experience.

Capstone Project

The Capstone Project allows detailed investigation of a topic of special interest to the student. The Project may involve applied research and/or development of a simple prototype. Possible topics change with time but may include the following: :

- Big Data Analytics
- Business Strategy in the Digital Age
- Business Intelligence & Decision Support
- Information Security Management
- Marketing, Finance and Accounting
- Mobile Computing & Wireless Systems
- Next Generation Enterprises
- Project Management
- Serious Gamification for Developing Countries
- Smart Services and Enterprises in Developing Countries
- Strategic Intelligence in the Digital Age
- Other Topics (please suggest some)

Course C0: IT Principles for eBusiness and eGovernment

- Serves to bridge the IT gap for ITOs
- Provides a rigorous overview of the current, as well as emerging, IT building blocks (applications, computing platforms, databases, and networks).
- Emphasizes the Internet, broadband wired and wireless networks, classical Web, Semantic Web, XML, Web 2.0+, social networking, mobile computing, and intelligent systems concepts.
- Heavily relies on hands-on experiments for learning

6. ISEM (Information Systems Engineering & Management) Program

The Harrisburg University of Science and Technology is a new and unique university that is focusing on STEM (Science, Technology, Engineering, and Mathematics). Located in Harrisburg, capital of the Commonwealth of Pennsylvania, it offers graduate degrees in ISEM (Information Systems Engineering & Management), Project Management, and Learning Technologies. For more information, please visit www.harrisburgu.edu

ISEM (Information Systems Engineering & Management) is a 36 semester hour graduate program. It is designed to educate the IT leaders who can plan, engineer/re-engineer, and manage the systems needed to support the modern digital enterprises. Graduate studies in ISEM cut across the following three active areas of work:

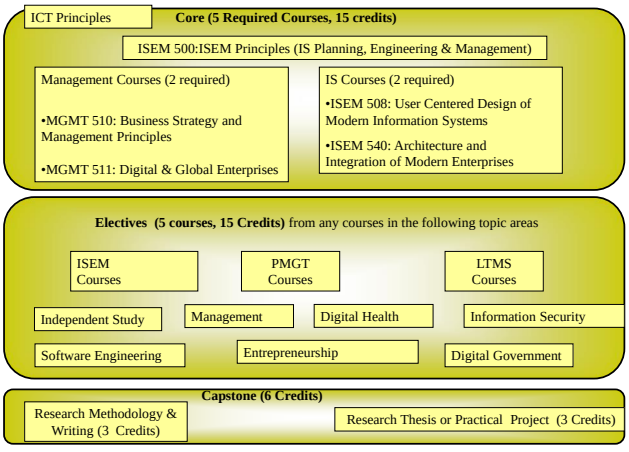
- *Information Systems*: latest technologies and approaches (e.g., web-based components, mobile computing and wireless communications, business intelligence, emerging technologies)
- *Systems Engineering*: systems thinking and emphasis on systems instead of individual components; enterprise architectures consisting of people, processes and technologies
- *Management:* business strategies, entrepreneurship, planning, integration, security, governance, global enterprises, agile enterprises

ISEM is a flexible and interdisciplinary program that emphasizes the enterprise architecture, planning and management issues at global levels. An ISEM student may specialize in the following areas:

- Business Analytics
- Cyber Security
- Digital Government and Digital Health
- Enterprise Architectures
- Entrepreneurship
- Project Management
- Software Engineering and Development)
- No Specialization (take different courses from different areas of your interest)

The core courses of the program provide the student with a strong, relevant and timely background in strategic planning, systems engineering, business strategy, global and digital enterprises, user centered design, systems analysis and design, and enterprise architectures and integration. The student can then take elective courses in topics that span project management, multimedia management, entrepreneurships, digital governments, digital health, enterprise management, leadership, financial aspects of systems, learning technologies, business intelligence, Internet technologies, information security and governance, mobile computing, and others. Students can also pursue independent studies and master's thesis projects to investigate areas of individual or professional interest.

An experiential project course serves as the required capstone of the program. This consists of a Research Methodology and Writing course and a Research Thesis or Practical Project in the broad discipline of ISEM.



For more information, please visit the ISEM site: http://www.harrisburgu.edu/academics/graduate/isem.php

7. SPACE (Strategic Planning, Architecture, Controls & Education) - A Computer Aided Environment for the ITOs

Highlights

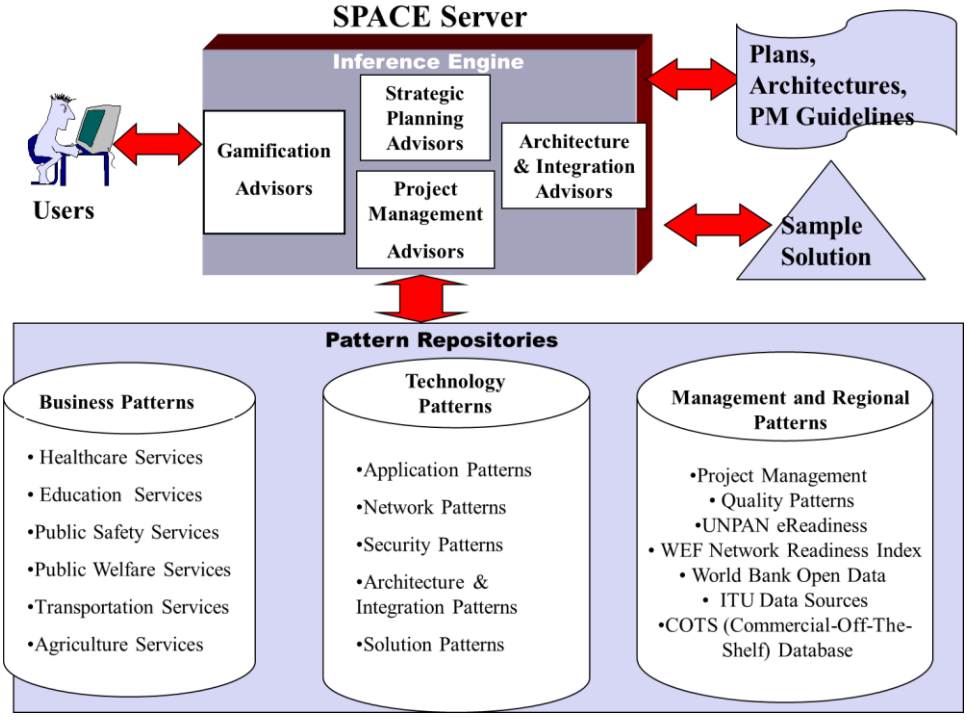
- One Stop Shop that contains decision support tools, online courses & simulations/games
- Simulates a team of experts that collaborate with each other to solve real life problems
- Quickly (in less than an hour) produces executive summaries, strategic plans, RFPs, a working prototype, and project management guidelines for more than 100 eservices.
- Results in time saving (from 5-6 months to a day) and cost saving (around $50K).
- Spinoff of the United Nations eNabler for ICT Development Project, available as SAAS
- Being used by 12+ countries, 15+ universities, and in IT Officials training

Key Capabilities of SPACE that cover the entire Learn-Plan-Do-Check Cycle (see the Figure)

- **Pattern Repositories** that capture the core knowledge in terms of business patterns(almost 100 services in more than 10 sectors such as healthcare, education, public safety and public welfare), technology patterns, management patterns, and country region patterns.
- **A Powerful Inference Engine** that provides expert systems ("advisors") with capabilities for:
    - *Intelligent Decision Support* for the IT officials who need to actually plan, architect, integrate, and manage the needed IT initiatives quickly and effectively by using the best practices for a wide range of services in different parts of the world.
    - *Gamification Support* for education and training in strategic analysis, mobile services planning, interagency integrations and health exchanges, application migration versus integration tradeoffs, risks and failure management, and quality assurance.

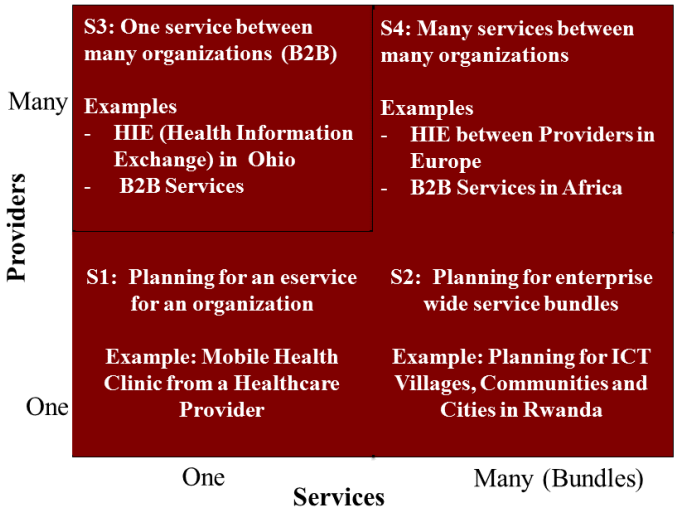
Main Outputs Produced by SPACE in less than an hour

- Strategic IT plan, 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 implemented quickly



8. Sample Hands-on Experiments

Hands-on experiments with SPACE can be used to plan and architect very simple to very large and complex scenarios. The following figure shows four possible categories of scenarios (S1, S2, S3, S4) in terms of services and service providers. These scenario categories can support the following experiments:



- S1: Strategic planning, engineering and management of a single service in a sector. The users can select more than 100 services from sectors such as health, education, public safety, public welfare, transportation, agriculture and other vital sectors.
- S2: Strategic planning, engineering and management of a service bundle in an organization. Many individual services can be combined to form service bundles that represent offices, health clinics, Mobile Health, Aging Population Project, Nursing centers, Business Units, Health Community Centers, Healthcare agencies
- S3: Strategic planning, engineering and management of a service between organizations. This scenario can be used to model a large number of B2B services such as Health Information Exchanges between different healthcare providers and interagency services in governments.
- S4: Strategic planning, engineering and management of service bundles between organizations. This scenario can be used to model large and complex projects such as smart cities and large health exchanges. Exhibit 1 describes a capstone project for smart cities that has been used frequently.

Exhibit 1: Capstone -- **Planning and Integration of Smart City and Intercity Services**

This project, inspired by our work with the Smart Enterprises in Developing Countries Project, is being used for management training and graduate courses in Strategic ICT Planning, Architectures and Management. The class is divided into several teams, 3 to 4 persons per team, and each team was asked to choose one city (population around one million people) from any part of the world. Their first assignment is to do the following by hand:

- Each team member develops ICT plan for one service of the chosen city in the area of public health, education, welfare, and safety.
- Combine the chosen city services into a city-wide architecture that works smoothly
- Each city (team) is then asked to partner with another city (team) and to exchange information about their services for a set of scenarios (e.g., food shortage)

The second assignment is to do Self Assessment of the results from Assignment 1 by using SPACE. This allows the students to redo their work by using the SPACE tool and then improve their results based on the hands-on experiments. This project requires the students to understand the concepts of developing individual services, then integrating them for enterprise wide scenarios, and finally struggle through interagency communications for G2G and B2B integration.