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Ibero-American Science & Technology Education Consortium


# "I+D+ Educación: Nuevas Tendencias para la Formación del Ingeniero Basados en Escenarios Inter/Multi/Trans-disciplinarios"

**By**

**Dr. Wilfrido Moreno**

**GA-ISTEC 2018**

**Octubre 12, 2018**

# Why do we do what we do?

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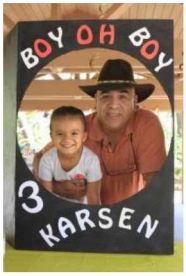




USF UNIVERSITY OF SOUTH FLORIDA.


USF UNIVERSITY OF SOUTH FLORIDA
ELECTRICAL ENGINEERING
College of Engineering
ABOUT US
UNDERGRADUATE
GRADUATE
FACULTY & STA
ELECTRICAL ENG
TAKE 1ST PRIZE
CONFERENCE
Read more...

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# Objetivos de la Presentación

- ✓ Un vistazo de la Universidad del Sur de la Florida (USF)
- ✓ Nuevas Tendencias para la Formación del Ingeniero ***impulsadas por***:
  - ➢ Grandes Desafíos para el Siglo XXI - Academia de la Ciencias de la Ingeniería
  - ➢ Iniciativa de las Ciudades Inteligentes
  - ➢ Industria / Fundación Nacional de La Ciencia (NSF)
- ✓ Compartir la experiencia de la Transformación del Departamento de Ingeniería Eléctrica en USF
- ✓ Mostrar la importancia de abordar los desafíos complejos de impacto a la sociedad a través del trabajo Multi/Inter/Trans-disciplinario del ingeniero
- ✓ Exponer la importancia de trabajar en REDES y fomentar la interacción entre la academia, industria, gobiernos, agencias de financiamiento basados en I+D+E (ISTEC)

***"Student Success is Everyone's Responsibility…."***

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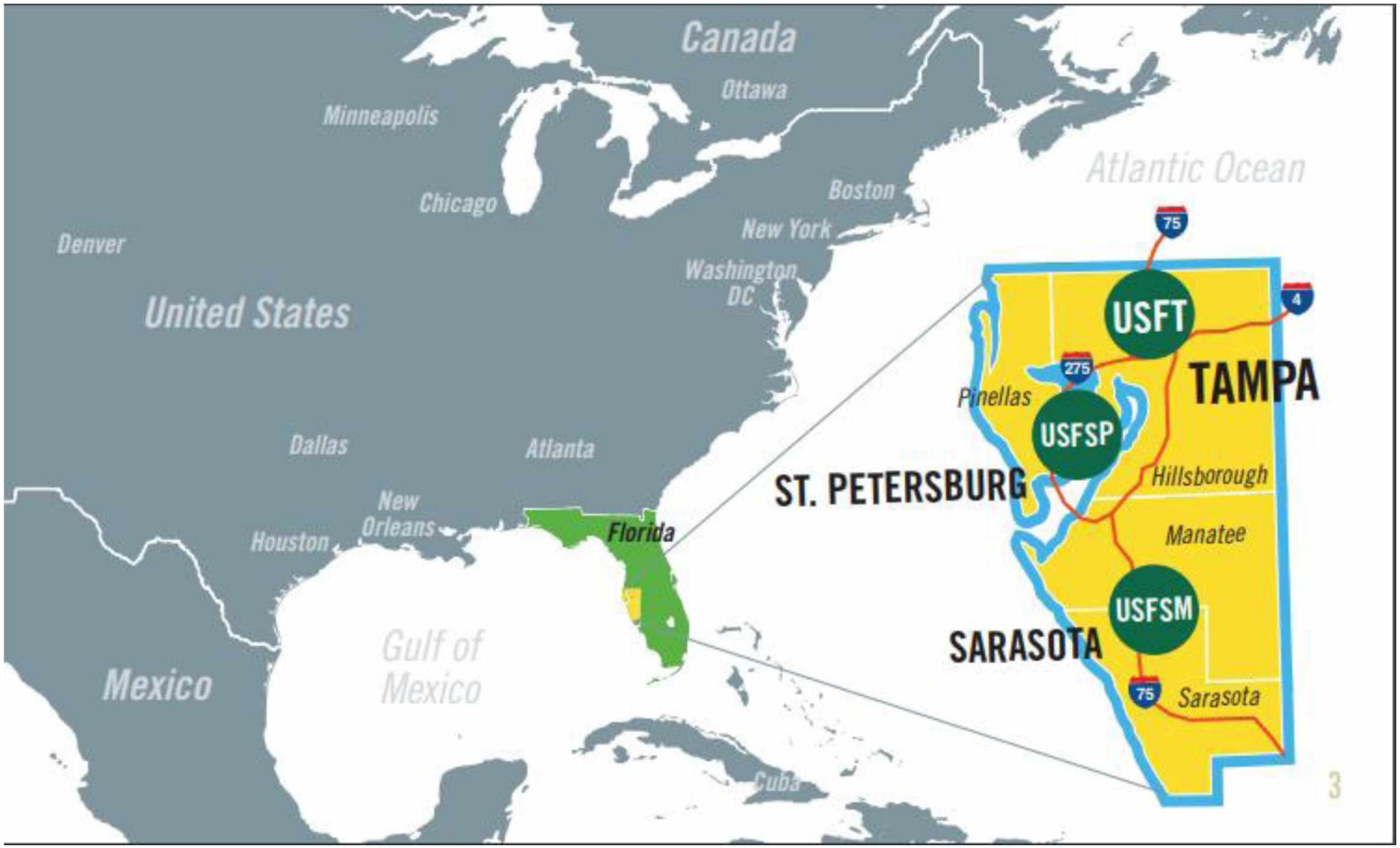
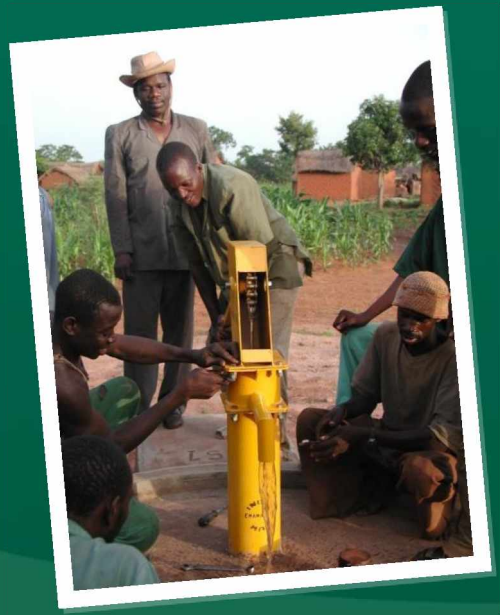
**We are not in "South" Florida**

USF UNIVERSITY OF SOUTH FLORIDA



Education



USF
UNIVERSITY OF SOUTH FLORIDA
COLLEGE OF ENGINEERING

Global
Community
Outreach

Research

USF UNIVERSITY OF SOUTH FLORIDA

- ✓ USF was established in 1956 as a public university, one of 12 universities within the State University System of Florida
- ✓ Over 50,000 students
- ✓ 1,800 full-time instructional faculty
- ✓ Over 7,000 full-time staff
- ✓ It has a $1.8 billion ($568 M in research) annual budget
  - ✓ Annual economic impact of $4.4 billion.

USF UNIVERSITY OF SOUTH FLORIDA

- ✓ "Research I" designation by Carnegie Foundation
- ✓ USF has 13 colleges: Arts and Sciences, The Arts, Behavioral & Community Sciences, Business, **Education**, **Engineering**, Global Sustainability, Honors, Marine Science, **Medicine, Nursing, Pharmacy, and Public Health**
- ✓ The University offers:
  - ➢ 90 bachelor programs
  - ➢ 48 master programs
  - ➢ 28 research doctoral programs
  - ➢ and four MD programs.

**Over Ninety professors from Latin America & Mexico have earned their Ph.D. degrees in Engineering since 1991**

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COLLEGE OF ENGINEERING

# Major Research Centers

CUTR

CERC
Clean Energy Research Center
University of South Florida

CARRT
Center for Assistive, Rehabilitation & Robotics Technologies
Research · Education · Service

WAMI

NREC
Nanotechnology Research & Education Center

Global Center for Hearing & Speech Research

Mini-Circuits
DESIGN FOR X LABORATORY

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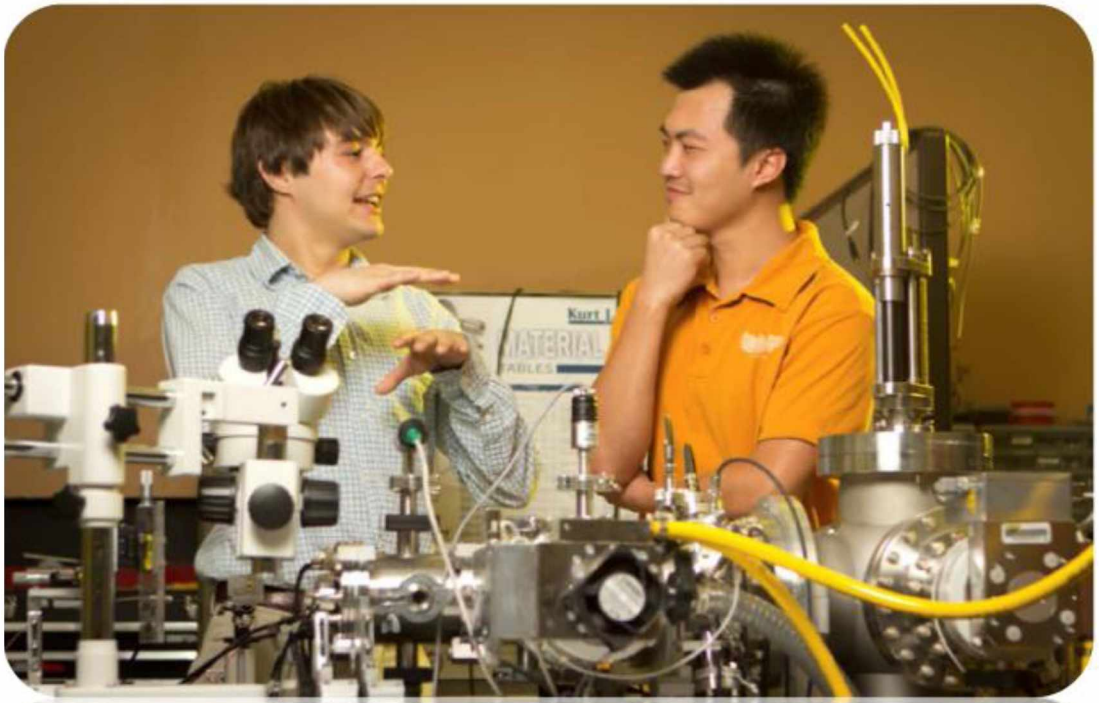
COLLEGE OF ENGINEERING

# Department of Electrical Engineering

## Major Areas of Research

- Bioelectrical Systems
- Communication Systems
- Energy, Power, and Sustainability
- Mechatronics, Robotics and Embedded Systems
- Micro and Nano Scale Systems
- Wireless Circuits and Systems



# Department of Medical Engineering

## USF partnership creates department of medical engineering

Claire McNeill, Times Staff Writer

Thursday, January 5, 2017 12:38pm

Robert H. Bishop, PhD (left), dean of the USF College of Engineering, and Charles J. Lockwood, MD, senior vice president for USF Health and dean of the Morsani College of Medicine.

"We are creating an environment where intellectual collisions can readily occur between **engineering professors, medical doctors, researchers, and students leading to innovative solutions that save lives and improve the quality of health care….."**

# Great beaches . . .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COLLEGE OF ENGINEERING

USF UNIVERSITY OF SOUTH FLORIDA.

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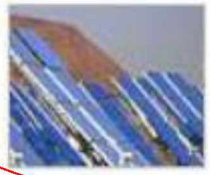
- Nuevas Tendencias para la Formación del Ingeniero ***impulsadas por***:
  - Grandes Desafíos de la Ingeniería para el Siglo XXI - Academia de la Ciencias de la Ingeniería

En que área le gustaría comprometerse para ayudar afrontar los desafíos?

# Engineering Grand Challenges



Make solar energy economical

Provide energy from fusion

Develop carbon sequestration methods

Manage the nitrogen cycle

Provide access to clean water

Restore and improve urban infrastructure

Advance health informatics

Engineer better medicines

Reverse-engineer the brain

Prevent nuclear terror

Secure cyberspace

Enhance virtual reality

Advance personalized learning

Engineer the tools of scientific discovery

Source:

NATIONAL ACADEMY OF ENGINEERING
OF THE NATIONAL ACADEMIES

http://www.engineeringchallenges.org

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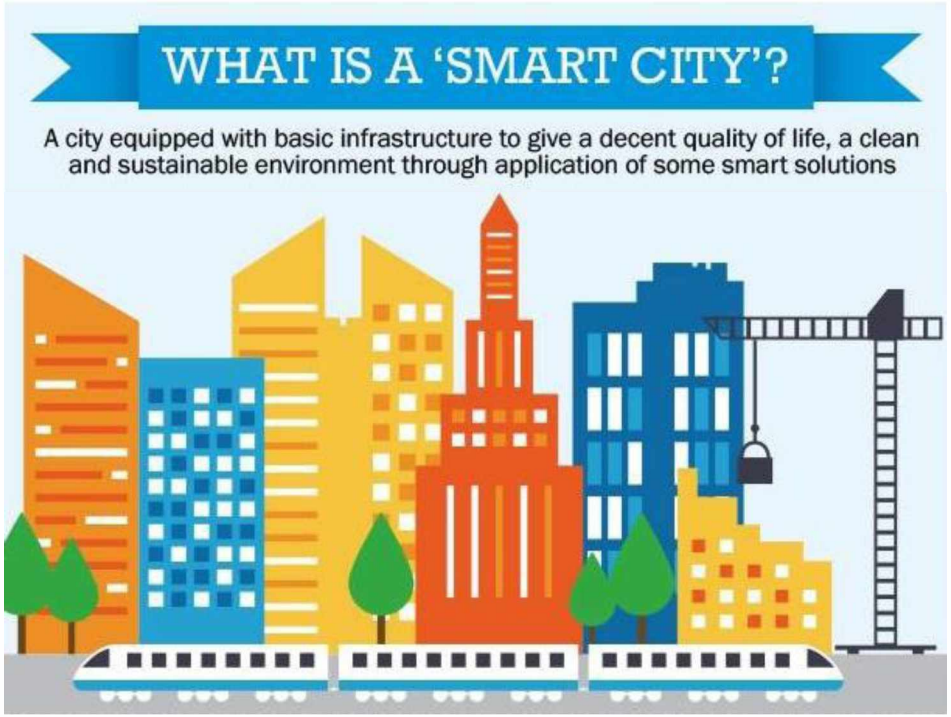
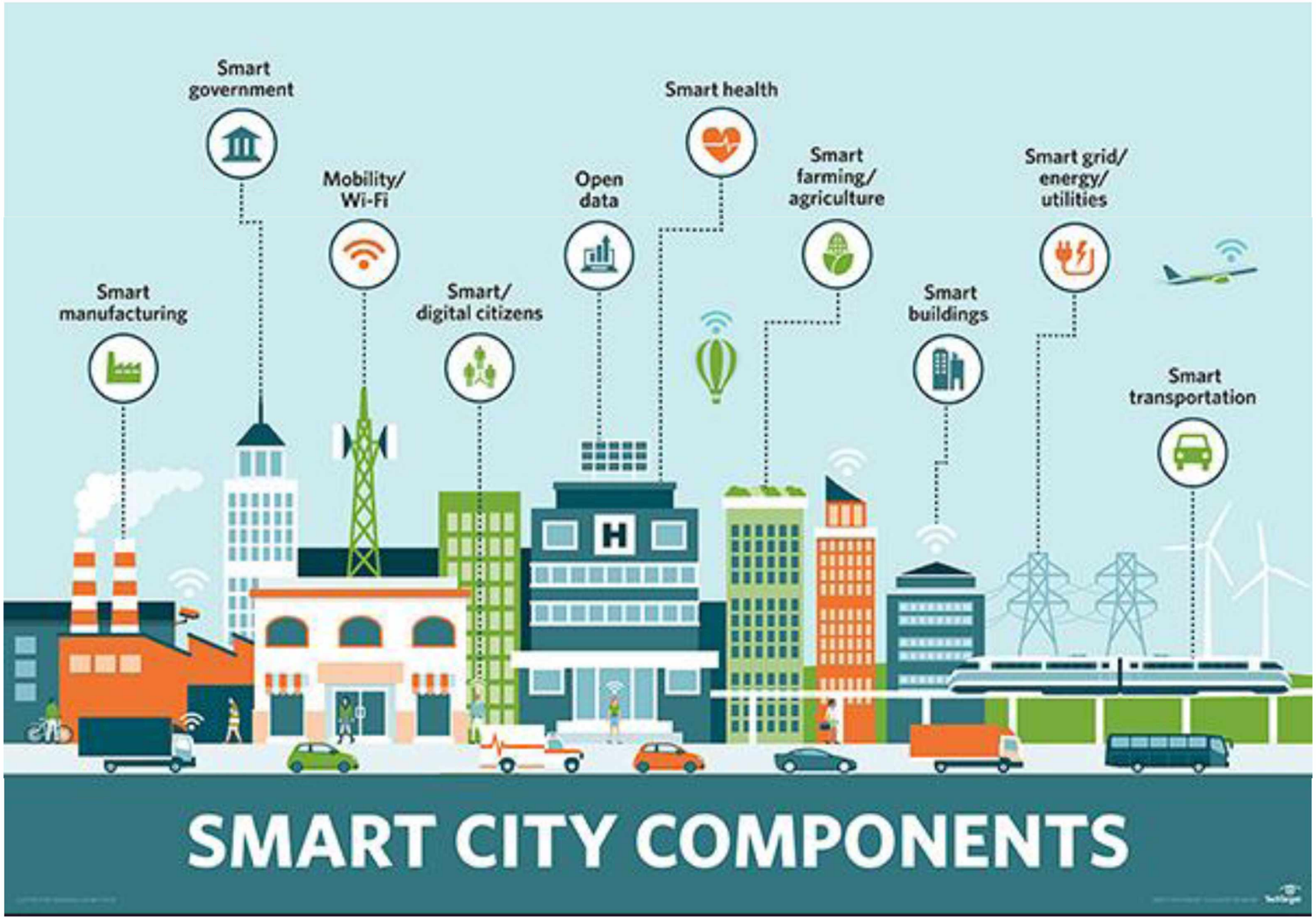
- Nuevas Tendencias para la Formación del Ingeniero ***impulsadas por***:
  - Iniciativa de la Ciudades Inteligentes

En que área le gustaría participar?

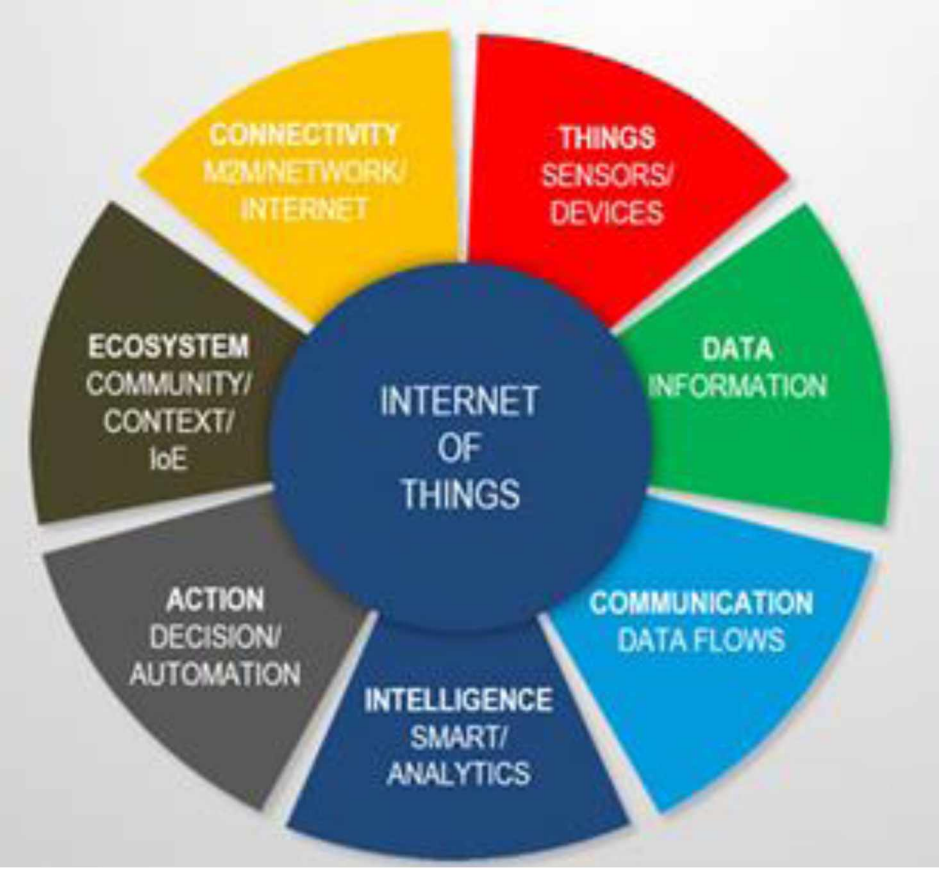
IEEE Smart Cities



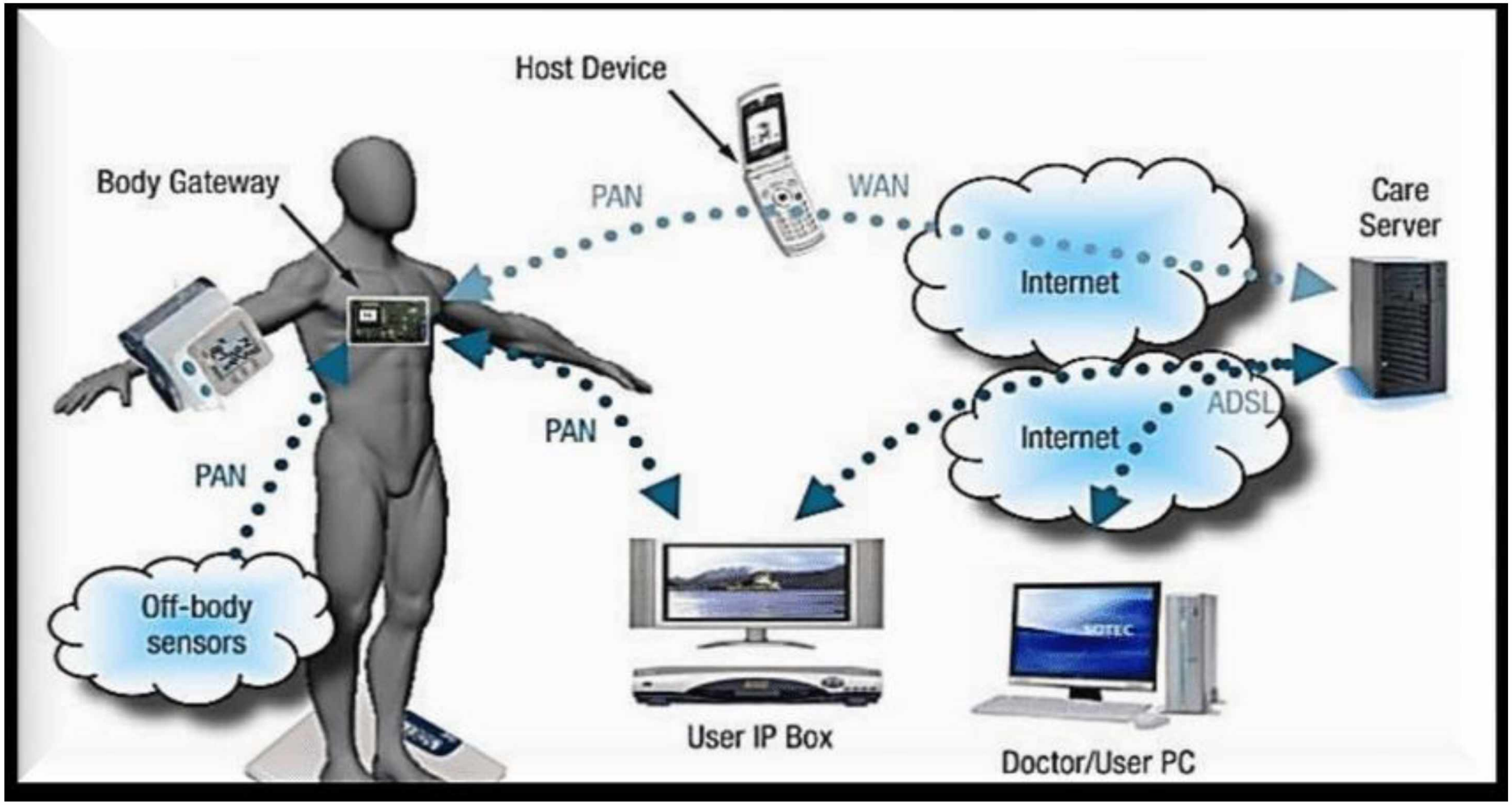

"A city equipped with basic infrastructure to give a decent quality of life, a clean and sustainable environment through application of smart solutions"

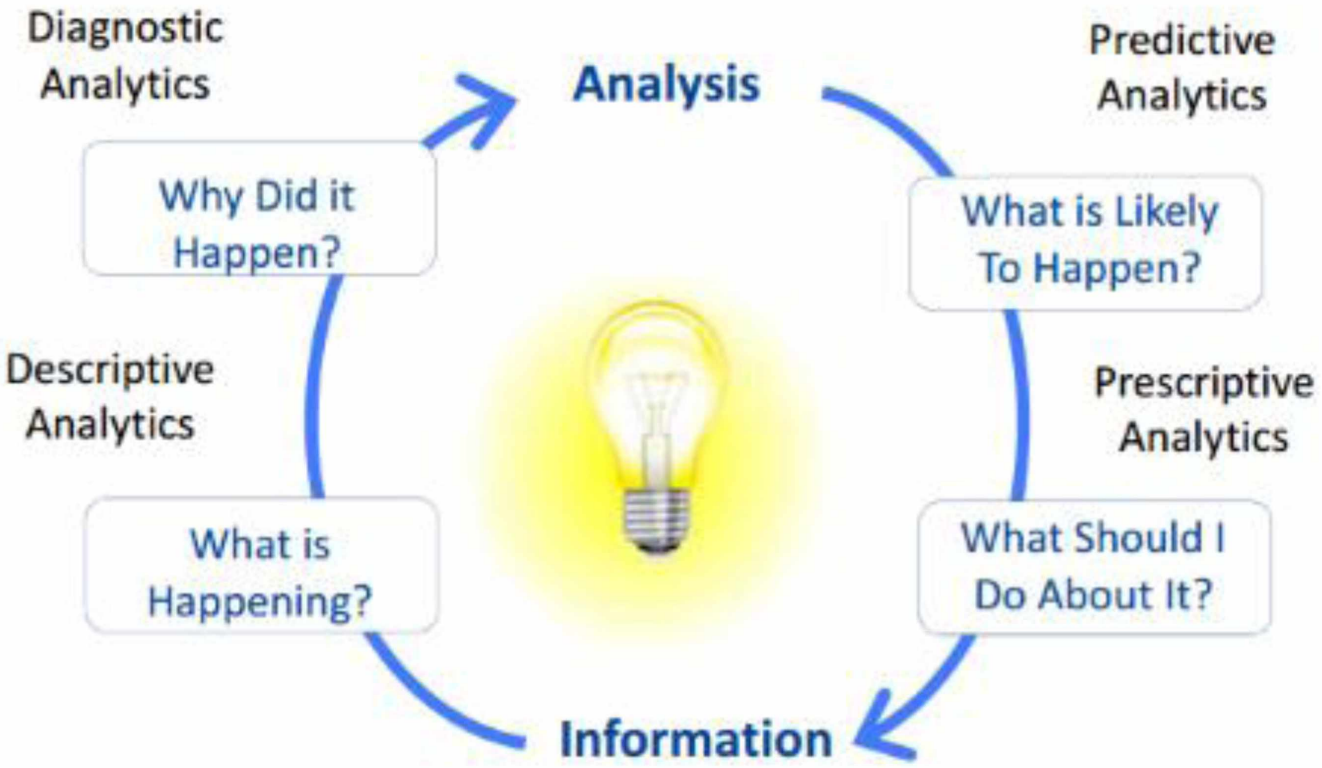

Smart government
Smart health
Mobility/ Wi-Fi
Open data
Smart farming/ agriculture
Smart grid/ energy/ utilities
Smart manufacturing
Smart/ digital citizens
Smart buildings
Smart transportation
H
SMART CITY COMPONENTS

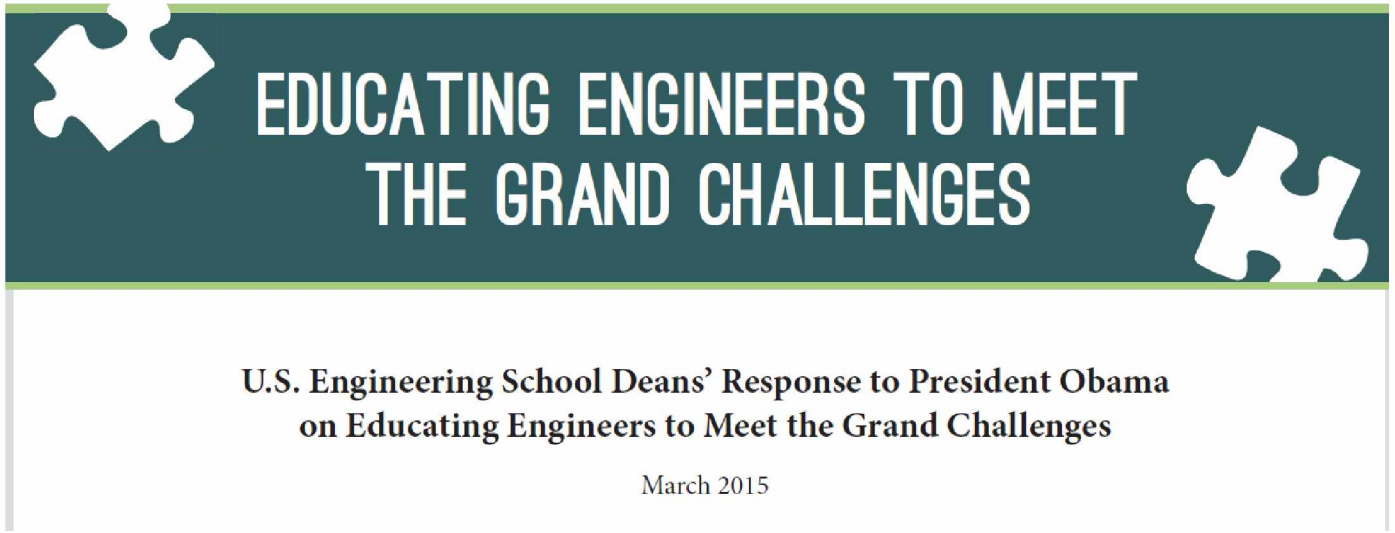
# Internet of Things (IoT)



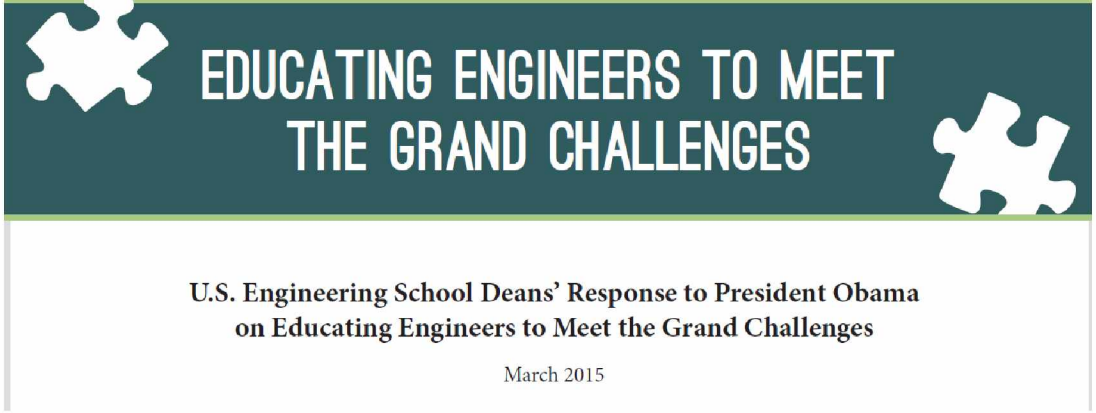
# Precision Medicine




Diagnostic Analytics
Analysis
Predictive Analytics
Why Did it Happen?
What is Likely To Happen?
Descriptive Analytics
Prescriptive Analytics
What is Happening?
What Should I Do About It?
Information



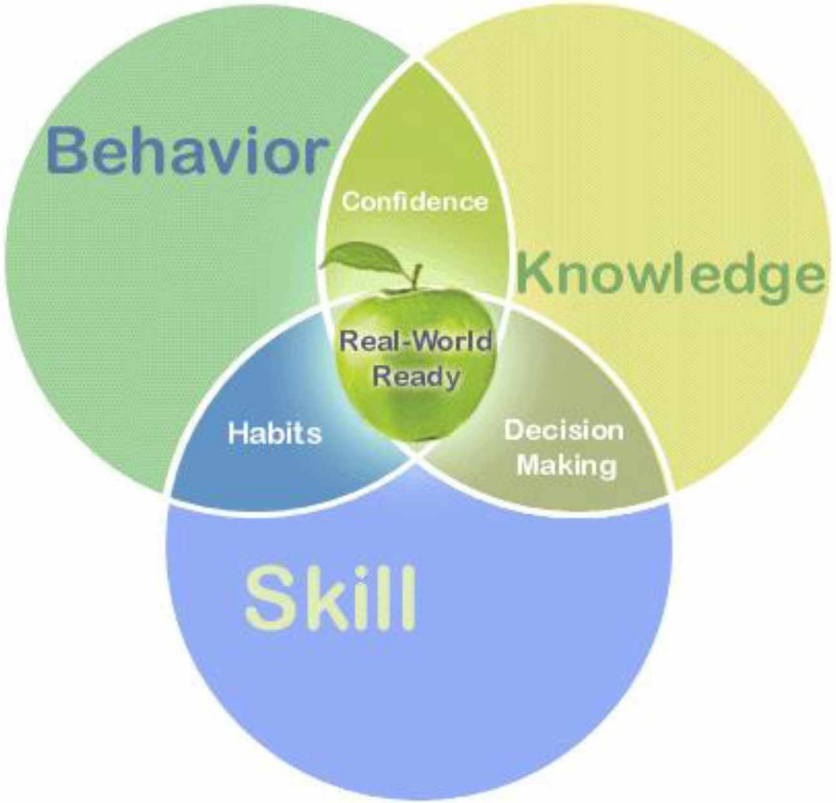

Recognizing **the urgency** to prepare engineering students with the skillset and mindset to meet Grand Challenges over the course of their careers



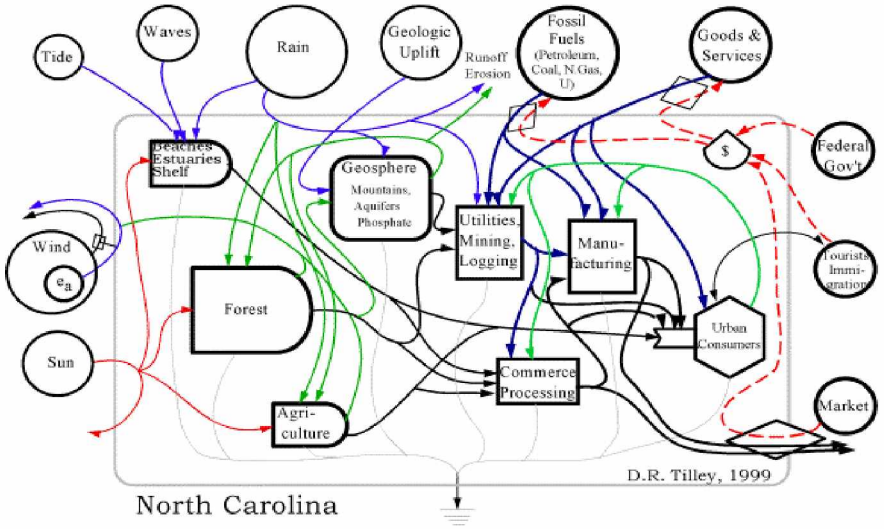

Colleges/universities commit to establishing at each of the institutions a program that integrates the following key elements:

- ✓ A creative learning experience connected to the Grand Challenges such as research or design projects
- ✓ Authentic experiential learning with clients and mentors that includes interdisciplinary experience
- ✓ Entrepreneurship and innovation experience such as the start-up of a new venture
- ✓ Global and cross-cultural perspectives gained through student mobility experiences as a semester abroad

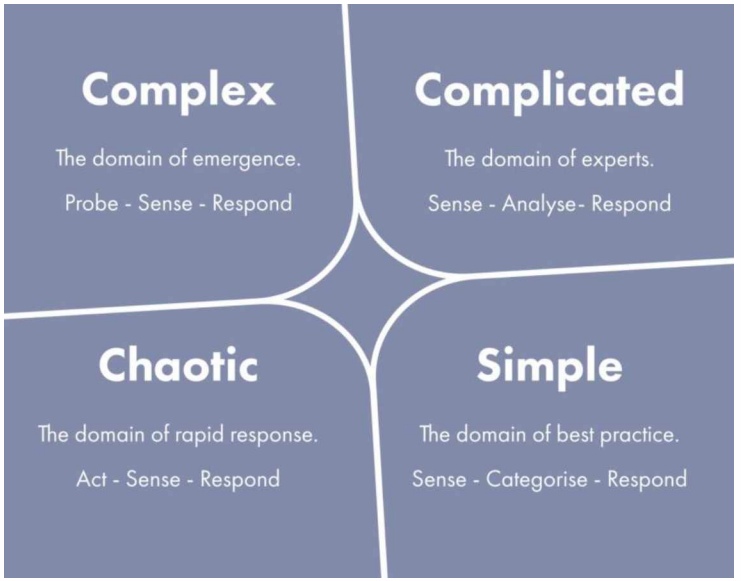
How to prepare ***engineering students***, ***faculty*** and ***university administrators*** to face such challenges?



# Is this a complicated or complex mission?




## Are we Fit?
## Estamos en condiciones?



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“OPPORTUNITY DOESN’T MAKE APPOINTMENTS, YOU HAVE TO BE READY WHEN IT ARRIVES.”
Tim Fargo

## Aerospace

# CONTROL SYSTEMS: THE EVER-PRESENT

"Trans/Multi/Inter-disciplinary by it's Own Nature"

Communications

Cyber

CPS

Physical

Computers

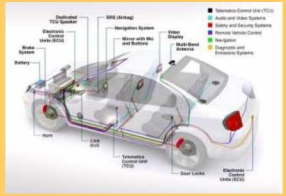
Systems

*Instrumentation & Control*

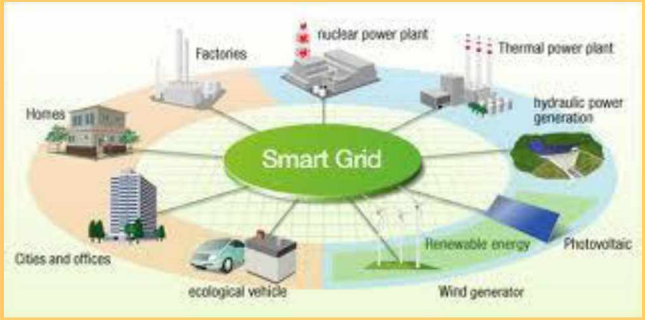
## Robotics

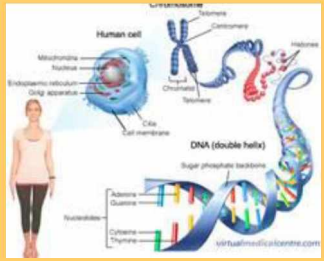
## Biological Systems & Personalized/Precision Medicine

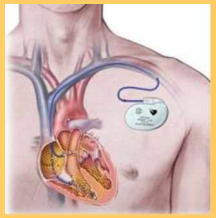
## Automotive



## Renewable Energy and Smart Grids



**Dr. Wilfrido Moreno**

# Ingeniería

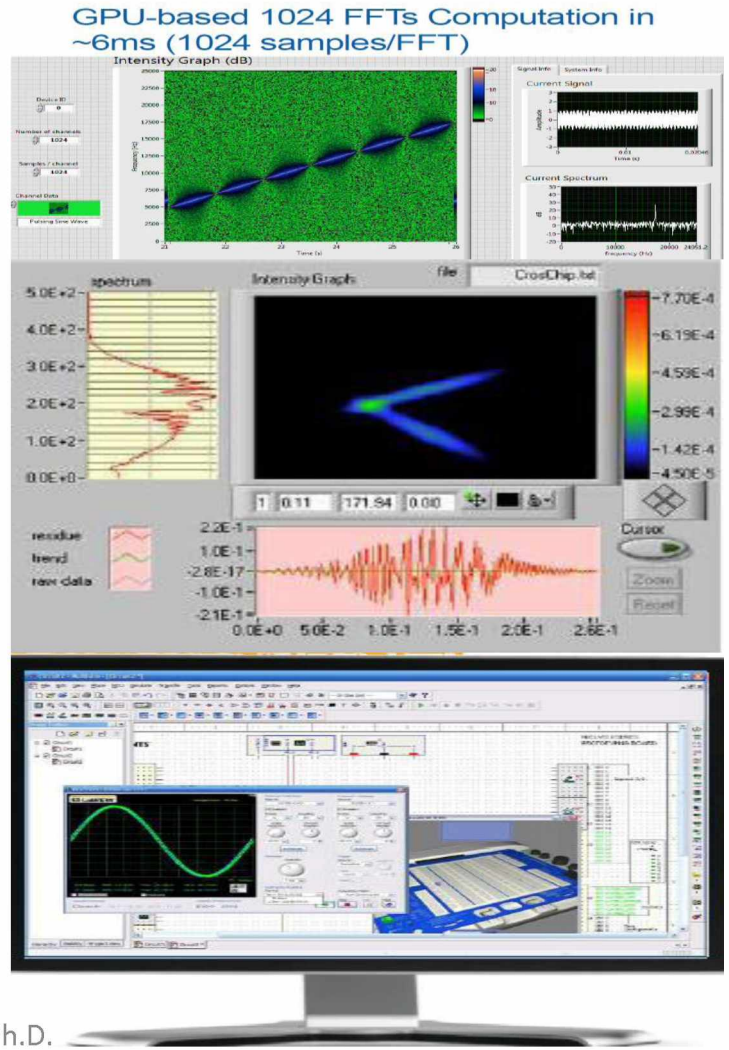
# y

# Sistemas Complejos


Luis Fernando Cruz MD.,Ph.D.

# Sistemas Complejos y Resolución de Problemas

- Nanotecnología
- Energía
- Biomatemáticas
- Robótica bioinspirada
- Computación bioinspirada
- Vida artificial
- Metaheurísticas
- Modelamiento y simulación



# RED IBEROAMERICANA TRANSDISCIPLINARIA DE INVESTIGACIÓN EN SISTEMAS COMPLEJOS

Istec
Ibero-American Science & Technology Education Consortium

Open Access Environment

Educación

SCED Complex Systems & Education Istec

Energía

UNIVERSIDAD TÉCNICA PARTICULAR DE LOJA
La Universidad Católica de Loja

Salud

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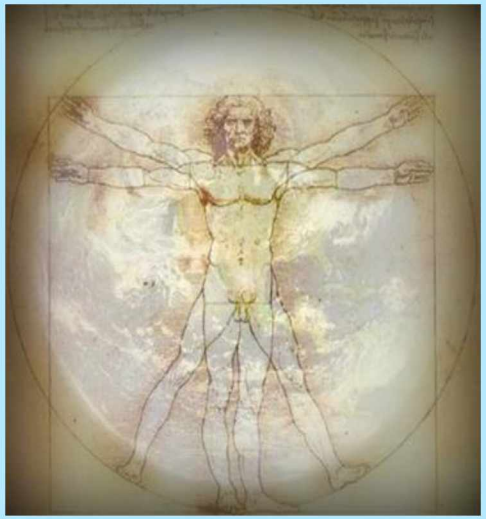

Bioingeniería

Cyber Physical Systems

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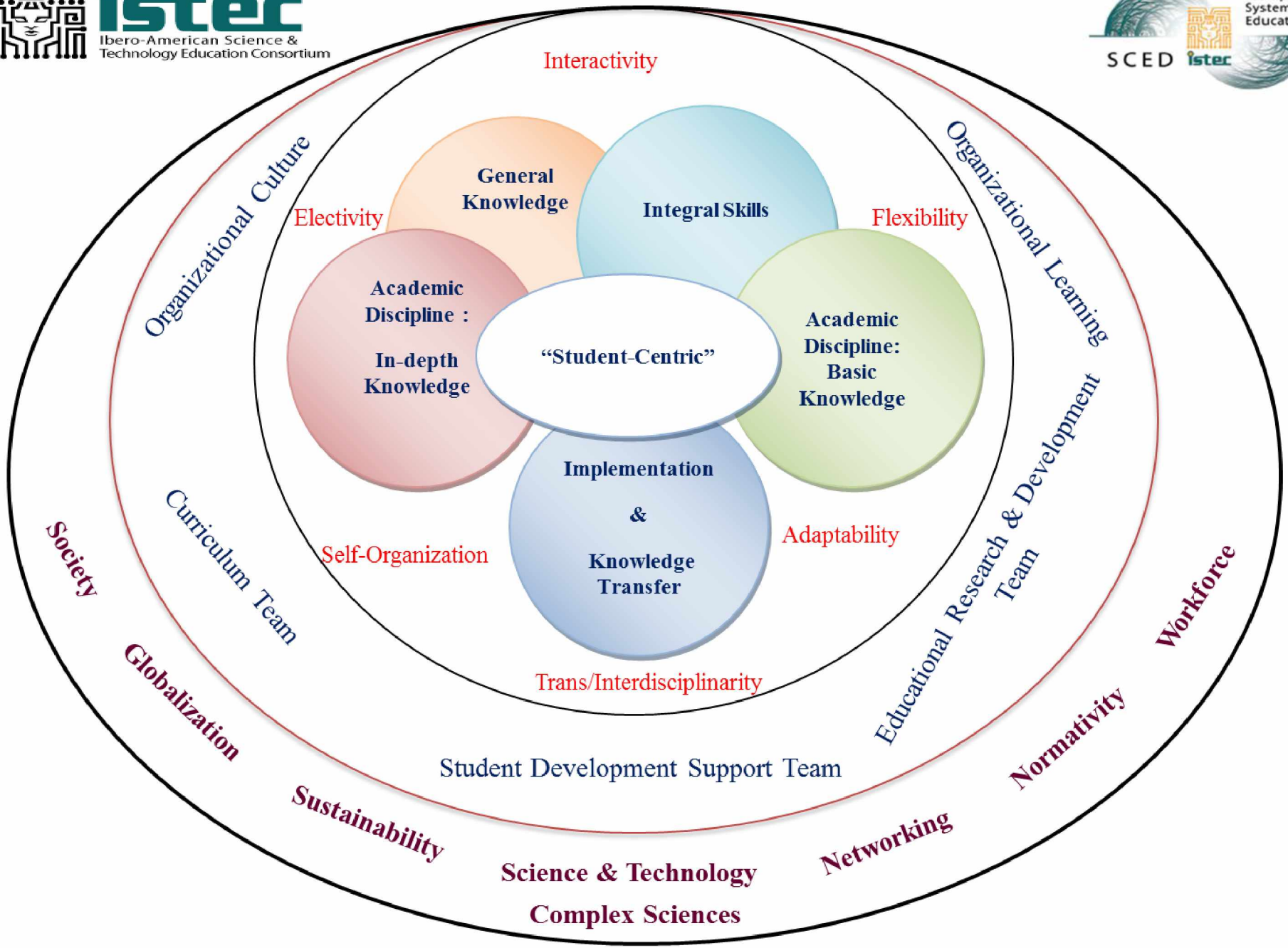
Nanotecnología

Istec Library Linkage Network



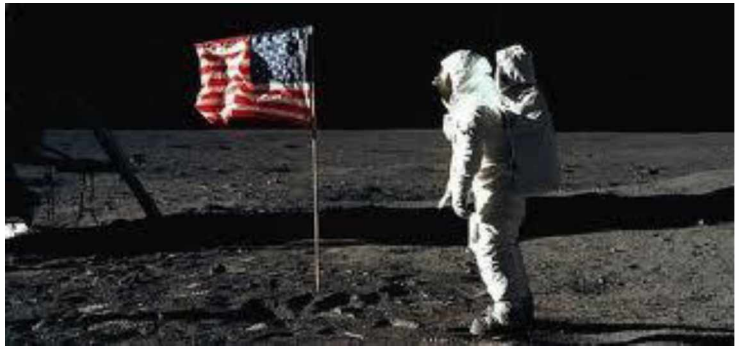

Luis Fernando Cruz Quiroga, Wilfrido Alejandro Moreno – Collaborative Effort (ASEE 2012)

**Mission:** Sending and bringing back an American **safely** to the Moon before the end of the decade

May 25, 1961


July 16, 1969

Neil Armstrong stepped off the Lunar Module's ladder and onto the Moon's surface



July 20 / July 21, 1969

July 24, 1969

NASA System Engineering Handbook

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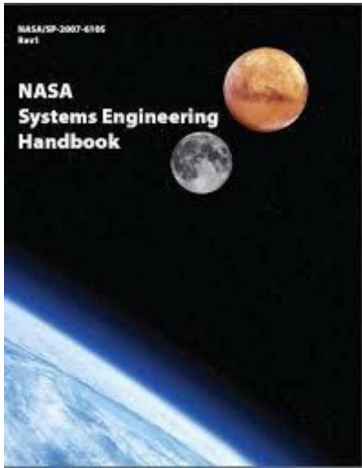
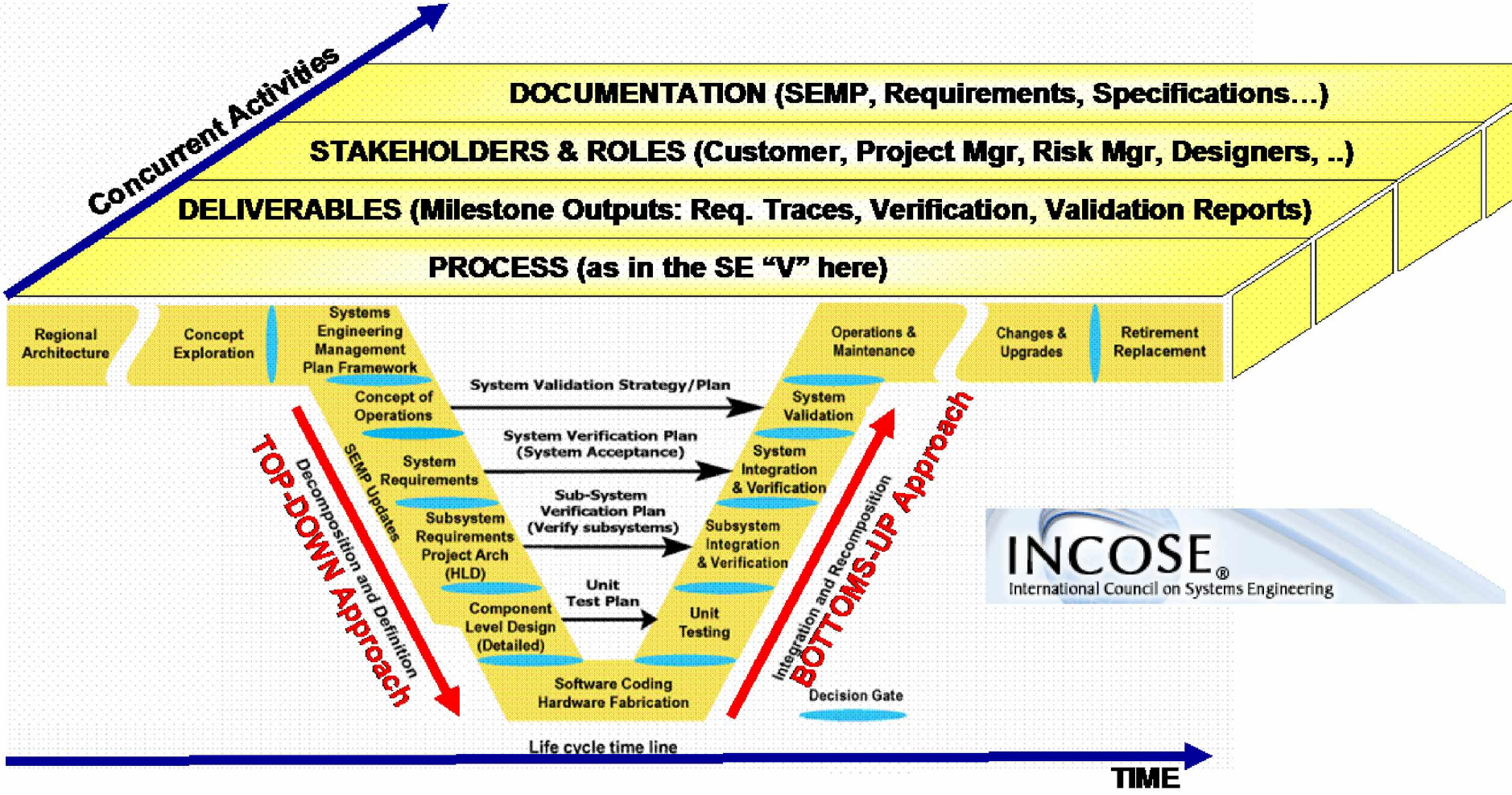
INCOSE® International Council on Systems Engineering

# Systems Engineering (SE) principles that express "systems thinking" and that are needed to tailor the process **according to the project complexity**



# The System Engineering "VEE"

*VEE Development Model is part of the Systems Engineering Process*
*It has become standard in a number of industries including automotive, banking, defense, health, and aerospace.*



INCOSE
International Council on Systems Engineering

# Working Groups (over 40 groups)

| | | | | |
|---|---|---|---|---|
| **Affordability**<br>Jay Haimowitz<br>Analytic Enablers | **Agile Systems and Systems Engineering**<br>Rick Dove / Ron Lyells, Larri Rosser, Kevin Gunn<br>Transformational | **Anti-terrorism International**<br>Bill Mackey<br>Application Domains | **Architecture**<br>Mike Wilkinson / Richard Martin / Alain Faisandier<br>Process Enablers | **Automotive**<br>Alain Dauron / Gary Rushton<br>Application Domains |
| **Competency**<br>Don Gelosh<br>Analytic Enablers | **Complex Systems**<br>Jimmie McEver<br>Analytic Enablers | **Critical Infrastructure**<br>Mike deLamare<br>Application Domains | **Decision Analysis**<br>Frank Salvatore<br>Analytic Enablers | **Defense Systems**<br>Karl Geist<br>Application Domains |
| **Enterprise Systems**<br>Willy Donaldson<br>Process Enablers | **Global Earth Observation System of Systems (GEOSS)**<br>Ken Crowder<br>Application Domains | **Healthcare**<br>Bob Malins / Chris Unger<br>Application Domains | **Human Systems Integration**<br>Guy Boy<br>Analytic Enablers | **Infrastructure**<br>Alain Kouassi / Mike deLamare / Laura Uden<br>Application Domains |

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“OPPORTUNITY DOESN’T MAKE APPOINTMENTS, YOU HAVE TO BE READY WHEN IT ARRIVES.”
Tim Fargo

# Improving Undergraduate STEM Education (IUSE)

(13 pages)

## Improving Undergraduate STEM Education (IUSE: EHR)

**PROGRAM SOLICITATION**
**NSF 14-588**

**REPLACES DOCUMENT(S):**
**PD 14-7513**

**National Science Foundation**

Directorate for Education & Human Resources
Division of Undergraduate Education

**Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):

October 22, 2014

Engaged Student Learning: Exploration

October 24, 2014

Institutional and Community Transformation: Exploration

January 13, 2015

Engaged Student Learning: Design and Development, I & II

January 13, 2015

Institutional and Community Transformation: Design and Development

# Professional Formation of Engineers: Revolutionizing Engineering Departments (RED)

($1,000,000 to $2,000,000 /5 Years)

(14 Pages)

## IUSE / Professional Formation of Engineers: Revolutionizing Engineering Departments (RED)

### PROGRAM SOLICITATION
### NSF 14-602

**National Science Foundation**

Directorate for Engineering
- Engineering Education and Centers
- Division of Electrical, Communications and Cyber Systems
- Division of Chemical, Bioengineering, Environmental, and Transport Systems
- Division of Civil, Mechanical and Manufacturing Innovation
- Industrial Innovation and Partnerships

Directorate for Computer & Information Science & Engineering

Directorate for Education & Human Resources

**Letter of Intent Due Date(s)** ***(required)*** (due by 5 p.m. proposer's local time)*:*

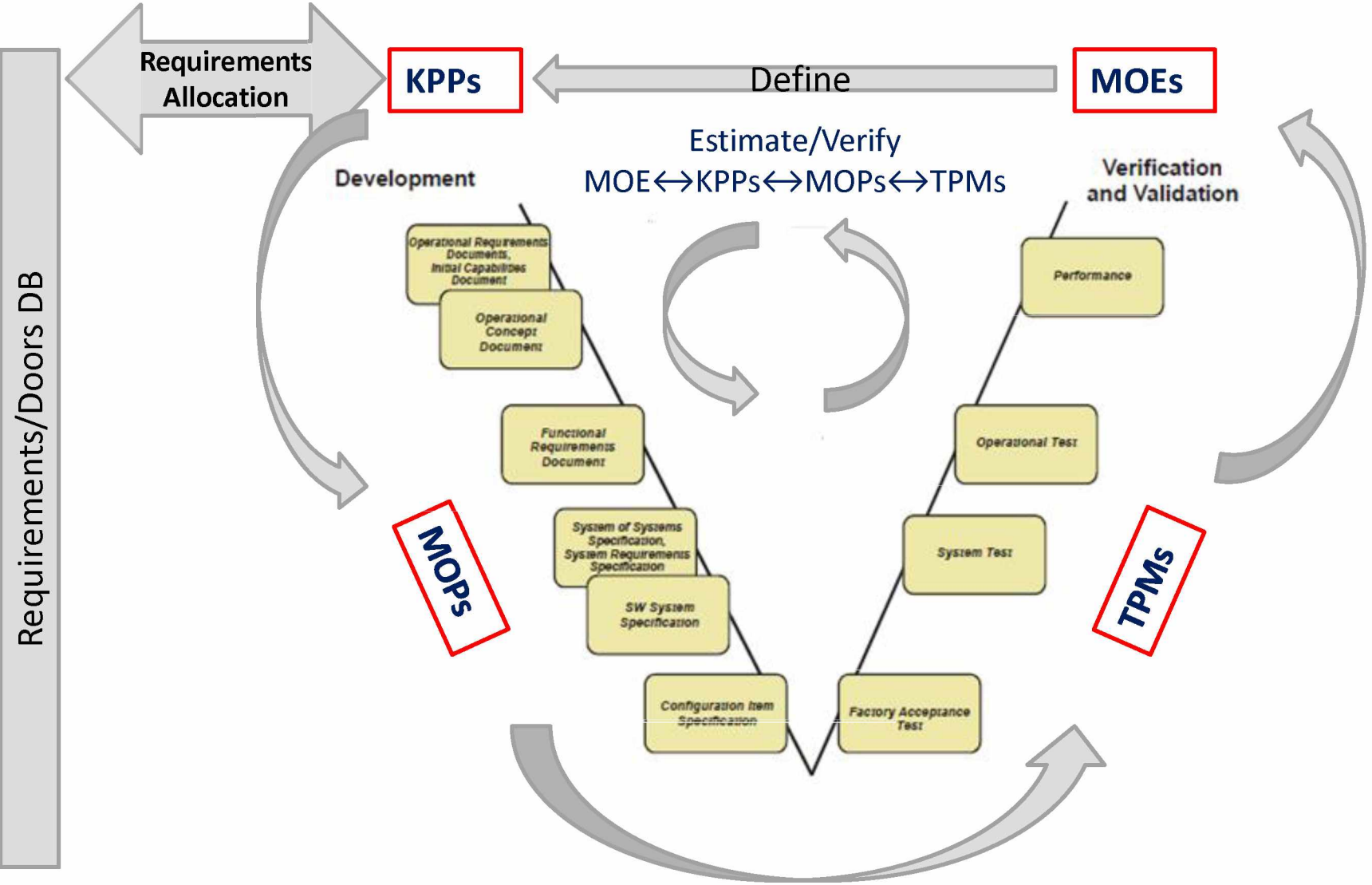
October 28, 2014

**Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):

November 26, 2014

# Electrical Engineering Modernization and Social Adaptation Using a Complex Systems Approach (**EE MOSAICS**)

# Top-Down Traceability

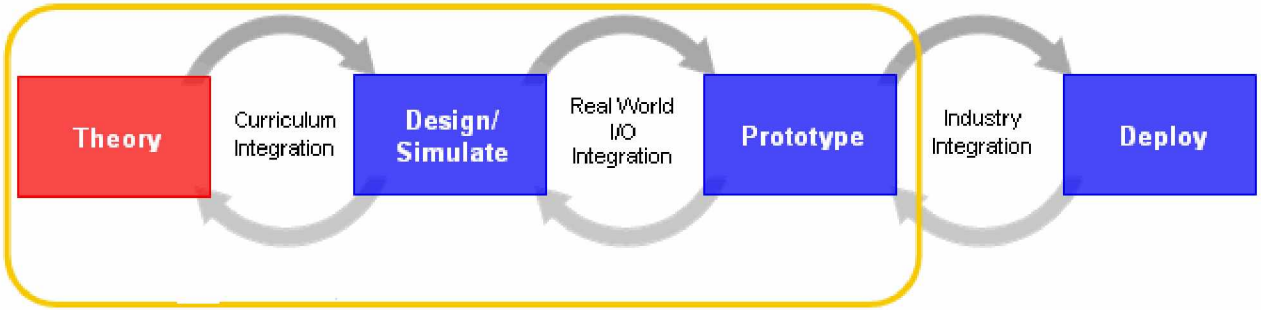



INCOSE-TP-2003-020-01 (Technical Measurement)

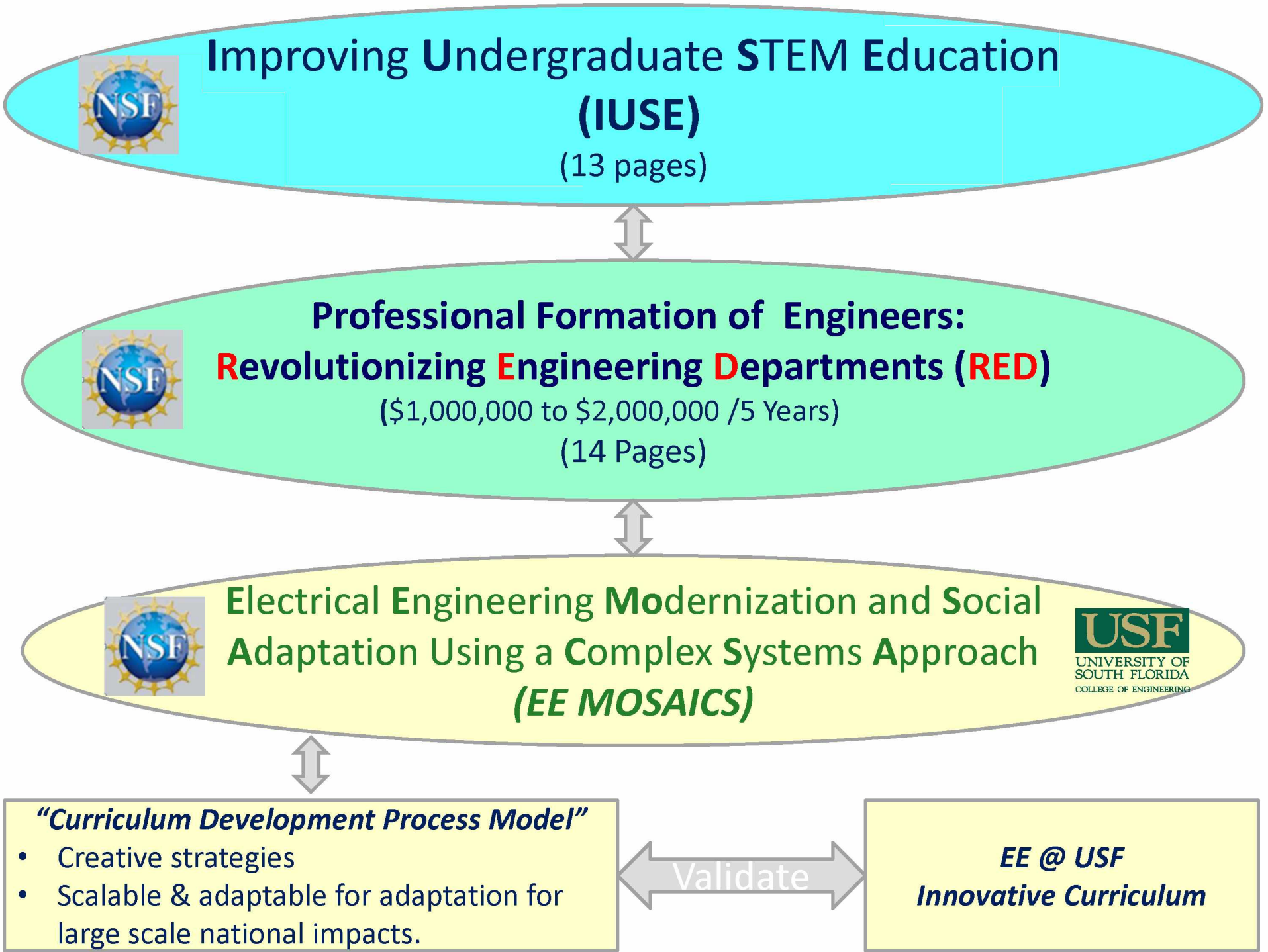
# "Innovation via Social Responsibility"

Inter/Multi/Trans/Disciplinary Teams

Social Impact




Identify "A NEED…."


Improving Undergraduate STEM Education
(IUSE)
(13 pages)
Professional Formation of Engineers:
Revolutionizing Engineering Departments (RED)
($1,000,000 to $2,000,000 /5 Years)
(14 Pages)
Electrical Engineering Modernization and Social Adaptation Using a Complex Systems Approach
(EE MOSAICS)
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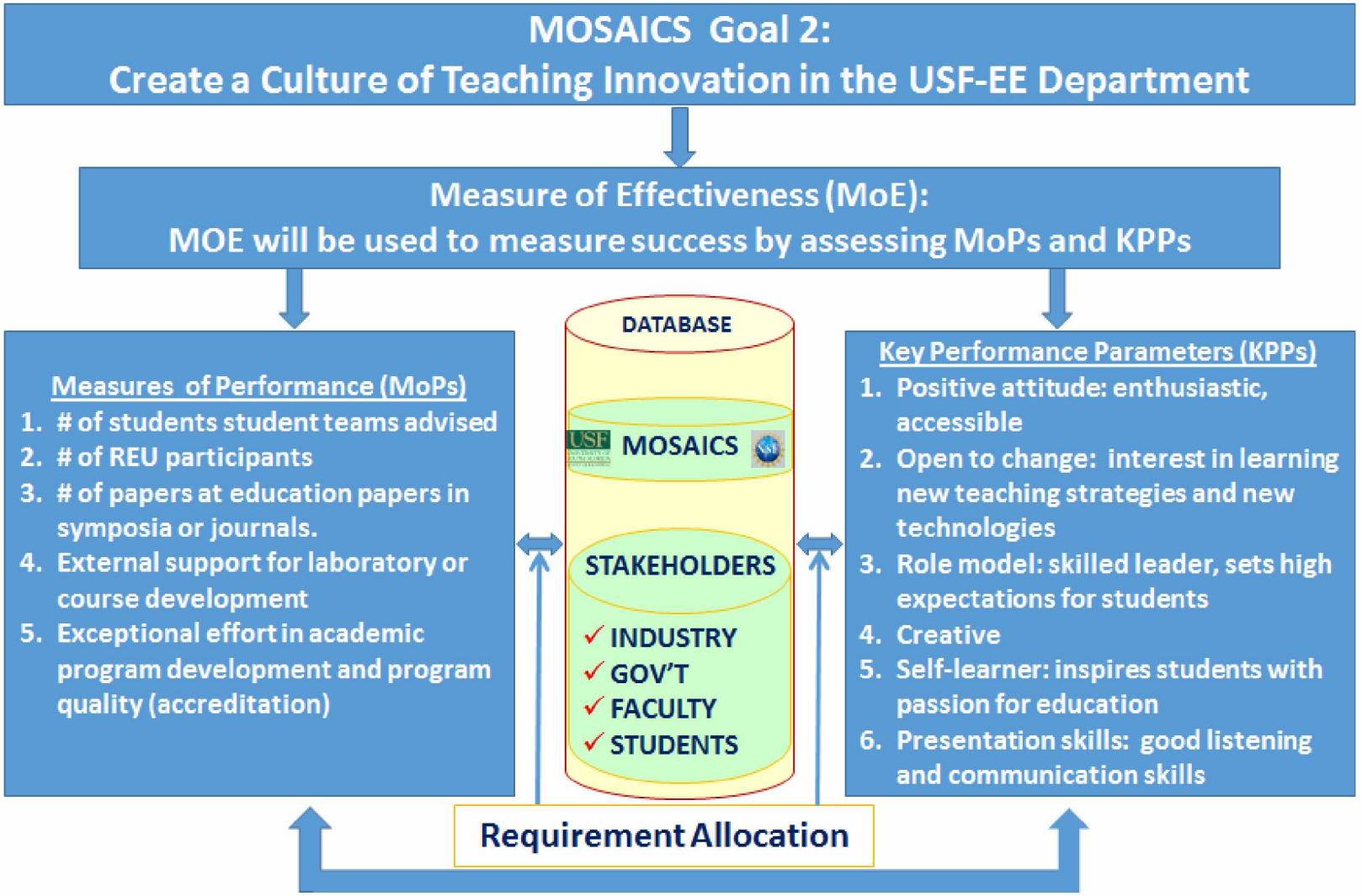
COLLEGE OF ENGINEERING
"Curriculum Development Process Model"
• Creative strategies
• Scalable & adaptable for adaptation for large scale national impacts.
Validate
EE @ USF
Innovative Curriculum

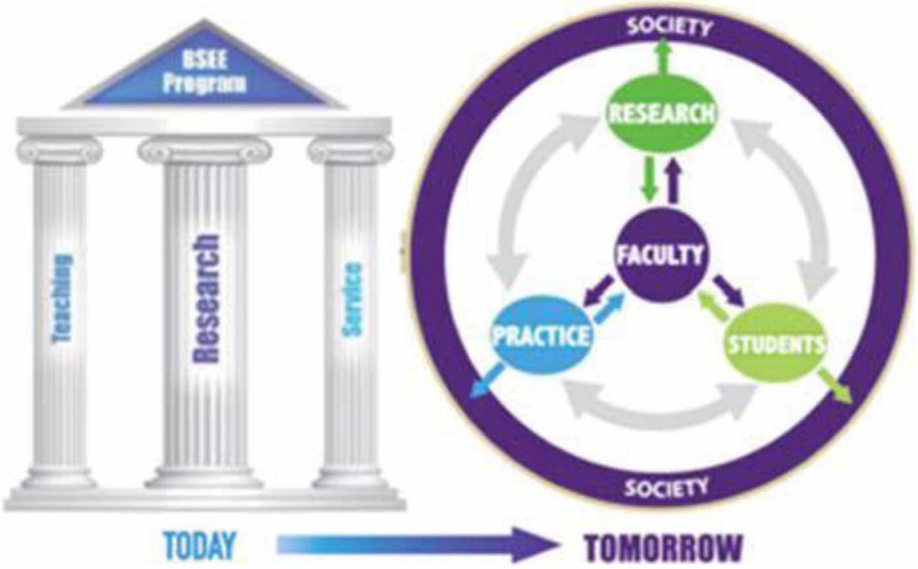
# Electrical Engineering Modernization and Social Adaptation Using a Complex Systems Approach *(EE MOSAICS)*

- Establish levels (statements, numbers, %, etc) of desired outcomes in order of relative importance.
- Define the assessment methods to provide evidence of desired outcomes.
- Identify the changes required in order to achieve the desired outcomes:
  - In curriculum
  - In teaching methods
  - In learning environment
  - In faculty
  - In procedures
  - In policies
  - ……..
- Research existing knowledge of change theory to select most appropriate change strategy and perspective.
  - Involve all action agents (students, faculty, stake holders).
  - Strive for a shared vision, reflective teachers and complexity leadership.

# Complex Systems Perspective
# Systems Approach: Creating a Culture of Teaching Innovation.



# "NSF IUSE/PFE - RED: Fall 2016"
# Transforming Professional Formation through Multi-Dimensional Qualification of Practice and Outreach"




The pillars of today and the informing ***pathways*** of tomorrow's USF EE Department

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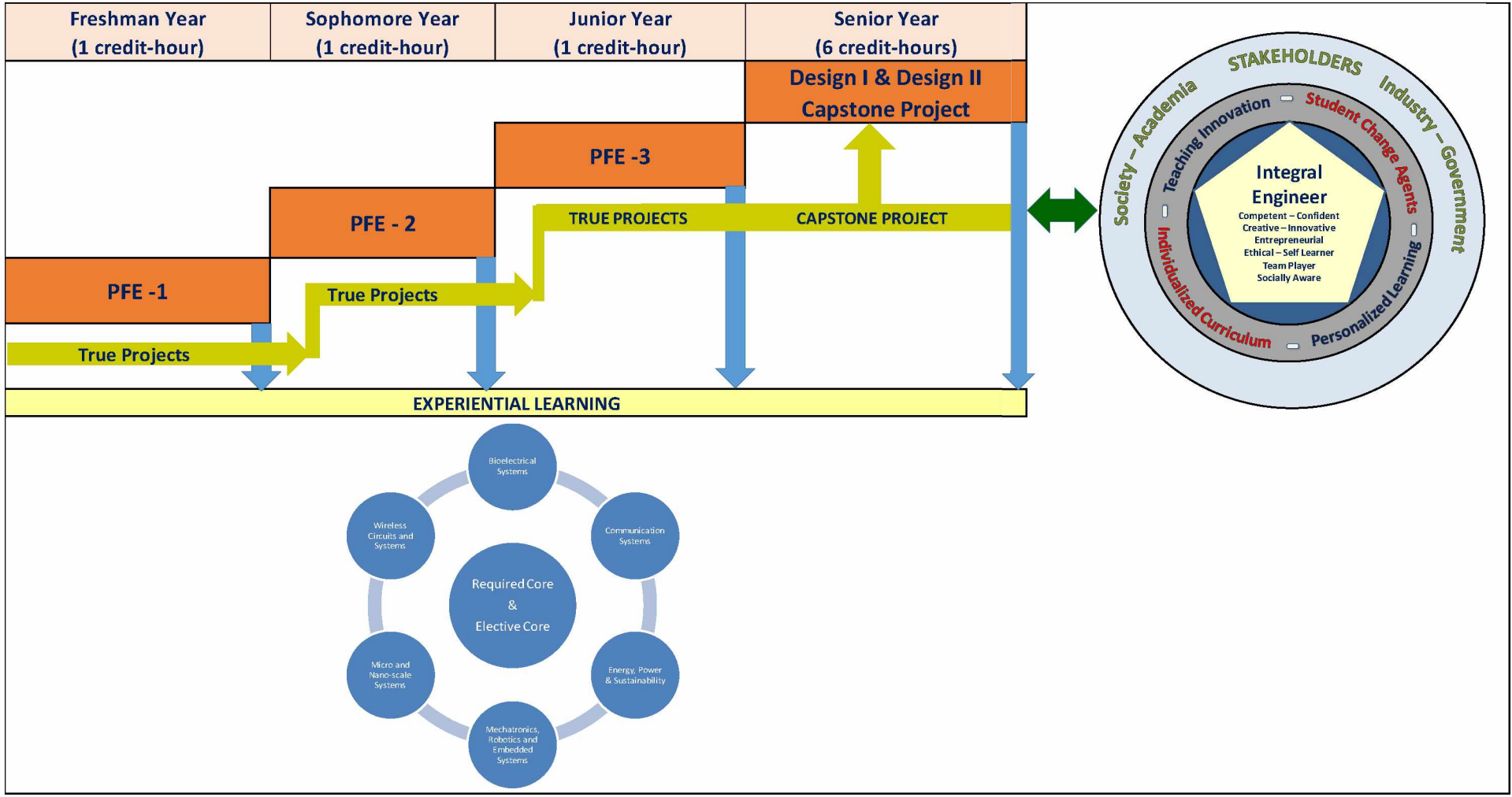
# "The EE Department PFE: 1, 2 & 3 Ladder"



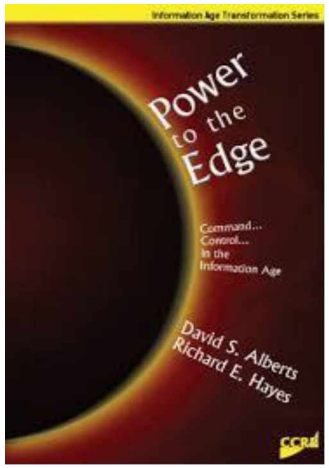
The **philosophy** of **power to the edge** is aimed at achieving organizational agility…….

# TRUE - Initiative

ACKING

ENSPONSIBILITY

NDERSTANDING



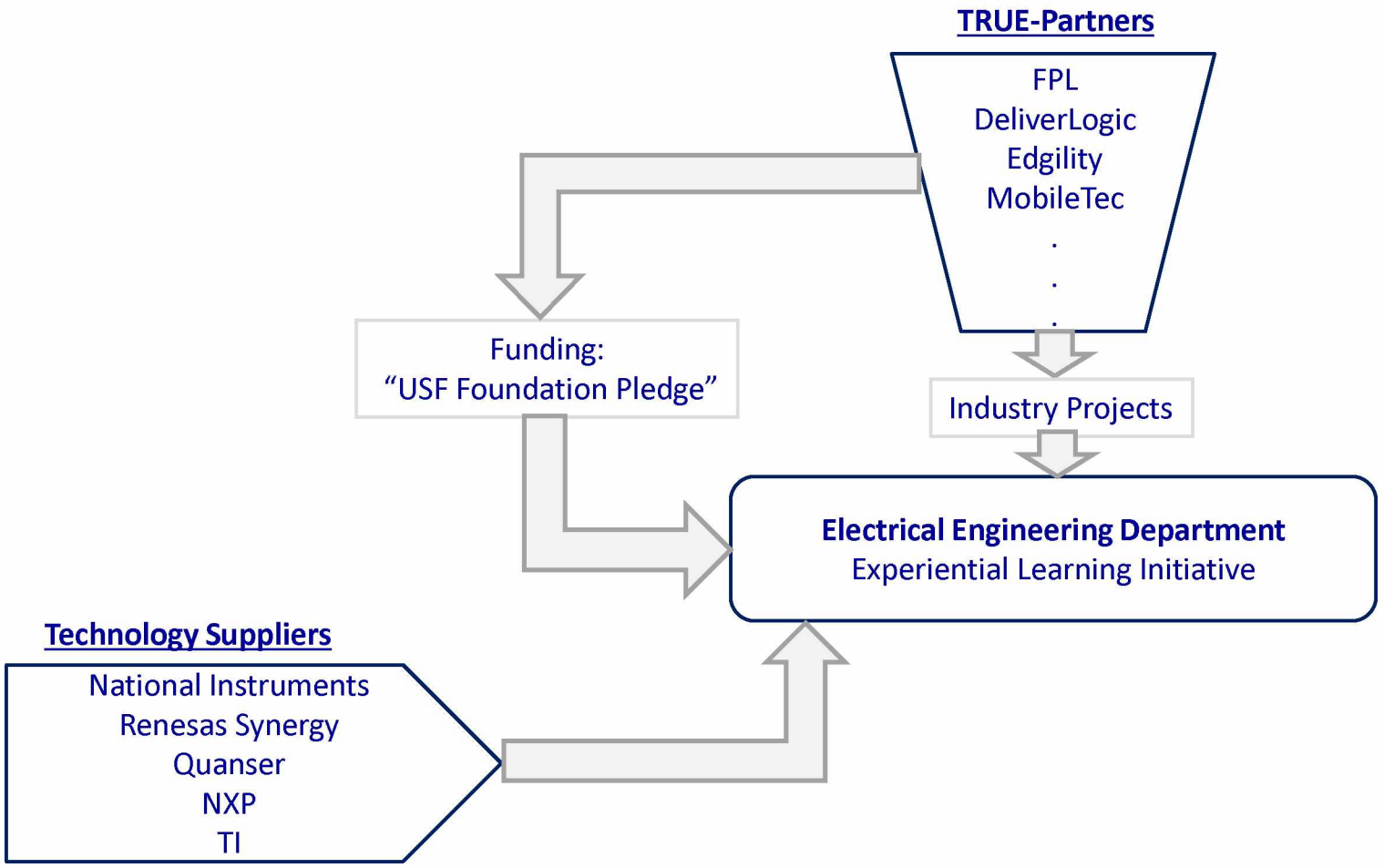

"…..Power to the edge:

- Is about changing the way individuals, organizations, and systems relate to one another and work
- Involves the empowerment of individuals ***(STUDENTS, FACULTY…..)*** at the edge of an organization ***(EE DEPARTMENT)*** (where the organization interacts with its operating environment (**TEACHING, RESEARCH, OUTREACH)** to have an impact or effect on that environment)
- Command in the Information Age is ultimately not the sole responsibility of any single individual. It is a shared and distributed responsibility.

# Experiential Learning Initiative "TRUE-Partner Network"

- Experiential learning opportunities for graduate and undergraduate students
  - ✓ Students get the opportunity to apply/develop Electrical Engineering Knowledge & Skills in industry driven projects
  - ✓ Increase employability opportunities for the students
- Improved agility in responding to current industry needs
- Mutually beneficial and helps to build trusting relationships with industry
  - ✓ Emphasis on "Student's Development/Formation" vs. Intellectual Property(IP) challenges
- Designed in accordance of the PFE's course sequence

# "TRUE-Partner Network"



# TRUE-PARTNER NETWOF

ENDLESS OPPORTUNITIES

FPL Energy

WELBILT
Bringing innovation to the table

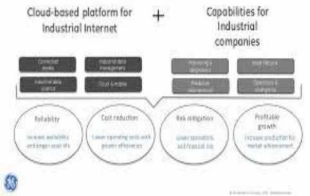
Manitowoc Foodservice

occam md
SIMPLICITY BY DESIGN

Facilities Management
A DIVISION OF ADMINISTRATIVE SERVICES

USF UNIVERSITY OF SOUTH FLORIDA

GE PREDIX PLATFORM IS THE ENABLER




CERC
Clean Energy Research Center

WITHLACOOCHEE RIVER
Electric Cooperative, Inc.
A Touchstone Energy® Cooperative

GE Instrument Transformers, Inc.

Honeywell
Aerospace

Instituto Nacional de Astrofísica, Óptica y Electrónica
INAOE
www.inaoe.gob.mx

NREC
Nanotechnology Research & Education Center

DUKE ENERGY®

DELIVERLOGIC
A National Delivery Network

RCA Solutions

SECURE WIRELESS LLC
Building Secure Products

MobileTec™ Public Safety Software

FPL Energy

ENDLESS OPPORTUNITIES

***Fall 2015 – Spring 2016***

***"Smart hard hat prototype for substation work, or for a responding Restoration Specialist (First Responder) to a substation outage"***

The Hard Hat would need to allow the user to do the following things:

1. Inform the user about important information on a screen inform of the users eyes so their hands are free. This info could be anything from data on a piece of equipment to updated switching info on a substation
2. Have a video camera to send live video, thermal camera to allow the user to see if any equipment is hot.
3. Allow the user to use voice commands to access blue prints and also as a user walks up to a piece of equipment it can recognize that equipment and pull the data automatically.
4. Allow training manuals and training videos to be accessed by the user to help in restoration and switching.

**Owner: TRUE Partner: Subject Matter Expert(s)**

ConOps Document
Owner: Graduate Projects / Capstone Student Team

Requirement Document

- ✓ High Level Design
- ✓ Implementation
- ✓ Validation

**Sponsor:** Florida Power & Light

**Subject Matter Expert:** Eric Schwartz

**TRUE-Project Title:** Pole-Tilt-Sensor

**TRUE-Project Summary:** A standalone device that would be mounted to a FPL pole. The device would be able to alert FPL if the pole was starting to tilt over a prescribe degree. It also would needs to be able to withstand over 150 mph winds and this team should be able to use the UCF wind tunnel to test that. The sensor should be able to communicate with other sensors (hope from one to another to help with some sensors that are not in a cellphone range) or possible use another means of data transfer. Overall this sensor will live on a pole and should have room for other possible sensors to be placed inside at a later time.


WE

ELBILT®

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ENDLESS OPPORTUNITIES

Cloud

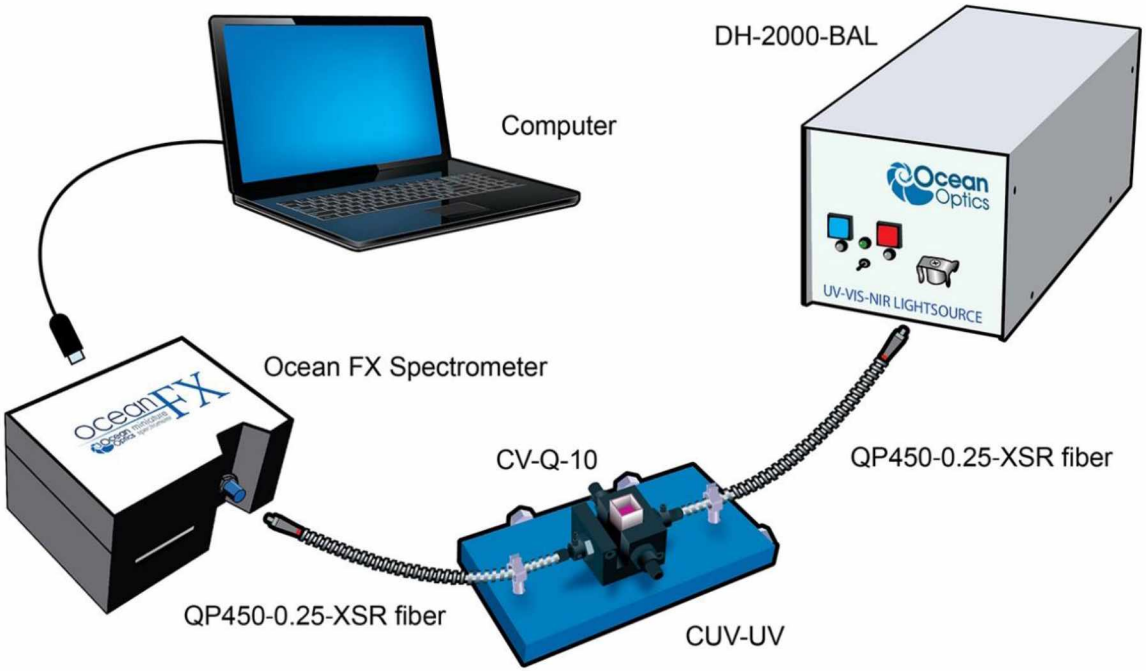
Data

**Sponsor:** EDGILITY

**Subject Matter Expert:** Balaji Ramadoss

**TRUE-Project Title:** IoT - Hyperspectral Imaging System Integration

**TRUE-Project Summary:** Hyperspectral Imaging (HIS) collects and processes information from across the electromagnetic spectrum. The goal of hyperspectral imaging is to obtain the spectrum for each pixel in the image of a scene, with the purpose of finding objects, identifying materials, or detecting processes. Assessment and feasibility of utilizing Hyperspectral imaging for identifying the spectral make up of different chemical components associated.




## Instrument Set up

- Light Source: Halogen bulb and Deuterium Bulb(190nm-1100nm)
- Sample Holder: Holds one sample
- Computer: Uses ocean optics software
- Light source, sample holder and spectrometer connected with optical cables

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occam md
SIMPLICITY BY DESIGN

MICROCHIP

ENDLESS
OPPORTUNITIES

# LoRa®-Based Wall-less IoT Lab Concept Information and Brainstorming Session

A LoRa®-based system has been deployed at USF this past summer offering students, professors, and researchers the opportunity to conduct extensive testing and pilot studies suitable for real-world applications.

Through a donation provided by Occam Technology Group, the underlying LoRa®-based infrastructure, including a long-range antenna and access to a custom LoRaWAN™ server, now enables the collection of LoRa®-based Internet-of-Things sensor data campus-wide, effectively turning the entire university into one of the world's largest *LoRa®-enabled* wall-less IoT labs.

Join us to learn more about LoRa®-based technologies, understand how it will benefit students, and discuss possible applications that could be taken into the class room.

## Do you have an IoT project in mind?

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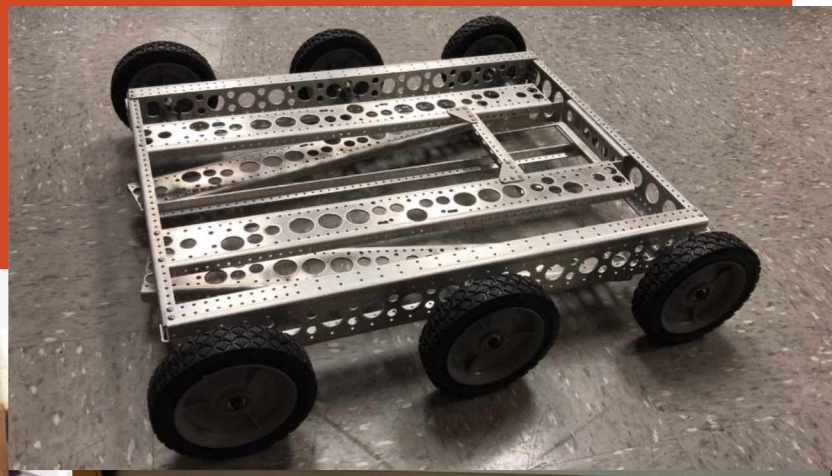
DELIVERLOGIC
A National Delivery Network

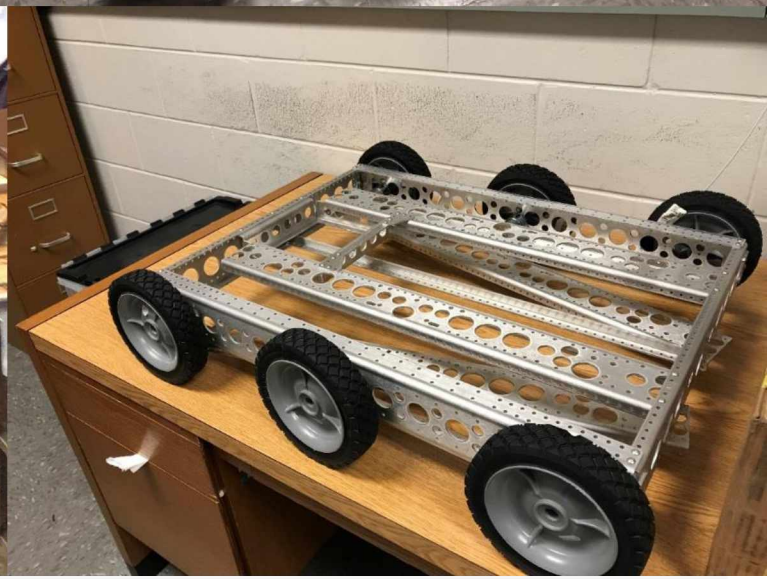
ENDLESS OPPORTUNITIES

# Autonomous Food Delivery System

- Self driving delivery vehicle
- Provides last mile delivery automation
- Will be used for delivering
  - ✓ Food
  - ✓ Groceries
  - ✓ Medicines etc.,


# Thank You





# The Future of Agriculture: Harvest CROO Robotics

JULY 11, 2017 BY JESSE BROCK LEAVE A COMMENT

Gary Wishnatzki, owner and head pixie of Wish Farms, wears many hats. One of which is co-founder of what will be the world's first commercially viable robotic strawberry harvester.

# Robotic Solar Farm Grass Cutting System Design Challenge

8/27/2018

# Background

- Solar farms utilize photovoltaic (PV) panels to convert sunlight into electrical energy.
- Ground-mounted solar arrays require maintaining the grass that grows around the base of the arrays, and these grasses tend to be thick, dense and difficult to reach via conventional mowing techniques.
- While there may be various approaches for providing ground maintenance service


# Proposal #1 – Autonomous Drone for the Electric Grid

**Sponsor: Florida Power & Light,** Jupiter, FL
Coach:
Primary Liaison: Giovanni Herazo, FPL

FPL is the third-largest electric utility in the United States, serving more than 4.9 million customer accounts or more than 10 million people across the state of Florida. FPL is a subsidiary of Juno Beach, Florida-based NextEra Energy, Inc. (NYSE: NEE), ranked No. 1 in the electric and gas utilities industry in Fortune's 2017 list of "World's Most Admired Companies. NextEra Energy is the world's largest generator of renewable energy from the wind and sun.

**Goal:**

- Develop an autonomous drone to fly on a predetermined flight map for electric grid inspections with visual and thermal cameras.

**Description**

- FPL uses drone technology for quick assessments on the electrical grid when line disturbances or fault conditions are detected on the line.
- Leverage NextAlerts (AI model) to autonomously deploy a drone on a programmed flight map from the substation
- Develop capability to take pictures and report back to FPL engineers to address conditions

**Key Objective**

- Fall semester – Mobile platform fabricated and operated under joystick control for supervisory control.
- Spring semester – Autonomous mapping integrated with sensors and controls with user interface software developed. System is demonstrated.

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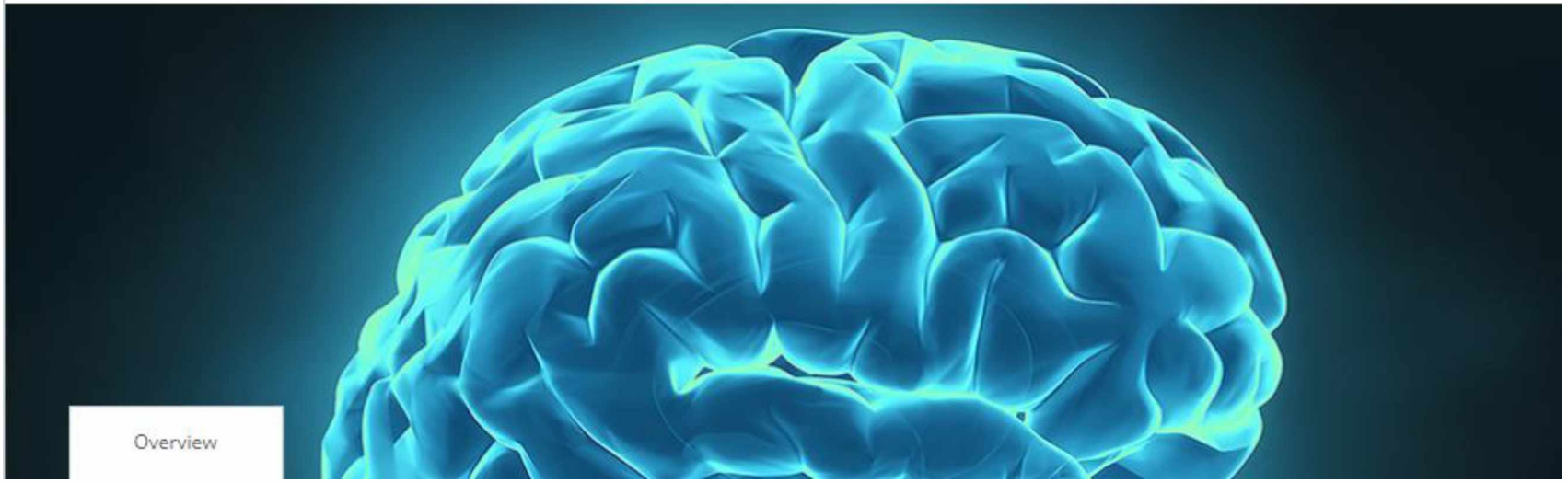
istec Ibero-American Science & Technology Education Consortium

# Reverse-Engineer the Brain




*The intersection of engineering and neuroscience promises great advances in health care, manufacturing, communication and* ***EDUCATION***

"Computers capable of emulating human intelligence"

http://www.engineeringchallenges.org/challenges/9109.aspx

Luis Fernando Cruz Q., MD.,Ph.D., Director

- Research area:
  - ✓ Theoretical Model of Neurobiological Computation to Solve Complex Problems in Higher Education Based on the Sciences of Complexity

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SCED Complex Systems & Education

istec Ibero-American Science & Technology Education Consortium

# "NEUROAPRENDIZAJE Y FORMACIÓN INTEGRAL DESDE LA PERSPECTIVA DE LOS SISTEMAS COMPLEJOS ADAPTATIVOS"

Luis Fernando Cruz Q MD., Ph.D.

Director del SCED-ISTEC

USF UNIVERSITY OF SOUTH FLORIDA

MOFFITT CANCER CENTER

Shraddha Pandey
Ph.D. Student at the University of South Florida
MRI Based Research

## Research Objective

The research objective is to optimize raw (k-space) data acquisition so as to maximize the performance of a differential diagnostic computed from MRI data:

- Imaging speed is important in many MRI applications. However, the speed at which data can be collected in MRI is fundamentally limited by physical and physiological constraints.
  - ✓ A patient at times spends around 45 minutes to obtain couple of MRI scans.
  - ✓ Hence, researchers are trying to optimize the inverse transform algorithms to obtain MRI images with reduced sample acquisition (i.e. below sampling frequency).

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# Secure Cyberspace


It's more than preventing identity theft. Critical systems in banking, national security, and physical infrastructure may be at risk.

http://www.engineeringchallenges.org/challenges/cyberspace.aspx

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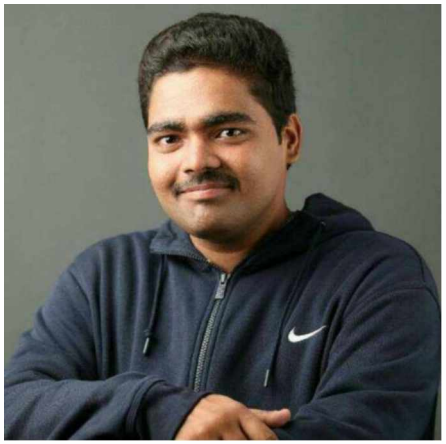
istec
Ibero-American Science & Technology Education Consortium

# Performing research in the area of Hardware Security and Cyber Security

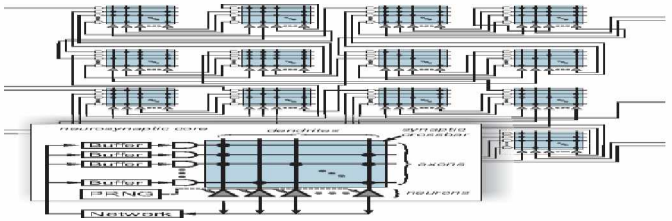
- Developing the ConOps for:
  - The DeliverLogic "Autonomous Food Delivery System"
  - The FPL Drone application
- Validation for the Hardware Security of this project using FPGA's (Field Programmable Gate Array).



Sai Praneeth Sagi
Department of Electrical Engineering
Dr. Moreno and Dr. Katkoori.

Ali Shiri Sichani

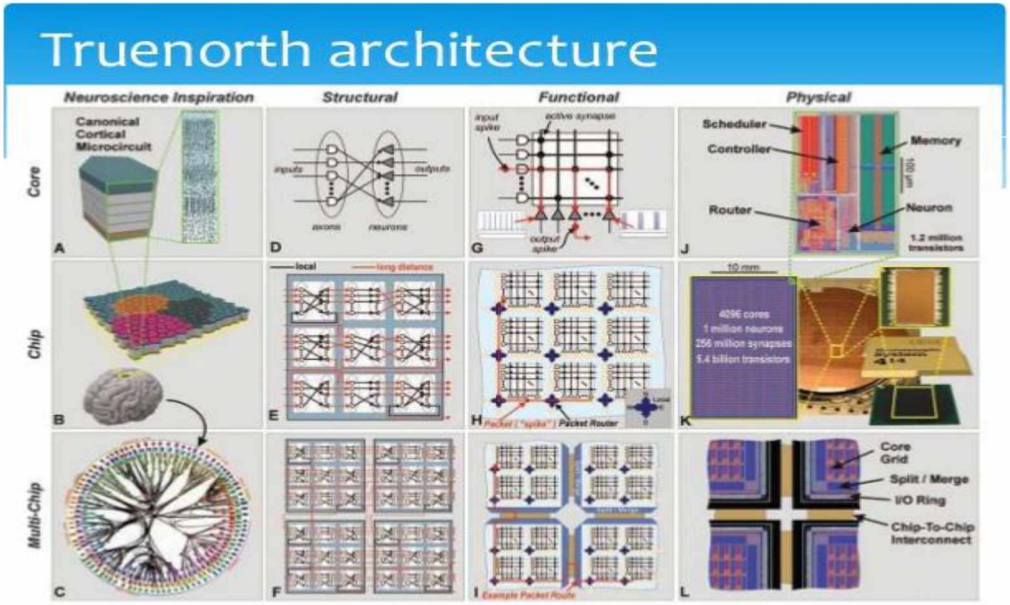
I am PhD student in electrical engineering department at University of South Florida. Already I am pursuing my research in the area of Analog-VLSI neuromorphic circuit design.




The area of neuromorphic circuit design is a multidisciplinary research which combines various knowledge and skills from assorted research fields to create non Von Neuman architecture to be used in Analog & Digital VLSI application where there is a HUGE Data computing need. My research consists of different aspects, the first part of research is related to design of some algorithms and partial architectures towards general purpose computer architecture. The second and third section of research are concentrated on synaptic devices and TrueNorth architecture methodology.

## TrueNorth Architecture Wise design

TrueNorth architecture methodology is the technique to design partial circuit architecture or fully circuit architecture for non VonNeuman computer. The third part of this research focuses on design of partial circuit architecture to satisfy the demand of huge data computing.



# Advance Personalized Learning


Instruction can be individualized based on learning styles, speeds, and interests to make learning more reliable.

http://www.engineeringchallenges.org/challenges/learning.aspx

# I + D+ E


- COGNICIÓN, APRENDIZAJE Y RESOLUCIÓN DE PROBLEMAS
- PEDAGOGÍA Y CURRÍCULO
- LIDERAZGO ADAPTATIVO
- GESTIÓN E INFORMACIÓN


Complex Systems & Education
SCED istec
A MODEL TO PEDAGOGICALLY SUPPORT TEACHING & LEARNING SCENARIOS FOR ENGINEERING INNOVATION FROM A COMPLEX SYSTEMS PERSPECTIVE
Luis Fernando Cruz Quiroga[1,3]
Wilfrido Alejandro Moreno[1,2,3]
Dulce Garcia[1,3]
[1]Complex Systems & Education Network – ISTEC (SCED-ISTEC)
[2]University of South Florida, College of Engineering (USF)
[3]Ibero-American Science and Technology Education Consortium (ISTEC)
Abstract
IV INTERNATIONAL BIENNIAL SYMPOSIUM
"COMPLEXITY 2011 – FOR A SUSTAINABLE DEVELOPMENT"
EDUCATION, COMPLEXITY, INTERDISCIPLINARITY, TRANSDISCIPLINARITY
June 2011
UNIVERSITY OF CAMAGUEY CUBA
MODELING AND EDUCATIONAL SIMULATION AS A BASIS FOR SUSTAINABLE DEVELOPMENT
Curricular Development for Engineering Education to Meet the Challenges of the XXI Century from a Complexity Perspective
Luis Fernando Cruz MD., Ph.D.
Wilfrido Moreno Ph.D., P.E.
Abstract
Keywords: engineering curriculum, transdisciplinarity, education, curriculum, complexity, engineering, assessment, educational modeling and simulation
Complex Systems as a Basis for Education and Pedagogy in the 21st Century
Luis Fernando Cruz Quiroga MD PhD(c)
Abstract — Pedagogy as a science of education must be epistemologically grounded on complex systems, being a contemporary scientific paradigm that explains the processes of teaching and learning based on a neural network that integrates biological, genetic, electrochemical, and social elements in a complex reality that is surrounded by uncertainty,
So far the educational and pedagogical processes have been planned and developed for stability and certainty, but the education of the future has been oriented towards probable states (uncertain ones), into the unknown, where the university professors of different disciplines must be prepared to move and manage volatile and uncertain contexts. Therefore, it is necessary to develop an epistemology that responds to the demands of reality and to the current knowledge of society.
Education and pedagogy as a grounding science should start from the understanding of complexity processes, grounded in the complexity of the neural network and its nonlinear and uncertain connectivity, in order to design effective didactic and learning
ISTEC 2011 GA e-books now available
Artificial Neural Network for Drug Design, Delivery and Disposition
USF UNIVERSITY OF SOUTH FLORIDA

USF UNIVERSITY OF SOUTH FLORIDA

# Adaptive Game-Based Learning using Psychophysiological Measurements from a Control Theory Perspective


**Liliana Villavicencio**

Major Professor: Wilfrido Moreno, Ph.D.

*Department of Electrical Engineering*

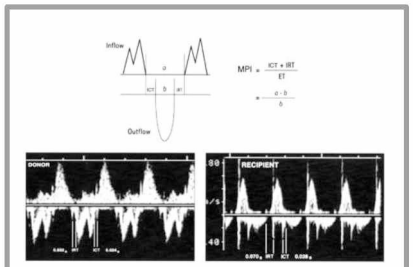
*College of Engineering.*

*University of South Florida*

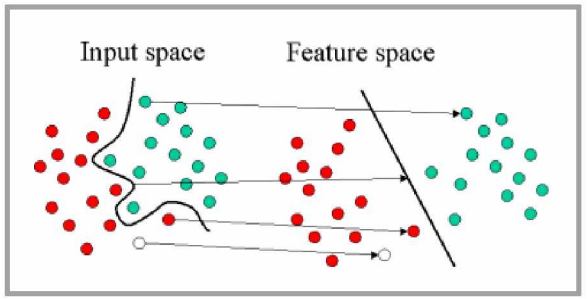

September, 2018

USF UNIVERSITY OF SOUTH FLORIDA

# Proposed Feedback System




EEG Brain Waves




Classification

Emotions Diagnosis
+
Somatic Responses

Learning
Feedback
Adaptive
System

Physiological


# Kishore Kumar Kadari

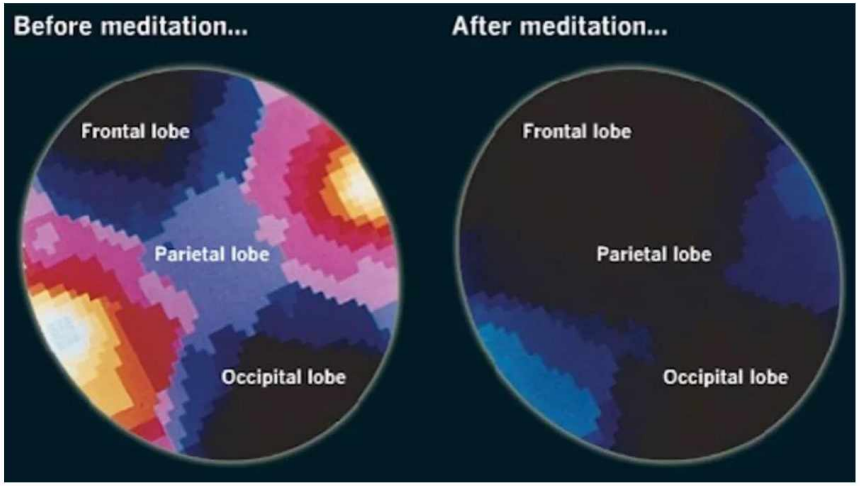
# Doctoral Research

My Current Research is on Precision therapy and Meditation therapy

I have been studying AI to pursue my research

# Key aspects of our research

- Study of Biochemical reaction Network
- Machine learning from meditation
- Compassionate AI for precision therapy




# Make Solar Energy Economical


*Solar energy provides less than 1% of the world's total energy, but it has the potential to provide much, much more.*

http://www.engineeringchallenges.org/challenges/solar.aspx

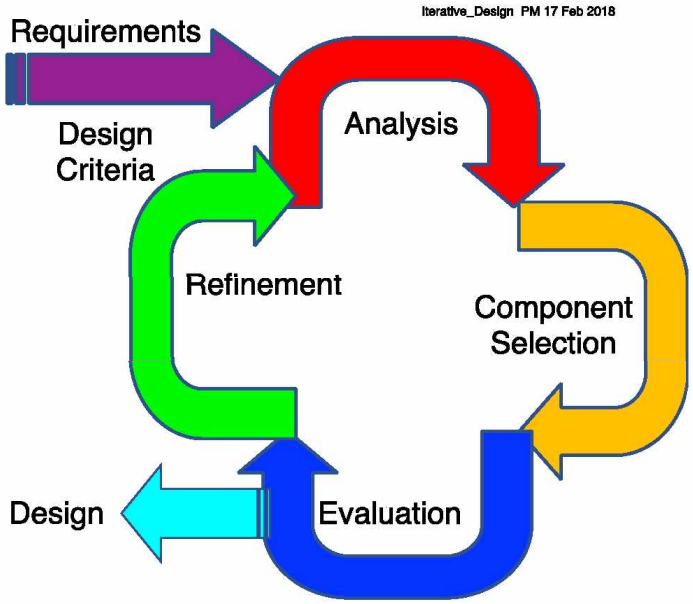
USF
UNIVERSITY OF SOUTH FLORIDA

# Ph.D. Dissertation Work In Process:

## Design and Implementation of a System for Economic Optimization of Energy Production for Solar Power Plants

- TECO Big Bend (Tampa, Florida USA)
  - 23 MW output
  - Over 200,000 modules
  - Only 9 MPPT inverters
  - Performance metrics on groups of ≈ 22K panels
- No detailed performance measurement on
  - Individual Modules
  - Strings of Modules
  - Smaller Array of Modules

- Systems View
- Economic Analysis
- System Design
- Validation




Peter Michael, P.E., PMP, PSP, Meng
Renewable Energy Outreach Director
FGCU ETI: pmichael@fgcu.edu

University of South Florida
PhD Electrical Engineer Candidate
prm@mail.usf.edu

Electrical & Systems Engineer
30+ years of Industry Experience

# Engineer the Tools of Scientific Discovery


*In the century ahead, engineers will continue to be partners with scientists in the great quest for understanding many unanswered questions of nature.*

http://www.engineeringchallenges.org/challenges/discovery.aspx

USF UNIVERSITY OF SOUTH FLORIDA

NREC Nanotechnology Research & Education Center

# Design and Simulation of a Miniature Cylindrical Mirror Auger Electron Spectrometer with Secondary Electron Noise Suppression

## Dissertation Defense

**Ph.D. Electrical Engineering**

**11-1-2017**

**Jay Bieber**

**Major Professor: Wilfrido A. Moreno, Ph.D.**

**Chair: Yashwant Pathak, Ph.D.**

**Committee:**
Sanjukta Bhanja, Ph.D.
Fernando Falquez, Ph.D.
John Kuhn, Ph.D.
Eduardo Rojas-Nastucci, Ph.D.
Paris Wiley, Ph.D.

## Research Contribution

A portable miniaturized electron spectroscopy instrument capable of measuring the elemental composition and thickness of thin films used in nanoscale devices and structures.

***Features***

- Auger Electron Spectrometer (AES) system with ~0.4 to 5nm depth resolution.
- Miniaturized instrument for low cost and portability.

***...t I... that use ...***

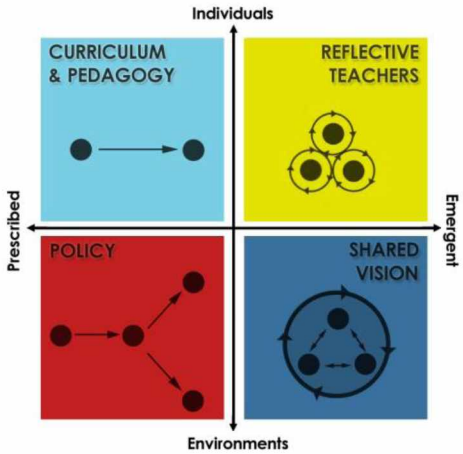
Manufacturing
Semiconductors
Metals
Solar PV films
Coat...
Heal...
Ener...
Mini...
Telecommunications



**Courtesy of Randy Dellwo President of RBD Instruments Inc. of Bend Oregon**

# Systemic Approaches to Facilitating Undergraduate STEM Change

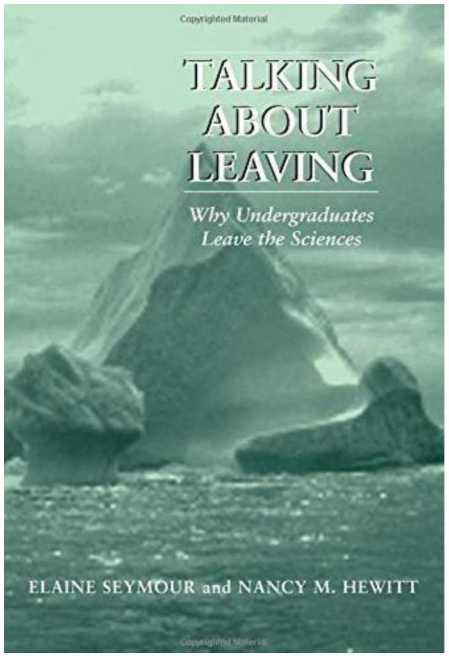
**Andrea L. Beach, PhD**
Professor, Higher Education Leadership
Co-Director, Center for Research on Instructional Change in Postsecondary Education
Western Michigan University




University of South Florida
February 2, 2017

# Undergraduate STEM Teaching in the US

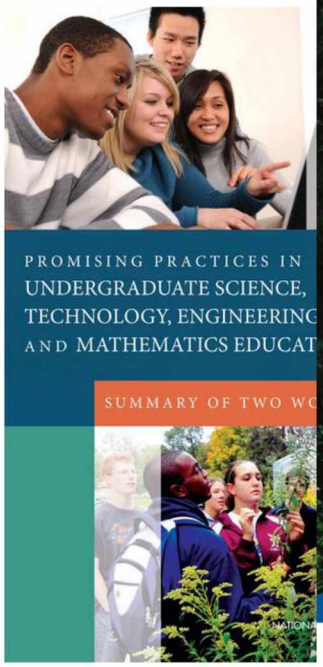
- ~400K new STEM students annually in BA programs*
- Half (48%) do not graduate with a STEM degree †
  - This trend has persisted for over 20 years ‡
  - A big reason for leaving is poor teaching practices‡

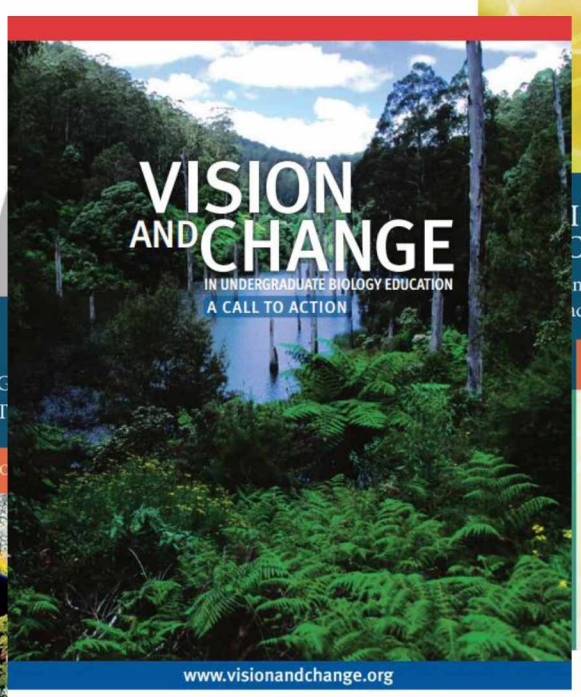


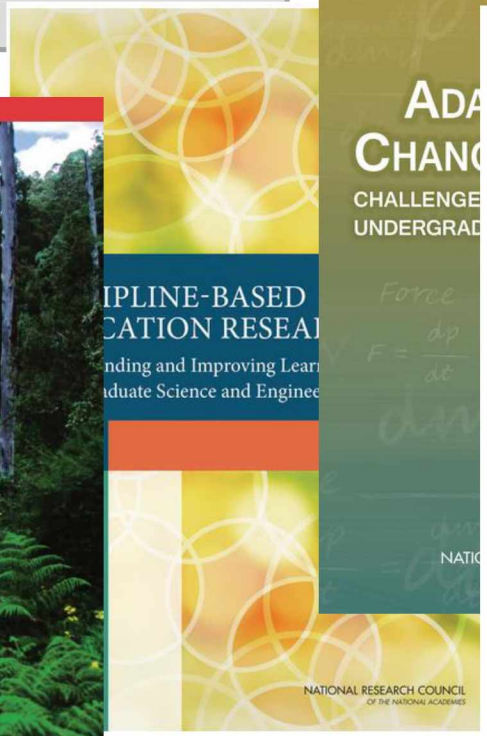

*NSF, Science and Engineering Indicators 2012 http://www.nsf.gov/statistics/seind12/pdf/c02.pdf
†NCES, STEM Attrition: College Students' Paths Into and Out of STEM Fields http://nces.ed.gov/pubs2014/2014001rev.pdf
‡Seymour and Hewett (1997)

# Problems have been identified....

"Improving undergraduate teaching is integral to meeting the pressing national need for more STEM majors." (AAU, 2011, p. 2)

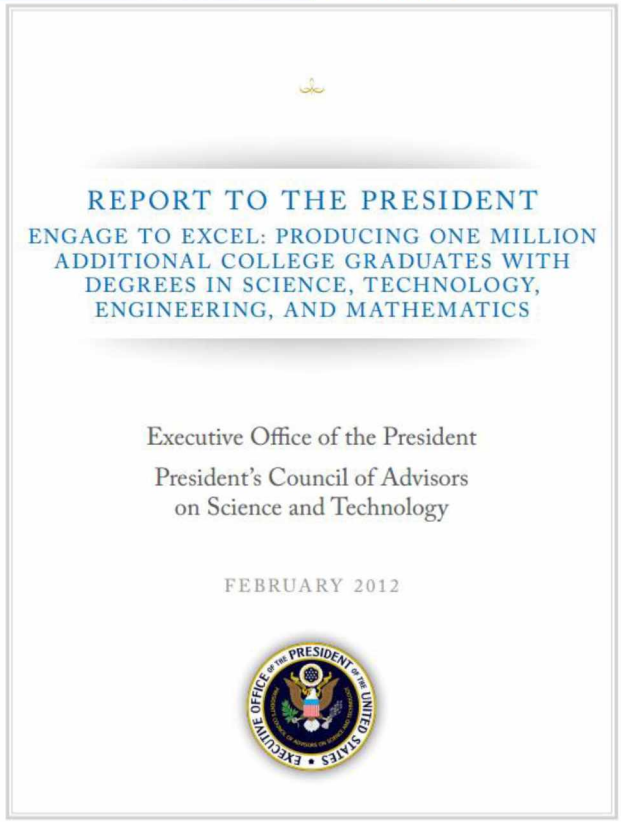









**Association of American Universities**
**Five-Year Initiative for Improving Undergraduate STEM Education**

DISCUSSION DRAFT
Updated October 14, 2011

**Introduction**
The Association of American Universities (AAU) is a nonprofit organization of 59 U.S. and two Canadian leading research universities. AAU's work focuses on issues that are important to research-intensive universities, including undergraduate education. Improving science, technology, engineering, and mathematics (STEM) education for undergraduates is a long-term challenge and a
se at the forefront of addressing this need.
issue, but it has taken on new resonance in
tes has increased. Along with the

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istec Ibero-American Science & Technology Education Consortium

# ***Should*** also Faculty Take Responsibility to Understand/Teach/Facilitate Learning in Engineering……?

# Academy for Teaching and Learning Excellence




Workshops

Full-Time Faculty

New Faculty

USF UNIVERSITY OF SOUTH FLORIDA.

istec Ibero-American Science & Technology Education Consortium

## STS-03: Flip it!


**MAY 11-12, 2016**

"Flip it!" - faculty explored the "flipped classroom" technique of moving content delivery to online only, and doing only activities in seat time. Topics discussed included everything from technical options and tweaks to best practices for using the newfound free class time.

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## STS-04: Game On!


**MAY 10-11, 2017**

Faculty learned about gamification, which involves applying the principles that make games fun and motivating in order to engage learners. Breakout and core sessions covered the lessons from games that can be adapted for the classroom.

STS-05: Motivating Students

STS-05
Inspiring Students
2018

**MAY 9-10, 2018**

At this year's event, faculty learned about motivating and inspiring students - particularly methods to help instill intrinsic motivation in them.

# The 2015 Summer Teaching Symposium ( STS-02)

## **"The Science of Learning"**

May 5-6, 2015

8:30 a.m.- 4:00 p.m.


- ✓ Faculty explored how lessons from brain science offer direct suggestions for more effective ways to:
  - ✓ Structure course assignments
  - ✓ Deliver lectures and content
  - ✓ Encourage student memory and retention.


The 2015 Summer Teaching Symposium ( STS-02)
"The Science of Learning"

Plenary Talk by Dr. Doug Rohrer

# "Evidence-based Instruction: what works, what doesn't"

**Dr. Doug Rohrer,** B.S. in Mathematics, M.A., Ph. D. in Psychology
**Research:** Most of his research concerns memory. Currently, his principal line of research examines and assesses various learning strategies. One aim of this research is **to identify pedagogical techniques that improve students' long-term retention of information learned in school.**

aps
ASSOCIATION FOR PSYCHOLOGICAL SCIENCE

Psychological Science in the Public Interest
14(1) 4–58

DOI: 10.1177/1529100612453266
http://pspi.sagepub.com
SAGE

# Improving Students' Learning With Effective Learning Techniques: Promising Directions From Cognitive and Educational Psychology

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## Summary

Many students are being left behind by an educational system that some people believe is in crisis. Improving educational outcomes will require efforts on many fronts, but a central premise of this monograph is that one part of a solution involves helping students to better regulate their learning through the use of effective learning techniques. Fortunately, cognitive and educational psychologists have been developing and evaluating easy-to-use learning techniques that could help students achieve their learning goals. In this monograph, we discuss 10 learning techniques in detail and offer recommendations about their relative utility. We selected techniques that were expected to be relatively easy to use and hence could be adopted by many students. Also, some techniques (e.g., highlighting and rereading) were selected because students report relying heavily on them, which makes it especially important to examine how well they work. The techniques include elaborative interrogation, self-explanation, summarization, highlighting (or underlining), the keyword mnemonic, imagery use for text learning, rereading, practice testing, distributed practice, and interleaved practice.

To offer recommendations about the relative utility of these techniques, we evaluated whether their benefits generalize across four categories of variables: learning conditions, student characteristics, materials, and criterion tasks. Learning conditions include aspects of the learning environment in which the technique is implemented, such as whether a student studies alone or with a group. Student characteristics include variables such as age, ability, and level of prior knowledge. Materials vary from simple concepts to mathematical problems to complicated science texts. Criterion tasks include different outcome measures that are relevant to student achievement, such as those tapping memory, problem solving, and comprehension.

We attempted to provide thorough reviews for each technique, so this monograph is rather lengthy. However, we also wrote the monograph in a modular fashion, so it is easy to use. In particular, each review is divided into the following sections:

aps ASSOCIATION FOR PSYCHOLOGICAL SCIENCE

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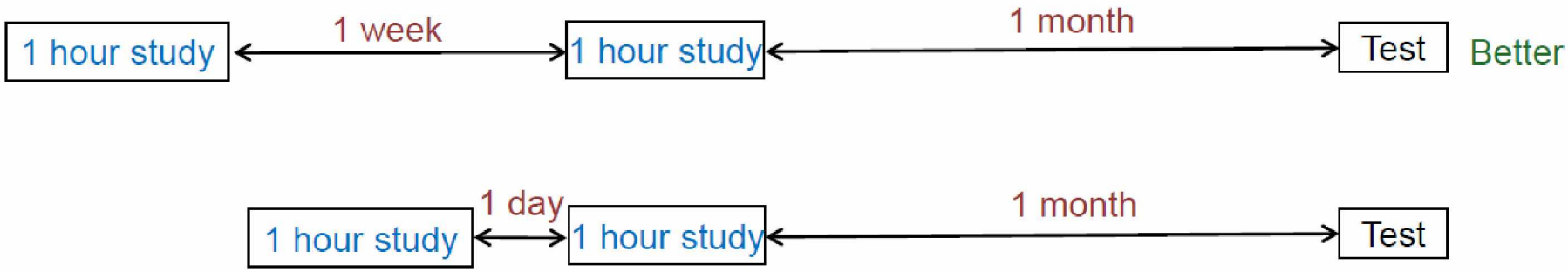
**Table 4.** Utility Assessment and Ratings of Generalizability for Each of the Learning Techniques

| Technique | Utility | Learners | Materials | Criterion tasks | Issues for implementation | Educational contexts |
|---|---|---|---|---|---|---|
| Elaborative interrogation | Moderate | P-I | P | I | P | I |
| Self-explanation | Moderate | P-I | P | P-I | Q | I |
| Summarization | Low | Q | P-I | Q | Q | I |
| Highlighting | Low | Q | Q | N | P | N |
| The keyword mnemonic | Low | Q | Q | Q-I | Q | Q-I |
| Imagery use for text learning | Low | Q | Q | Q-I | P | I |
| Rereading | Low | I | P | Q-I | P | I |
| Practice testing | High | P-I | P | P | P | P |
| Distributed practice | High | P-I | P | P-I | P | P-I |
| Interleaved practice | Moderate | I | Q | P-I | P | P-I |

Note: A positive (P) rating indicates that available evidence demonstrates efficacy of a learning technique with respect to a given variable or issue. A negative (N) rating indicates that a technique is largely ineffective for a given variable. A qualified (Q) rating indicates that the technique yielded positive effects under some conditions (or in some groups) but not others. An insufficient (I) rating indicates that there is insufficient evidence to support a definitive assessment for one or more factors for a given variable or issue.

**Distributed Practice**
**"Spacing"**

## The spacing effect.




Longer spacing gaps → Greater test scores

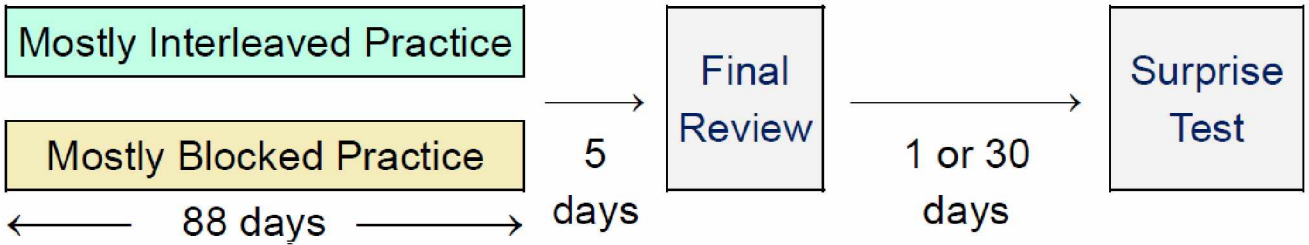
(e.g., Dunlosky et al., 2013; Roediger & Pyc, 2012; Rohrer & Pashler, 2010;

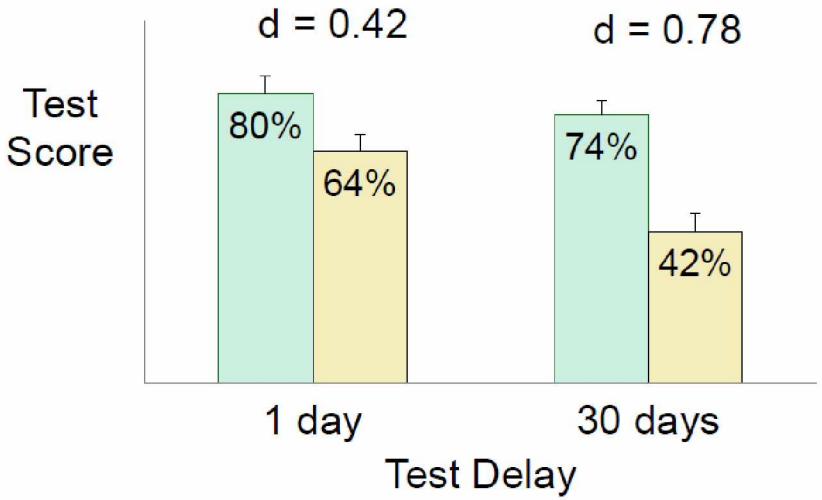
and dozens  and dozens more)

**Interleaved Practice**

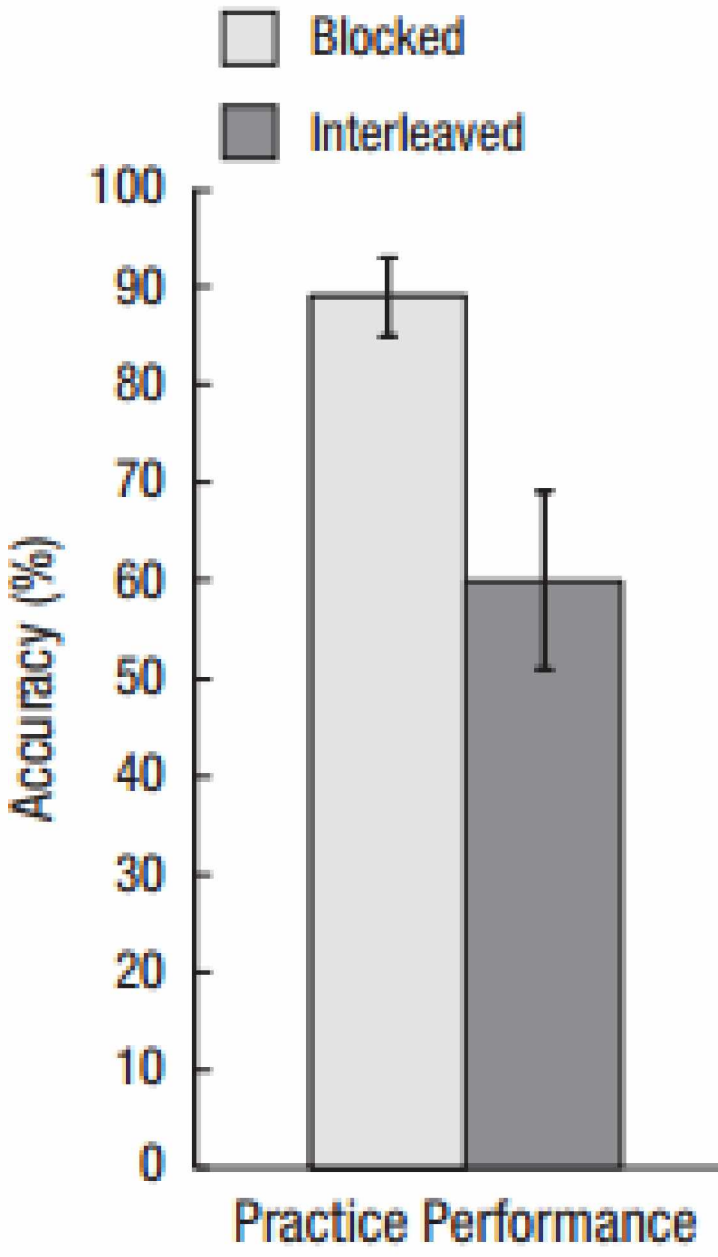
Interleaved practice, in which students alternate their practice of different kinds of topics or problems.

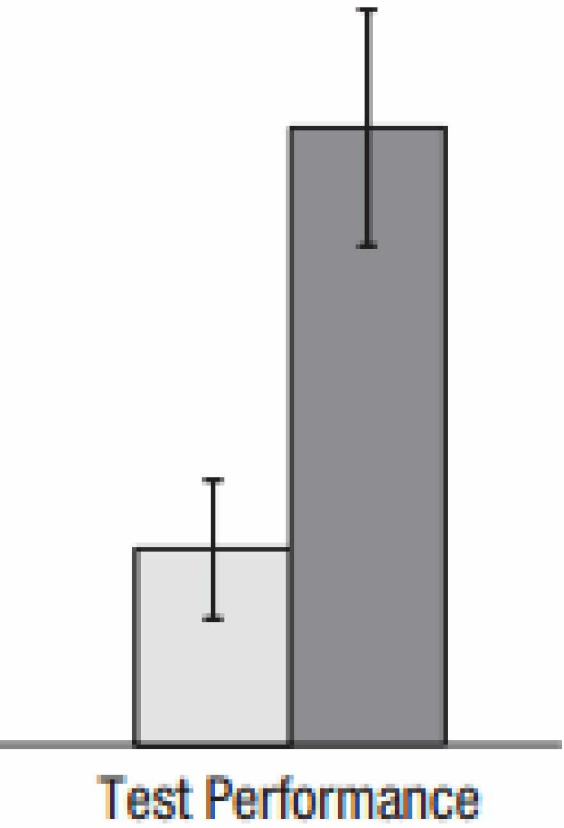
Interleaved practice boosts test scores, especially in the long run




(Rohrer, Dedrick, & Stershic, 2015)


Blocked
Interleaved
100
90
80
70
60
50
40
30
20
10
0
Accuracy (%)
Practice Performance


Test Performance

The Florida Consortium of Metropolitan Research Universities is a joint effort of Florida International University, The University of Central Florida, and The University of South Florida

- ✓ Faculty Learning Communities (FLCs) in Chemistry, Biology, Mathematics, Physics, and Engineering.

- ✓ FLCs are charged to:
  1. Analyze data on student retention and graduation in their respective disciplines
  2. Investigate innovative programs and policies that may contribute to higher completion rates and student learning

USF UNIVERSITY OF SOUTH FLORIDA

# PEER OBSERVATION PROGRAM

## WHAT IS IT?

A team-based peer observation program sponsored by the NSF-funded STEER grant, in collaboration with the Academy for Teaching and Learning Excellence (ATLE).

The focus is on collecting and sharing data in a non-evaluative way that benefits both the observer and the instructor being observed. Participants are placed in interdisciplinary teams of three in which discussions are highly encouraged.

## PROGRAM REQUIREMENTS

1. Complete a brief online pre-observation survey
2. Attend a kickoff event (9 am – 12 pm; early January date TBA) where you meet your team, learn about the program and schedule your observations
3. Observe the two other faculty members in your team one time each and participate in a debrief session one-on-one afterward
4. Participate in one of the COMMON observation opportunities
5. Deliver a written reflection on what was learned, and how your teaching may change going forward
6. Attend a closing event in April (TBD)

## MORE INFO

Upon completion of these activities you will receive a $500 stipend from STEER. Additional support will be available to help you implement a new strategy, if desired.

## IF INTERESTED

Contact:
Catherine Bénéteau
cbenetea@usf.edu

Systemic Transformation of Education through Evidence-Based Reforms (STEER) NSF DUE#1525574

# Innovación ….

"En realidad la mayoría de innovaciones son creadas a través de REDES – grupos de personas trabajando en "concordancia"

Dr. Andrew B. Hargadon
Professor of Management
Director, Technology Management Programs
Faculty Director, UC Davis Center for Entrepreneurship

## Definición de Desarrollo Sustentable (Naciones Unidas):

El desarrollo sustentable es el desarrollo que satisface las necesidades del presente sin comprometer la capacidad de las generaciones futuras para satisfacer sus propias necesidades

**A PRIMER ON: SUSTAINABLE TECHNOLOGY AND DEVELOPMENT**
CAROL CARMICHAEL
INSTITUTE FOR SUSTAINABLE TECHNOLOGY AND DEVELOPMENT
GEORGIA INSTITUTE OF TECHNOLOGY

Dr. Victor Mercader

# The Millennium Project Cont..

"Son tiempos de grandes oportunidades y optimismo puesto que la aplicación de las nuevas tecnologías emergentes no sólo tienen la capacidad de mejorar la calidad de vida, pero también permiten la creación y el florecimiento de nuevas comunidades y instituciones sociales mejor preparadas para afrontar las necesidades de nuestra sociedad"

**http://milproj.ummu.umich.edu/home/**

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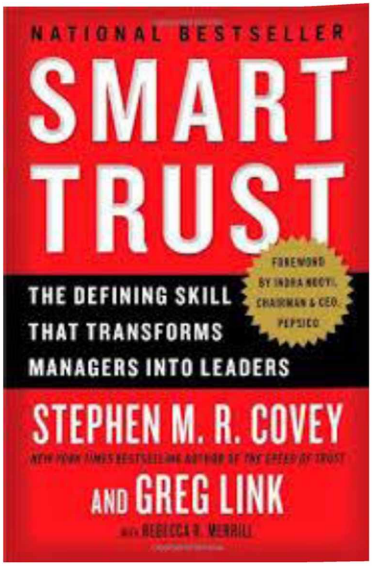
istec Ibero-American Science & Technology Education Consortium

SCED Complex Systems & Education istec

# Muchas Gracias .....

www.istec.org

wmoreno@usf.edu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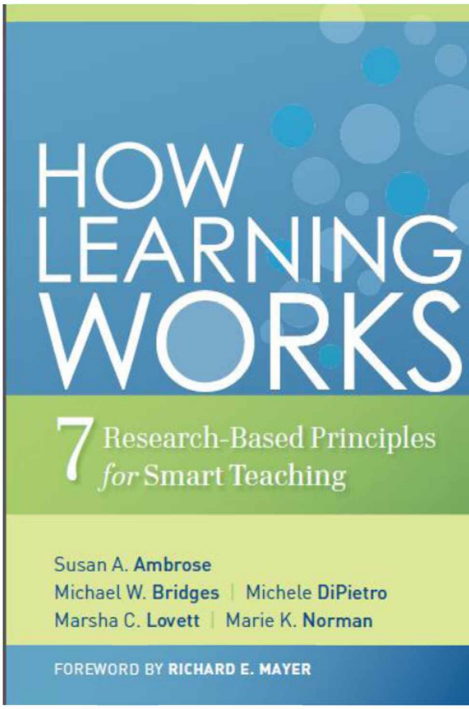
FOREWORD BY INDRA NOOYI, CHAIRMAN & CEO, PEPSICO
THE DEFINING SKILL THAT TRANSFORMS MANAGERS INTO LEADERS
STEPHEN M. R. COVEY
AND GREG LINK
with REBECCA R. MERRILL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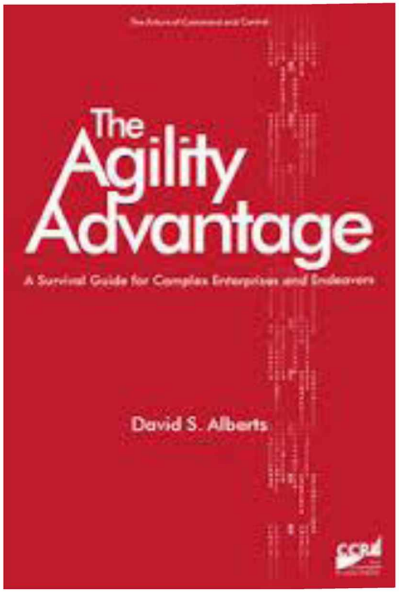
7 Research-Based Principles for Smart Teaching
Susan A. Ambrose
Michael W. Bridges | Michele DiPietro
Marsha C. Lovett | Marie K. Norman
FOREWORD BY RICHARD E. MAYER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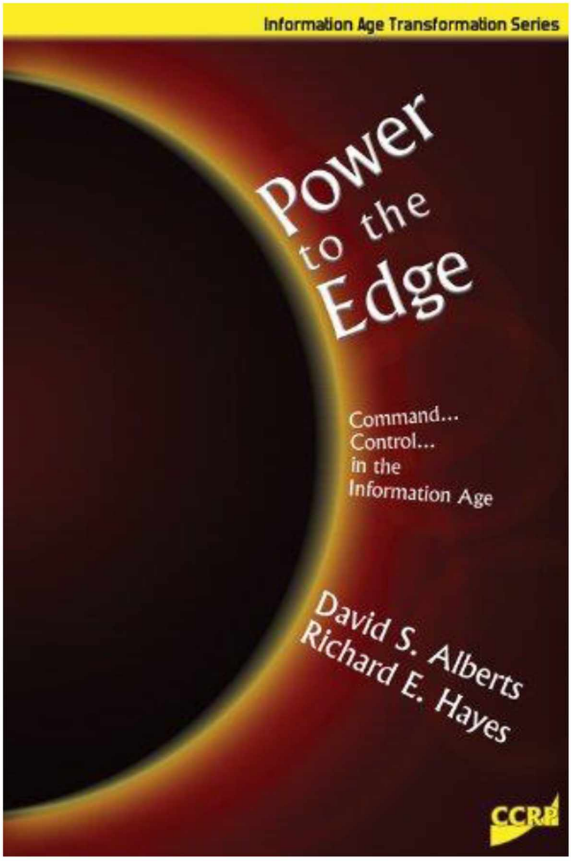
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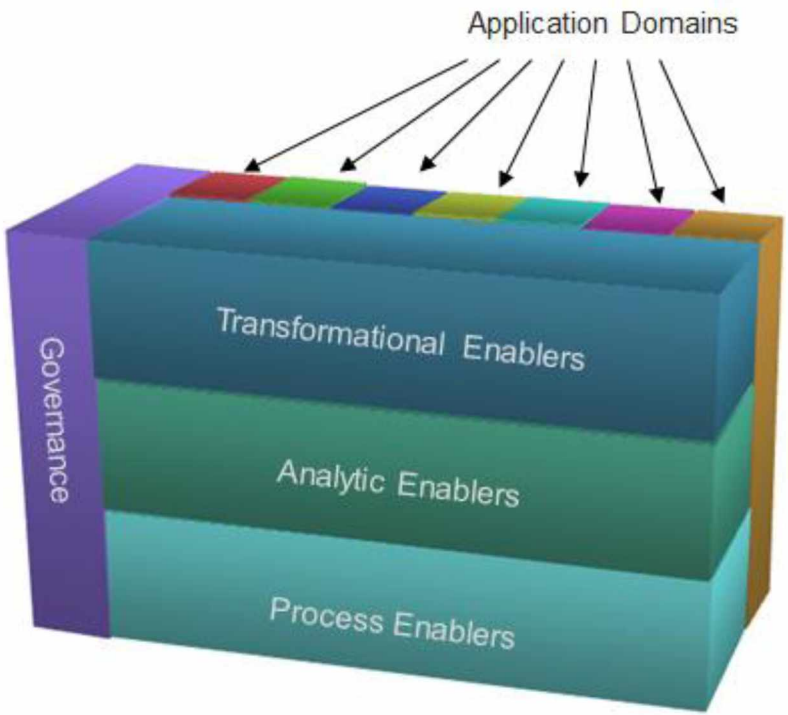
David S. Alberts
Richard E. Hayes
CCRP

# Working Groups

- Technical Operations Working Groups create the resource practitioners need.
- Discuss, collaborate, share in person and online
- Over  40 Working Groups with a wide diversity of interests.



# Working Groups

| | | | | |
|---|---|---|---|---|
| **Lean Systems Engineering** ★<br>Robert Bordley / John Drogosz / Arthur Hyde<br>Transformational | **Life Cycle Management**<br>Gary Langford<br>Process Enablers | **MBSE Initiative**<br>Mark Sampson<br>Transformational | **Measurement** ★<br>Paul Frenz<br>Process Enablers | **Model-based Conceptual Design**<br>David Harvey / Michael Vinarcik<br>Transformational |
| **NAFEMS-INCOSE Systems Modeling & Simulation**<br>Roger M. Burkhart<br>Transformational | **Natural Systems** ★<br>Curt McNamara<br>Analytic Enablers | **Object-Oriented SE Method**<br>Howard Lykins<br>Transformational | **Oil and Gas** ★<br>Mia Zager<br>Application Domains | **Ontology (under construction)**<br>Juan Llorens / Anabel Fraga<br>Transformational |
| **Patterns**<br>Bill Schindel<br>Transformational | **PM-SE Integration**<br>Jean-Claude Roussel / Tina Srivastava / Gary<br>Process Enablers | **Power & Energy Systems** ★<br>Ray Beach / John Juhasz<br>Application Domains | **Process Improvement**<br>John Clark<br>Transformational | **Product Lines**<br>Hugo Chale / Alain Leput / Dr. Charles Krueger/<br>Analytic Enablers |

# Working Groups

| | | | | |
|---|---|---|---|---|
| **Reliability Engineering**  Albertyn Barnard — Analytic Enablers | **Requirements** Michael J. Ryan / Lou Wheatcraft — Process Enablers | **Resilient Systems** John Brtis — Analytic Enablers | **Risk Management** Jack Stein / Bob Parro — Process Enablers | **SE in VSE** Angela Robinson / Ken Ptack / Claude Laporte / — Transformational |
| **Space Systems** David Kaslow — Application Domains | **System and Software Interface** Sarah Sheard / Mike Pafford / Edmund Kienast — Transformational | **System of Systems**  Alan Harding / Judith Dahmann — Analytic Enablers | **Systems Science** James Martin — Transformational | **Systems Security Engineering**  Rick Dove / Keith Willett / Beth Wilson / Ken Kepchar — Analytic Enablers |
| **Tools Integration & Model Lifecycle Management** John Nallon / Lonnie VanZandt — Transformational | **Training**  John Clark — Analytic Enablers | **Transportation**  Dale Brown / Nita Rabadia / David Rojas — Application Domains | | |