

# XXI Century Global Challenge: Engineering, Education and Complexity

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- On May 25, 1961, President John F. Kennedy announced before a special joint session of Congress the dramatic and ambitious goal of sending an American safely to the Moon before the end of the decade. A number of political factors affected Kennedy's decision and the timing of it. In general, Kennedy felt great pressure to have the United States "catch up to and overtake" the Soviet Union in the "space race." Four years after the Sputnik shock of 1957, the cosmonaut Yuri Gagarin had become the first human in space on April 12, 1961, greatly embarrassing the U.S. While Alan Shepard became the first American in space on May 5, he only flew on a short suborbital flight instead of orbiting the Earth, as Gagarin had done. In addition, the Bay of Pigs fiasco in mid-April put unquantifiable pressure on Kennedy. He wanted to announce a program that the U.S. had a strong chance at achieving before the Soviet Union. After consulting with Vice President Johnson, NASA Administrator James Webb, and other officials, he concluded that landing an American on the Moon would be a very challenging technological feat, but an area of space exploration in which the U.S. actually had a potential lead. Thus the cold war is the primary contextual lens through which many historians now view Kennedy's speech.
- The decision involved much consideration before making it public, as well as enormous human efforts and expenditures to make what became Project Apollo a reality by 1969. Only the construction of the Panama Canal in modern peacetime and the Manhattan Project in war were comparable in scope. NASA's overall human spaceflight efforts were guided by Kennedy's speech; Projects Mercury (at least in its latter stages), Gemini, and Apollo were designed to execute Kennedy's goal. His goal was achieved on July 20, 1969, when Apollo 11 commander Neil Armstrong stepped off the Lunar Module's ladder and onto the Moon's surface.
- In honor of Kennedy's historic speech, below are some documents and other information relating to the decision to go to the Moon and Project Apollo that we hope you find useful.

### Misión ambiciosa para ese momento

Una primera parte de necesidades globales, o algo así

NOISE CANCELLATION - audifonos



# Scientific Grand Challenges.....

## Scientific Grand Challenges Workshop Series



*Engaging science communities to discuss scientific grand challenges and the role of scientific computing*

### Climate

DOE is in the process of, in partnership with the other Science program offices, organizing a series of meetings, each focusing on the role of scientific computing in addressing one of the relevant scientific communities. The primary goal of the series is to identify the opportunities and challenges associated with scientific computing and multi-disciplinary partnerships.

### Material Science & Chemistry

### Nuclear Physics

The series is limited to approximately 50 invited technical leaders in the field of extreme scale computing, with a highly focused agenda targeted at identifying ways to overcome challenging technical issues and develop recommendations. The series will produce a report for the U.S. Department of Energy's Advanced Scientific Computing Research (ASCR) program office that has the specific scientific domain in its portfolio. The reports will also be available to the broad scientific and general community.

### National Security

### High Energy Physics

### Biology & Biofuels

The series is being organized by a coordinating committee. All meetings held with an overview of all the recommendations common to all meetings.

### Exascale Computing

### Energy

Source: DOE Office of Science, ASCR  
<http://www.er.doe.gov/ascr/Misc/GrandChallenges.html>

# 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>

# The Millennium Project



Where is complexity science headed?

One of the most exciting aspects of complexity science is its interdisciplinary nature, and the interface with the life sciences is paramount here. Biology (from ecology, to organismic biology, to neurology, to cellular biology, and molecular biology) is filled with marvellous examples of complex adaptive systems that not only cope with emergent dynamical behaviours but have adapted to control and exploit them in every way imaginable. A lot of research in complexity science is looking for ways to model, understand and extract the useful properties of biological systems. This is both with a view to better understanding of the biological systems systems biology and for inspiration for new approaches to solving technological and engineering challenges.

In the figure below, the left side lists some biological complex systems, and the right side list some example systems from ICT (information and communication technology) that need new approaches to handling complexity. The topics in the centre are examples of subjects that help connect the biological inspiration on the left with the challenges on the right.

Social insect foraging and collective construction behaviour

Economic mechanism design/market based mechanisms

Neurons: mechanisms and coding

Large-scale software development

Evolution and population dynamics

Infrastructure networks

DNA and self-replication

Peer-to-peer architectures

Epidemics and transmission

Semantic web

Metabolic networks

Grid computing

Gene regulation networks

Telecoms

Immune systems and repair

Infrastructure growth

Ecosystems stability and sustainability

World-Wide-Web

Morphogenesis and pattern formation

Network reconfiguration

Molecular evolution and Enzymatic reactions

Business organisation and operations

Cellular differentiation and developmental plasticity

Software dependency and encapsulation

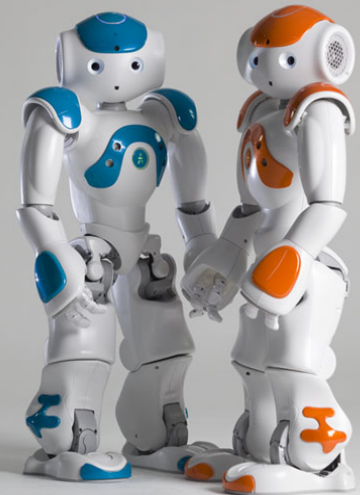
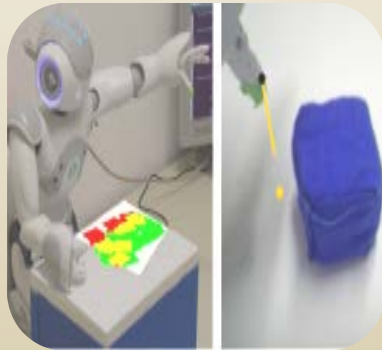
- 
- ◆ Dynamical systems
  - ◆ Network science ◆ Monte-Carlo simulation ◆ Graphical models/Bayes Nets ◆ Percolation models ◆ Associative memory ◆ Feedback control ◆ Machine learning
  - ◆ Statistical theory of complex systems
  - ◆ Algorithms for learning from examples
  - ◆ Game theory ◆ Information theory, probability
  - ◆ Developmental representations/evolutionary design
  - ◆ Computational complexity measures
  - ◆ Principles and concepts of Modularity
  - ◆ Population genetics ◆ Meta-languages ◆ Self-organisation ◆ Spontaneous symmetry breaking
  - ◆ Artificial life/simulation modelling ◆ Time-series analysis ◆ Evolutionary Algorithms
  - ◆ Amorphous computing
  - ◆ Autonomic computing

The model is pedagogically based on the theory of Complex Systems. It is understood educational reality as a complex adaptive system characterized by multiple interactions between faculty, students, context, information etc. that generate collective patterns not attributable to its isolated components. These patterns are given in different levels or subsystems with non-linear dynamics and heterogeneous behavior characterized by ruptures, forks and uncertain emerging processes, change the order from the disorder and from the disorder is feedback and auto-organize.

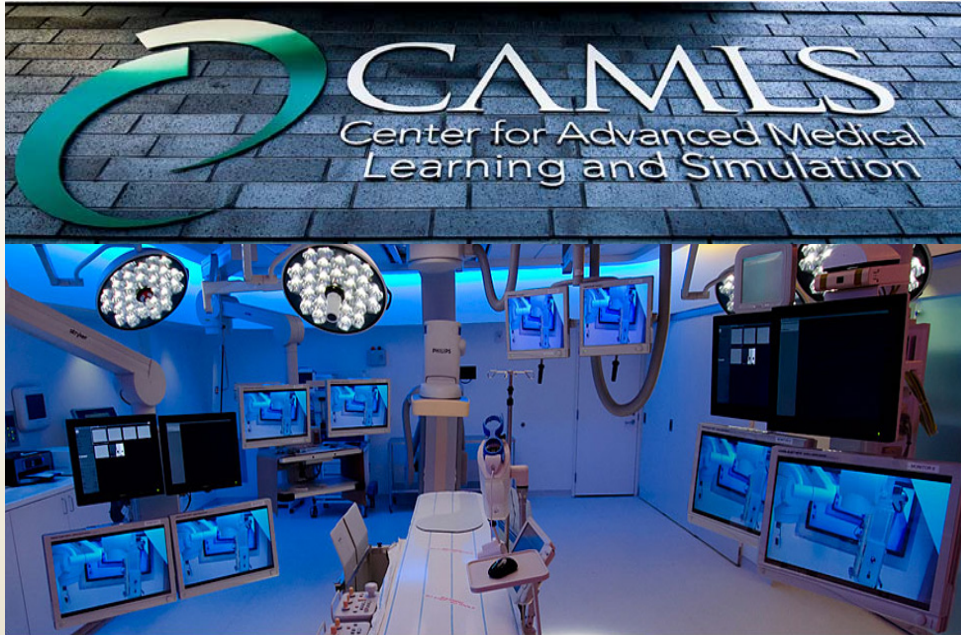
a complex adaptive system characterized by multiple interactions between faculty, students, context, information etc. that generate collective patterns not attributable to its isolated components. These patterns are given in different levels or subsystems with non-linear dynamics and heterogeneous behavior characterized by ruptures, forks and uncertain emerging processes, change the order from the disorder and from the disorder is feedback and auto-organize.



# Research Complex Systems



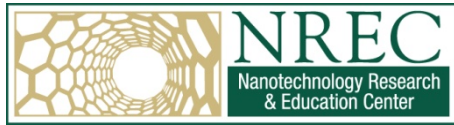
# Research Complex Systems



WELCOME TO THE USF NANOTECHNOLOGY  
RESEARCH AND EDUCATION CENTER



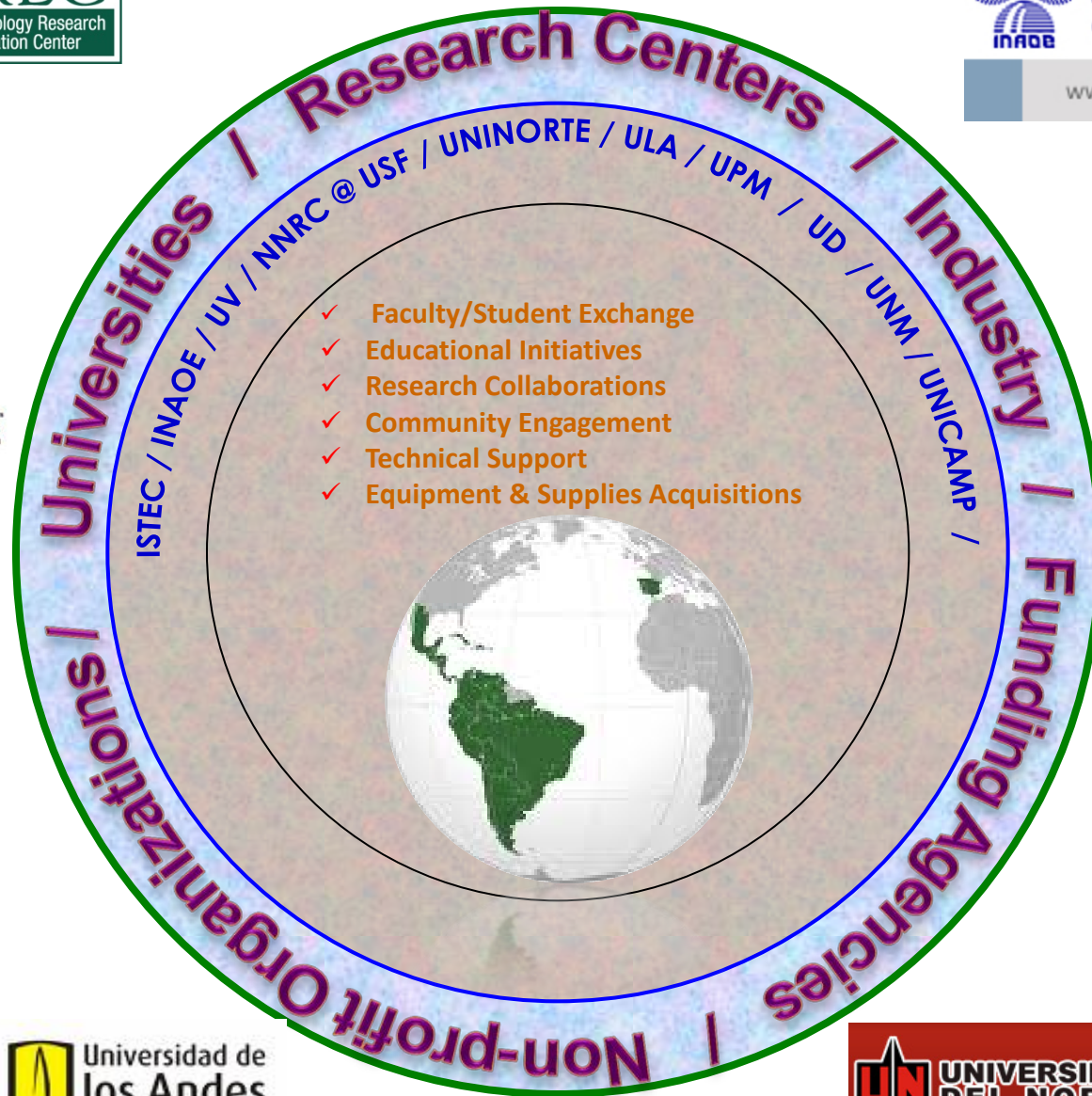
# Ibero-American Nanotechnology Centers Network (IBANCN)



[www.inaoe.gov.mx](http://www.inaoe.gov.mx)



Pontificia Universidade Católica do Rio Grande do Sul



The University of New Mexico



UNIVERSIDAD DISTRITAL FRANCISCO JOSE DE CALDAS





# Systems of Systems Engineering for complex problem solutions to make our Region Globally competitive today

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*Presented by:*

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Presented to USF, Tampa, FL

# Definitions

- SE\*: Systems Engineering is an interdisciplinary approach encompassing the entire technical effort to evolve and verify an integrated and total life cycle balanced set of system, people and process solutions that satisfy customer needs.
- SoSE: System-of-Systems Engineering is a set of developing processes, tools, and methods for designing, re-designing and deploying solutions to System-of-Systems challenges.

# SE scope and challenges

- **The Scope of Systems Engineering:** Includes transformation of needed operational capabilities into an integrated system design; integration of technical life cycle efforts; and development of technical information to support program management decision making. Systems Engineering, because it encompasses the entire technical effort, is a key enabler of effective Total Life Cycle System Management (TLCSM).
- **Challenges to Systems Engineering:** Include growing system complexity; workforce turbulence; low technical management investment; inconsistent application of Systems Engineering; insufficient early use of Systems Engineering; and poor initial program formulation, insufficient tools and environments and inconsistent requirements management.

# Top Five problems related to SE (GAO report and NDIA taskforce)

1. **Key Systems Engineering practices** known to be effective **are not consistently applied** across all phases of the program life cycle.
2. **Insufficient Systems Engineering is applied early in the program life cycle**, compromising the foundation for initial requirements and architecture development.
3. **Requirements are not always well-managed**, including the effective translation from capabilities statements into executable requirements to achieve successful acquisition programs.
4. The quantity and quality of **Systems Engineering expertise is insufficient** to meet the demands of the government and the defense industry.
5. **Collaborative environments**, including SE tools, **are inadequate** to effectively execute SE at the joint capability, System-of-Systems (SoS) and system levels.

# The SE “Vee”

This is the most common structured SE approach used in at least 100 countries and in multiple disciplines

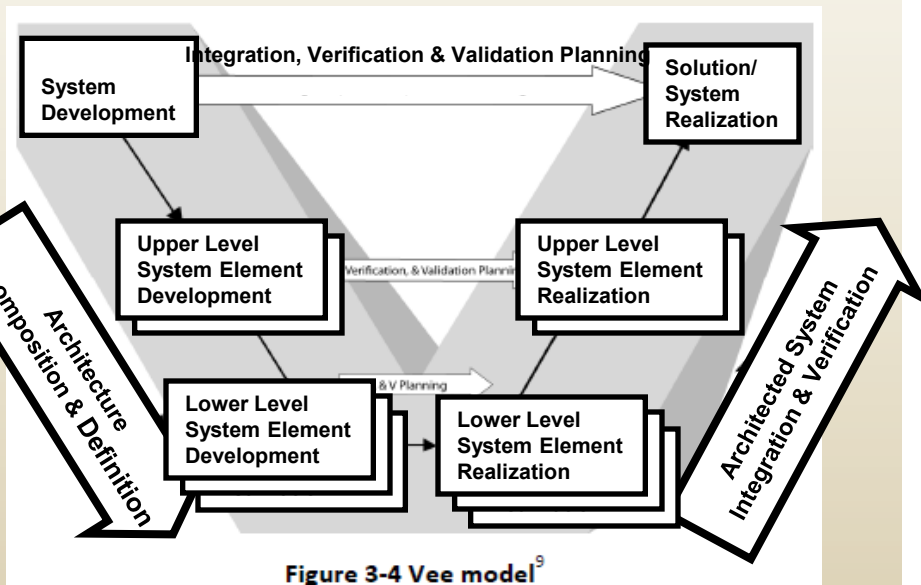
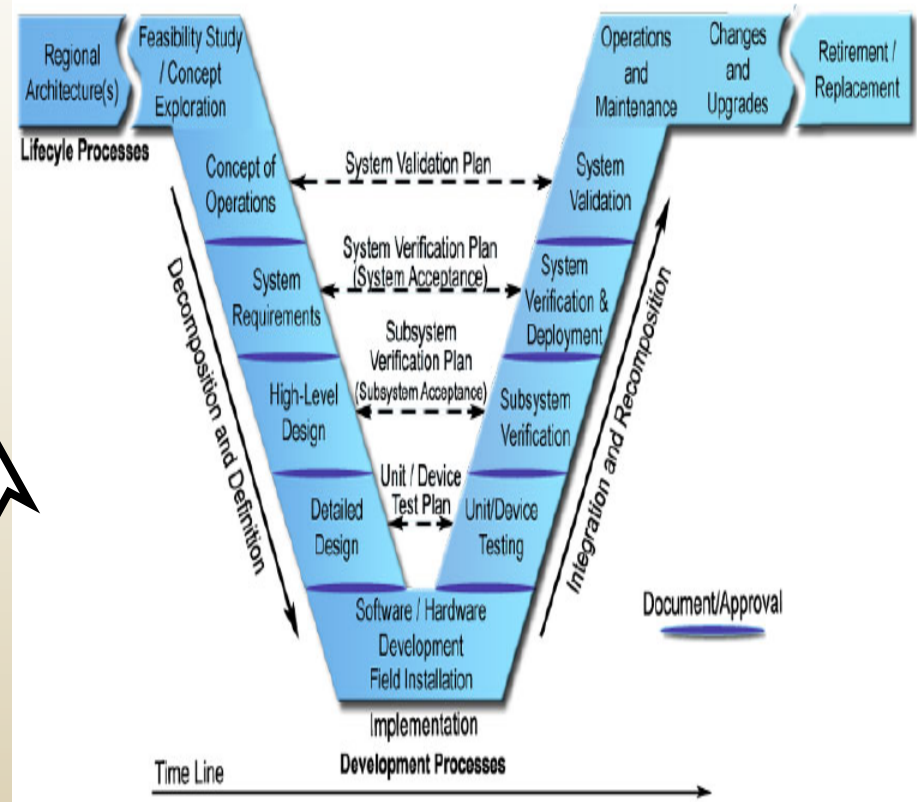


Figure 3-4 Vee model<sup>9</sup>



From INCOSE SE Handbook v3.2, January 2010

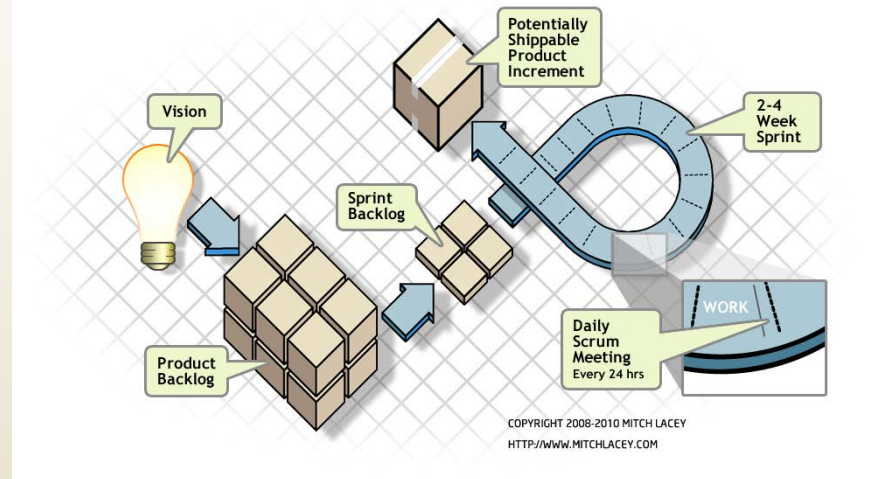
From SE for Intelligent Transportation Systems, Jan 2007



# Agile Methods and Scrum

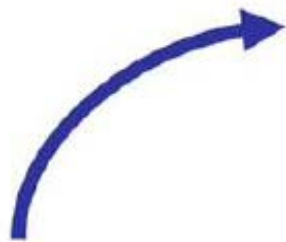
- Agile Principles:
  1. Individuals and Interactions
  2. Working Software
  3. Customer Collaboration
  4. Responding to Change
- Originally applied to SW development (with earliest application to hardware development)

- Now Applied to SE
- Adaptive, Responsive, Evolving, Continuous Improvement

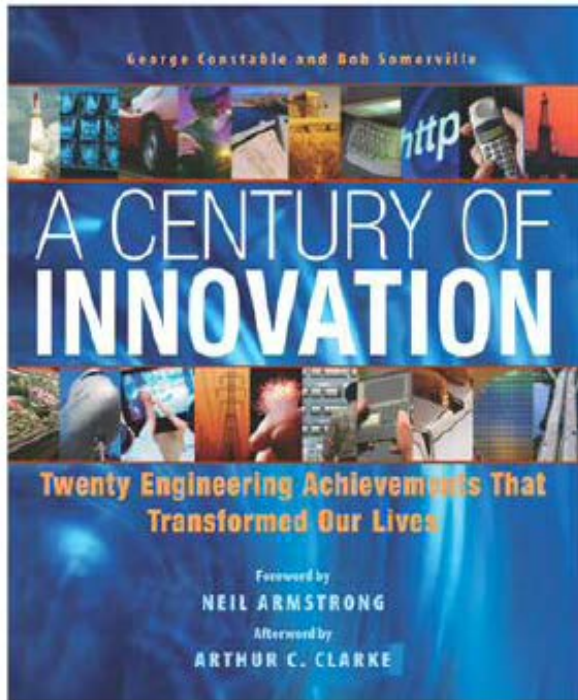


- Product Backlog created, backlog items completed in Sprints
- Roles
  - Product Owner
  - Scrum Master
  - Development Team
- Each Sprint produces a product(s)
  - Software or documentation

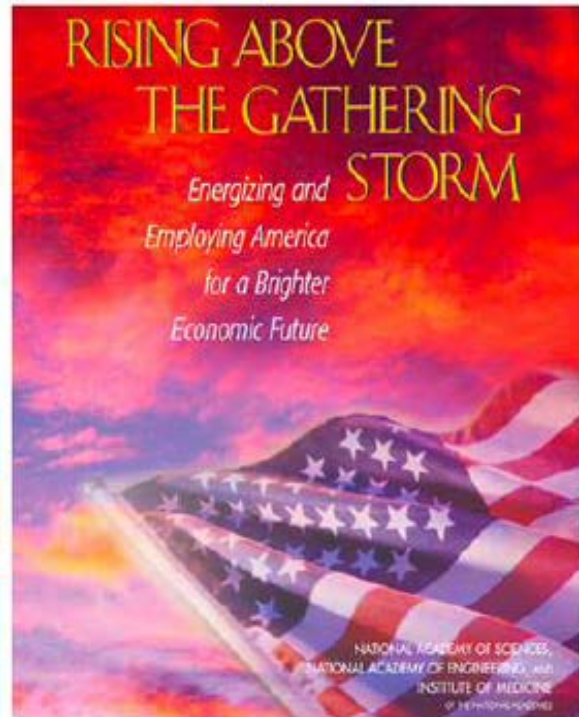
# Education > Research > Innovation > Entrepreneurship



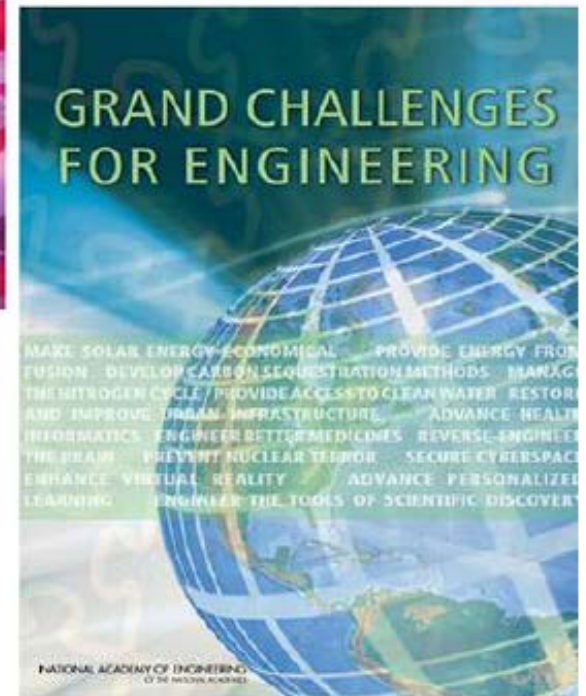
## 20th Century Achievement



## Policy Agenda



## 21st Century Challenge



- Education
- Research
- Innovation
- Entrepreneurship

Computation

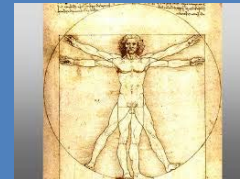
Cyber

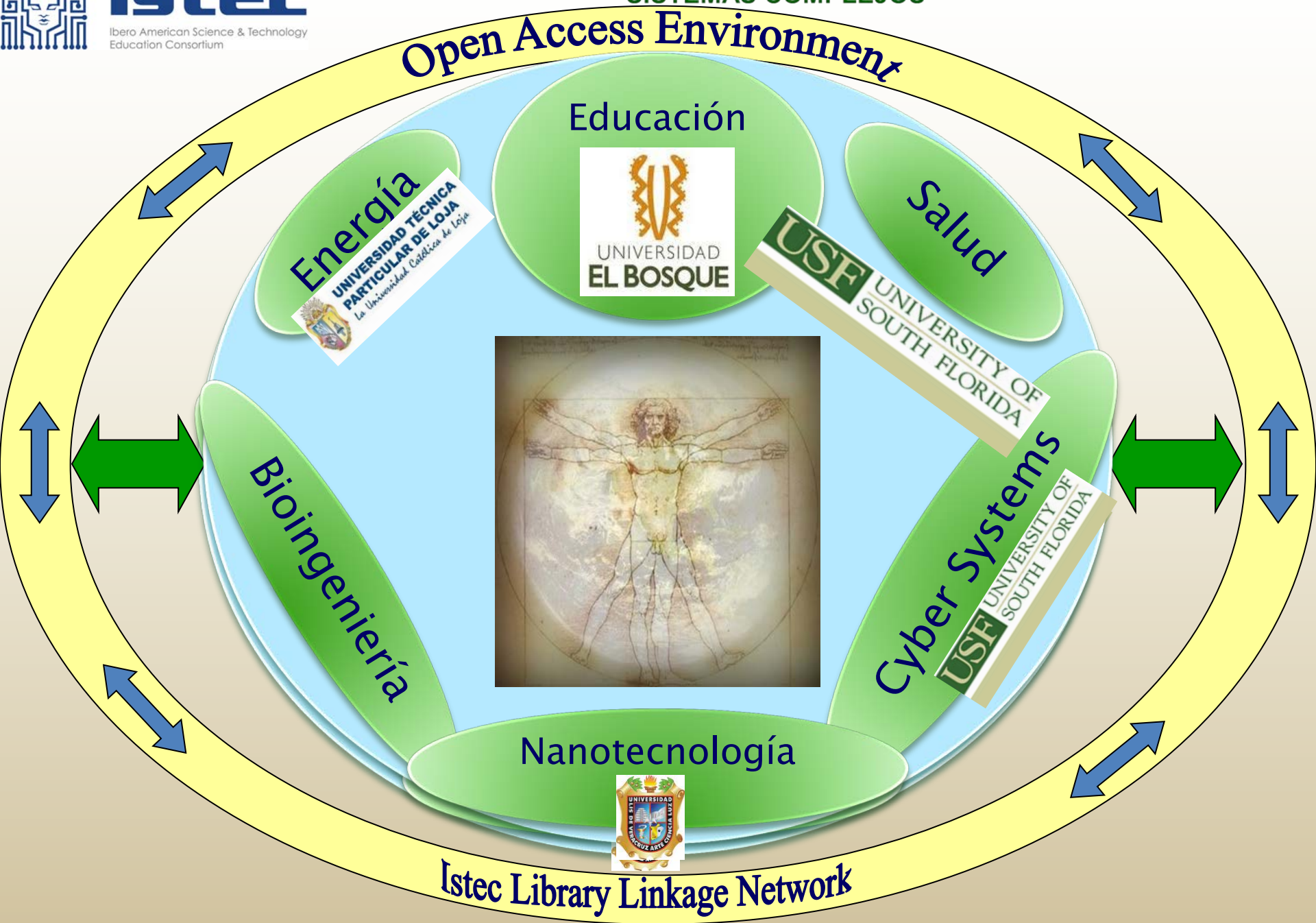
Physical



Communications

Complex Systems





# Writing the headlines of tomorrow



- On August 14, 2010, a headline on the front page of the *New York Times*<sup>1</sup> read “Pharmacists do more than count pills.”
- The story begins:
- “Eloise Gelinas depends on a personal health coach. At Barney’s Pharmacy, her local drugstore in Augusta, Ga., the pharmacist outlines all her medications, teaching her what times of day to take the drugs that will help control her diabetes.”

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## **2013 Rho Chi Lecture: Writing the Headlines of Tomorrow**

**Joseph T. DiPiro, PharmD** South Carolina College of Pharmacy, Columbia, South Carolina

Read More: <http://www.ajpe.org/doi/full/10.5688/ajpe77592>

65% of North  
American mothers  
use 5 or more forms  
of technology every  
day

# In the December 15, 2012, edition of the *New York Times*



The statistics around mobile technology are, of course, well known, but worth repeating: It took two years for Apple to sell 2 million iPhones. It took 2 **months** for them to sell 2 million iPads! It took 1 month to sell 1 million iPhone 4's! It took 1 day to sell 1 million iPhone 4s it's estimated that Apple sold 5 million iPhone 4s's in the first 4 days of release

on the editorial page, the headline read

**“When the doctor is not needed”**

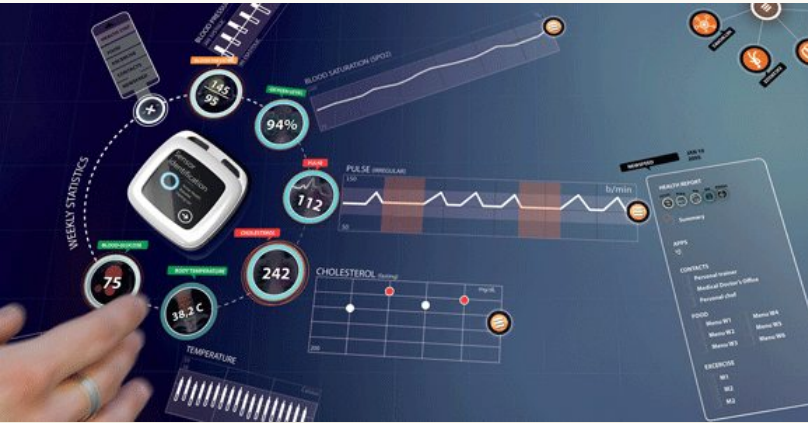
and it goes on to describe the potential for pharmacists (and other health professionals) to fill the big gap in primary care.

It talks about how pharmacists are underutilized given their education, training, and closeness to the community

Read More:

<http://www.ajpe.org/doi/full/10.5688/ajpe77592>

# National Public Radio a nationally broadcast story was headlined



MiniME device is the future of healthcare, says Ergonomidesign

- “Why The Hospital Wants the Pharmacist to Be Your Coach.”
- It talked about how hospitals are partnering with community pharmacies to help keep patients out of the hospital by managing their medications.

Read More:

<http://www.ajpe.org/doi/full/10.5688/ajpe77592>

78% of consumers are interested in mobile health solutions

Medical and health care apps are 3rd fast growing category for iPhone and Android phones

The Apple App store now has 17,000 health care related apps

60% of which are aimed at the consumer

<http://www.pdesigni.com/news/show/1468>

# Some of the future headlines can be



- “Pharmacists clinical services become a standard in health care” or
- “Retirees demand medication therapy management by pharmacists” or
- “Pharmacists play major role in designing drug treatment regimens using genomics.”
- And even the possible negative headlines, such as
- “Importation and automation lead to demise of the pharmacy profession.”

Rapid technological development and relentless innovation are the two key trends that will provide for a forthcoming **massive transformation** of our health care system.

Read More: <http://www.ajpe.org/doi/full/10.5688/ajpe77592>

<http://www.jimcarroll.com/tag/health-care/#.Uby6Rti20uJ>



# Vision for Future Pharmacy practice



- *“Pharmacists will be the health care professionals responsible for providing patient care that ensures optimal medication therapy outcomes” and “Pharmacists will have the authority to manage medication therapy and will be accountable for patients’ therapeutic outcomes.”*
- Vision foreseen by Joint Commission of Pharmacy Practitioners.



THE FUTURE  
OF PHARMACY IS HERE.

COP at USF

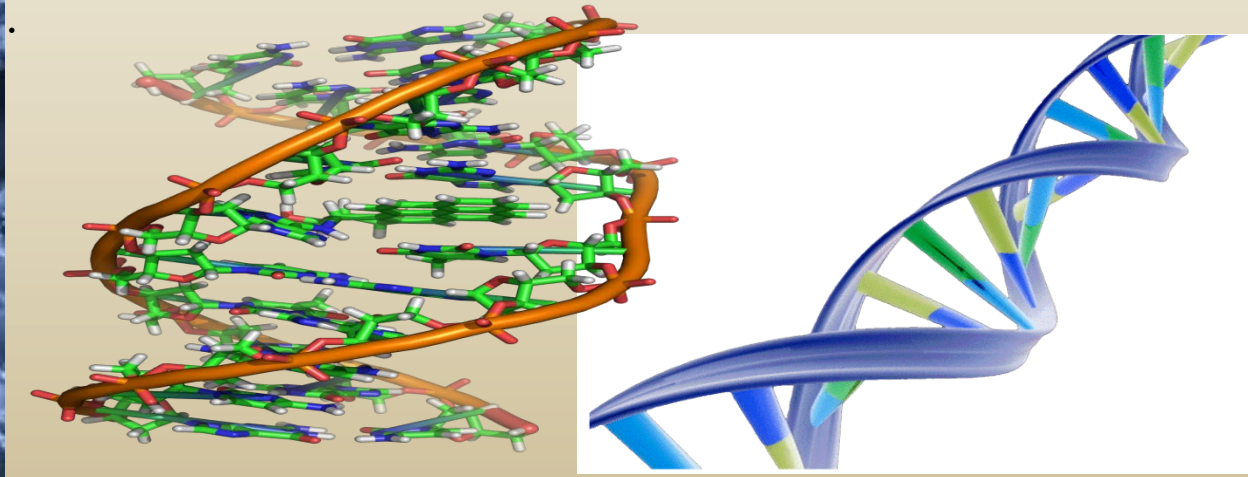
Read More: <http://www.ajpe.org/doi/full/10.5688/ajpe77592>

# Changing face of Pharmacy Profession and Practice in USA



- As noted by Dr. Dennis Helling upon receiving the 2013 Remington Honor Medal,
- “If you don’t like change, you will like irrelevance even less.”

- Helling DR. 2013 Remington Honor Medal Address.
- <http://www.pharmacist.com/dennis-k-helling-receives-remington-honor-medal-highest-honor-pharmacy>. Accessed June 8 2013.



# The landscape of the healthcare industry will undergo historic transformation in 2013 onwards



- Five Major healthcare Trends:
  - 1. Increased demand in healthcare staffing
  - 2. Industry preparation for the ACA
  - 3. The digital age meets the masses
  - 4. More opportunities for specialty training.
  - 5. Focus on consumer awareness and preventative care

- <http://www.supplementalhealthcare.com/blog/2013/5-major-healthcare-trends-2013>



# Major Digital Changes

## #1: MOBILE

*(mHealth, apps, self-care, remote monitoring...)*



# Tablets and iPads

Digital Health: **Mobile**



**Tablets**  
*(iOS, Android etc.)*



# FITBIT Tracker

Digital Health: **Mobile**



**Fitbit Tracker,  
wireless-enabled  
wearable data  
measuring device**

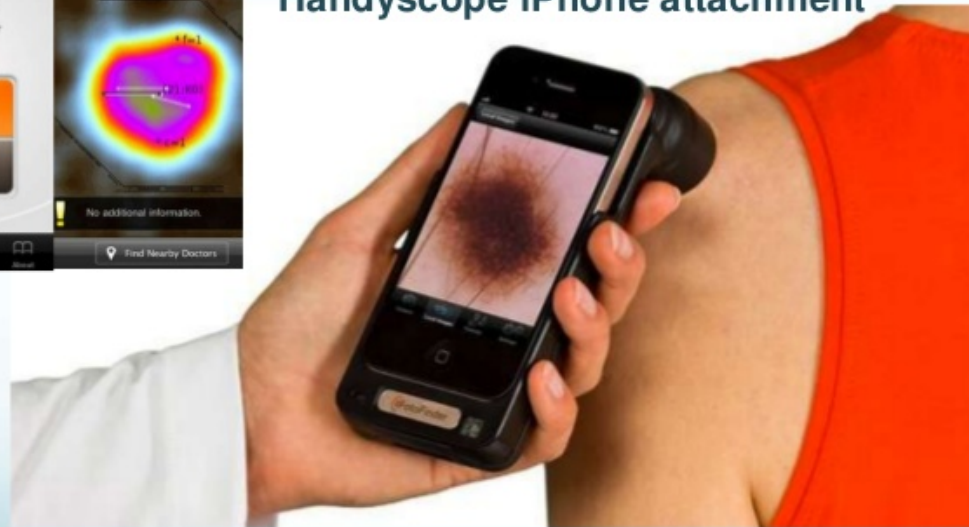


# Skin Scan applications

Digital Health: **Mobile**



Skin Scan app with an  
Handyscope iPhone attachment



# iTriage applications

Digital Health: **Mobile**

## iTriage apps





# Head set EEG hack

Digital Health: **Mobile**

**Nokia N900 and Emotiv EPOC neuro headset EEG hack**

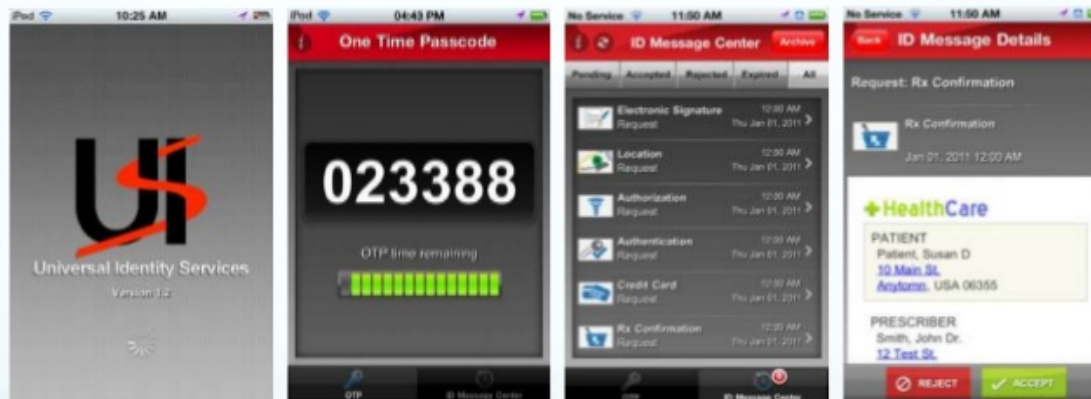


# Quiet care remote monitoring systems

Digital Health: **Mobile**



## Digital Health: **Big/Open Data**

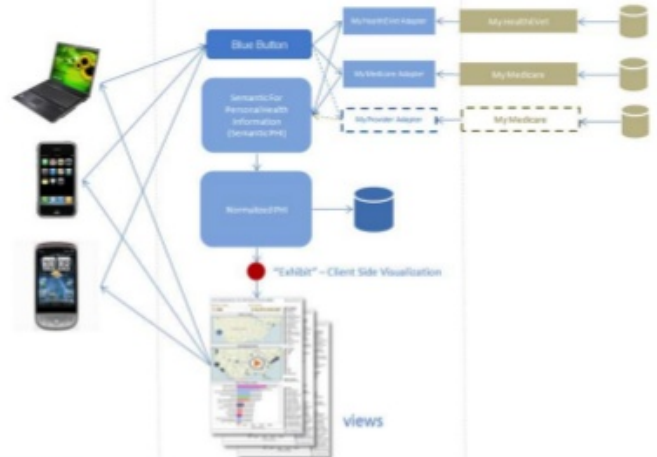


### Verizon Universal Identity Services (UIS) for healthcare

# Easy Personal health data download

## Digital Health: Big/Open Data

### Architecture



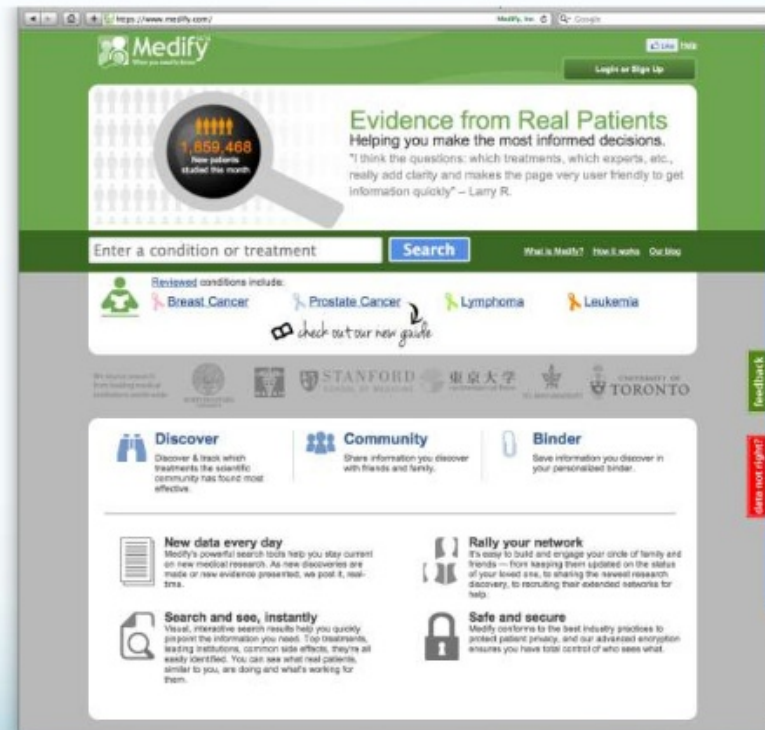
### Blue Button personal health data download initiative



# Medical and research database

## Digital Health: Big/Open Data

Medify medical research and treatment information database



# Digital health gaming

## Digital Health: **Gaming**



**Humana Games for Health**

# Interactive products

## Digital Health: Interactive Products

**Mobile scanning  
(NFC, QR codes,  
barcode scanners,  
Microsoft TAG etc.)**



# Video: tele health, telemedicine

## #5: VIDEO (telehealth, telemedicine...)





# Social media

## #6: SOCIAL

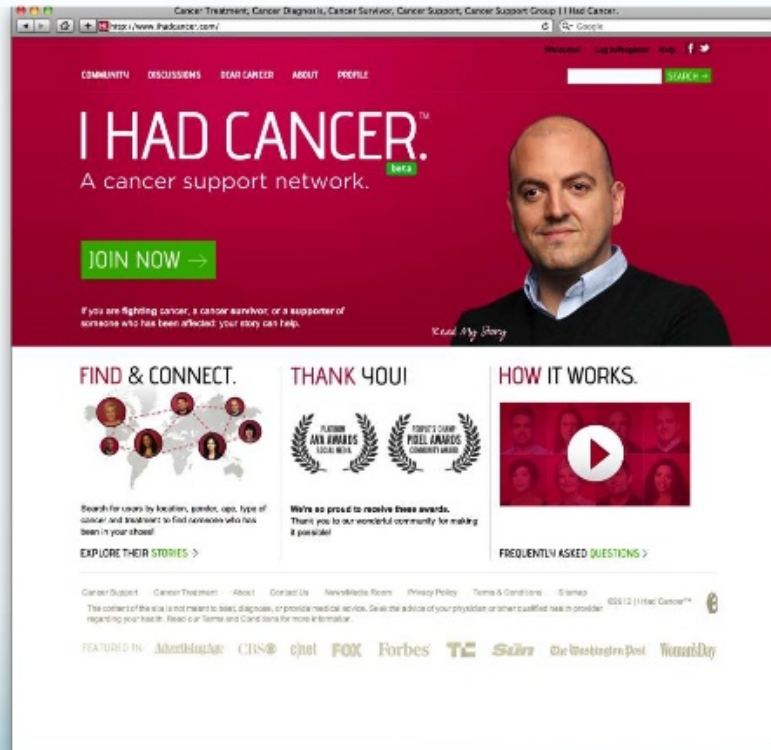
*(social commerce, networks, organizations, e-Patient...)*



# Community websites for health information and sharing

## Digital Health: Social

IHadCancer.com  
community website



# Web based Social meeting groups

Digital Health: **Social**

Meetups.com groups

The screenshot shows the Meetups.com interface for 'Epilepsy Meetup Groups'. At the top, there are navigation buttons: 'Meetup', 'Find a Meetup Group', 'Start a Meetup Group', and 'Save 50%'. Below this is the title 'Epilepsy Meetup Groups' and a description: 'Meet with other local Epileptics to foster support and awareness for this disease. Friends and family members are also welcome.' A map of the United States is displayed with several red location pins. Below the map, a statistics table shows: Groups: 10, Members: 510, Interested: 459, Cities: 10, Country: 1. At the bottom, there is a list of related topics: Seizures, Epilepsy Women's Group, People with Epilepsy, Epilepsy Friends Network, Epilepsy Men's Group, Epilepsy and Seizures in Our Community, Dealing With Epilepsy At Work, Natural Healing for Epilepsy, Epilepsy Fundraising, Epilepsy and Depression.

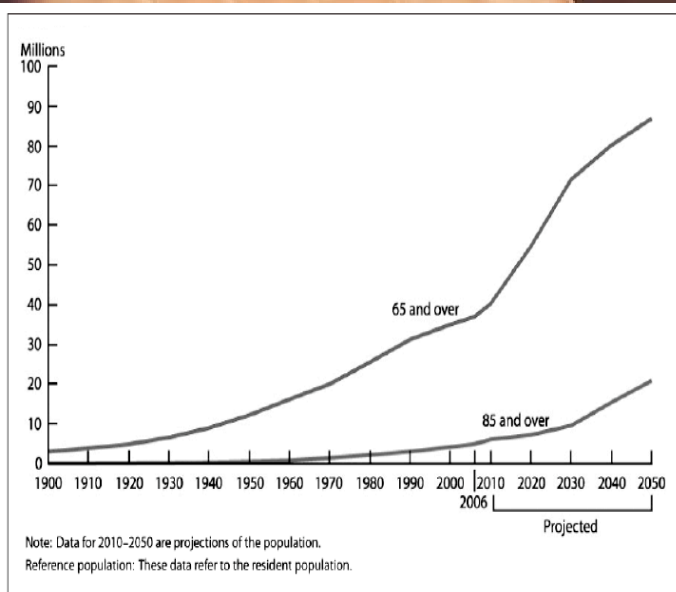
Groups	Members	Interested	Cities	Country
10	510	459	10	1

Related topics: Seizures, Epilepsy Women's Group, People with Epilepsy, Epilepsy Friends Network, Epilepsy Men's Group, Epilepsy and Seizures in Our Community, Dealing With Epilepsy At Work, Natural Healing for Epilepsy, Epilepsy Fundraising, Epilepsy and Depression

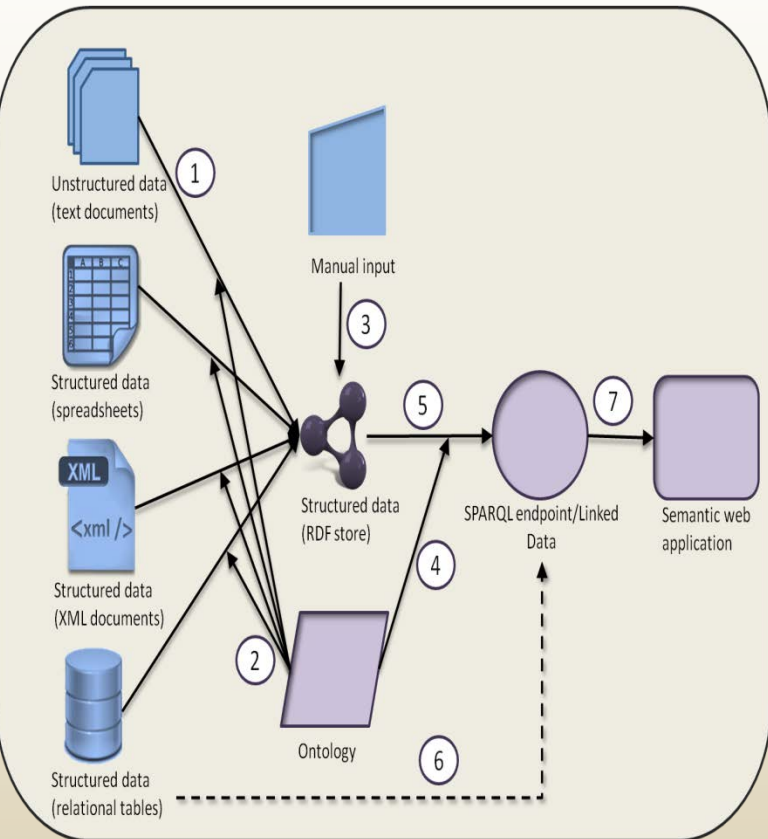
# Geriatric Pharmacotherapy : A forthcoming challenge to pharmacy profession



- The older population--persons 65 years or older--numbered 39.6 million in 2009 (the latest year for which data is available).
- They represented 12.9% of the U.S. population, about one in every eight Americans.
- By 2030, there will be about 72.1 million older persons, more than twice their number in 2000.
- People 65+ represented 12.4% of the population in the year 2000 but are expected to grow to be 19% of the population by 2030.
- [http://www.aoa.gov/Aging\\_Statistics/](http://www.aoa.gov/Aging_Statistics/)



# Bio-informatics : the unavoidable alternative for enormous data and its application

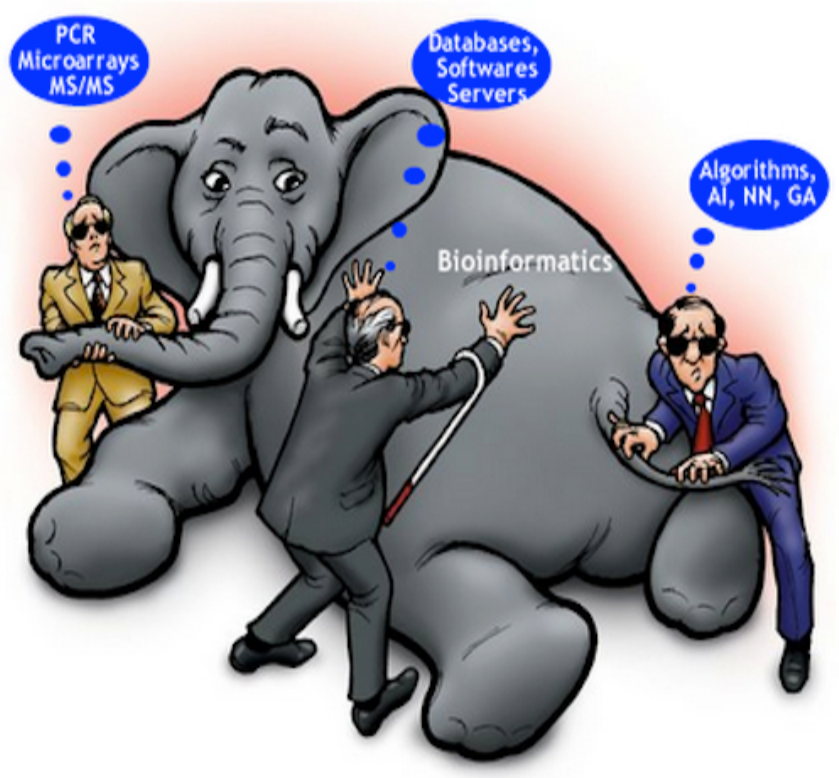


- The research found the following:
- Bioinformatics tools and services have important roles to play in all aspects of drug discovery and development as they help to design drugs, predict drug metabolism and toxicity, and model drug-gene or drug-protein interactions.
- In the post-genomic era, gathering biological information is no longer a bottleneck for scientific researchers. The major hurdle remains in the efficient organization, analysis, and interpretation of the data. The establishment, maintenance and open access of large datasets has been important in driving this field forward, as they have allowed researchers throughout the world to find new ways to analyze and interpret information into new knowledge.
- <http://www.healthcareitnews.com/news/bioinformatics-grows-billions>

<https://www.google.com/search?q=bioinformatics+an+unavoidable+for+health+care&source>

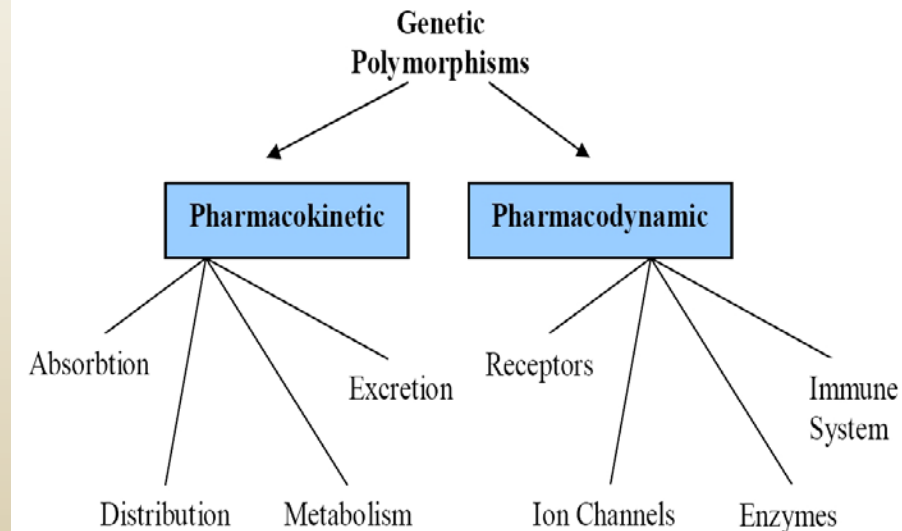
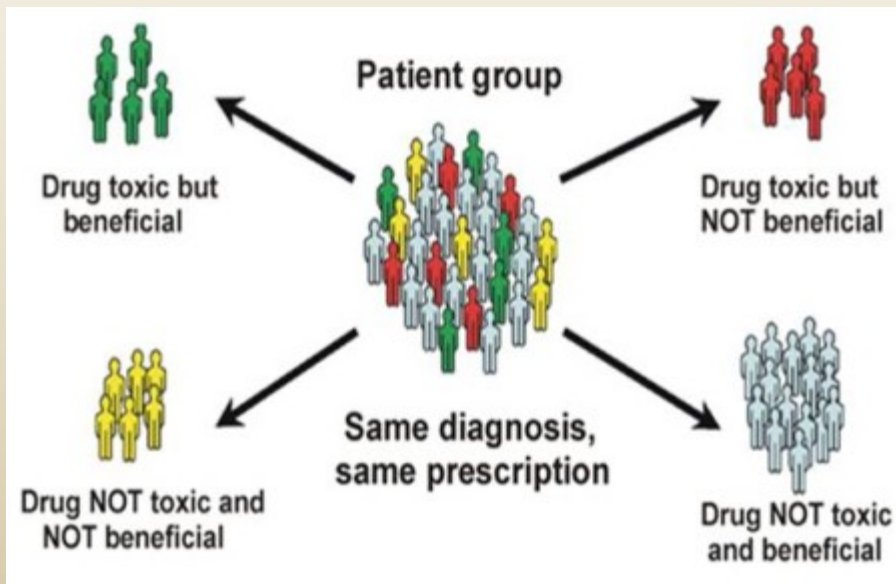
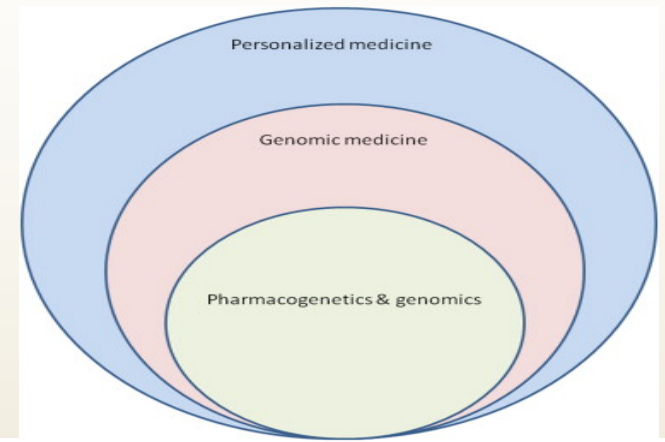
# Bio-informatics : the unavoidable alternative for enormous data and its application

- The research also found the following:
- Raw data is meaningless without context. The ultimate goal of bioinformatics is to extract knowledge from large-scale data. There are currently hundreds of software tools available online, many of which were developed by leading academic institutions and are freely available, enabling researchers to undertake sequencing, alignment, structure, and function analysis for a range of biological data.
- More data is being collected than can be physically stored; the storage gap is widening, and selecting which data to archive has become a major issue. During the last 30 years, IT infrastructure has become more integrated, and it has rapidly evolved from a computer cluster model to a **cloud computing** platform that allows computational capacity to be purchased as a service from a cloud computing provider.



# Pharmacogenomics : leading to personalized medicines

In pharmacogenomics, genomic information is used to study individual responses to drugs

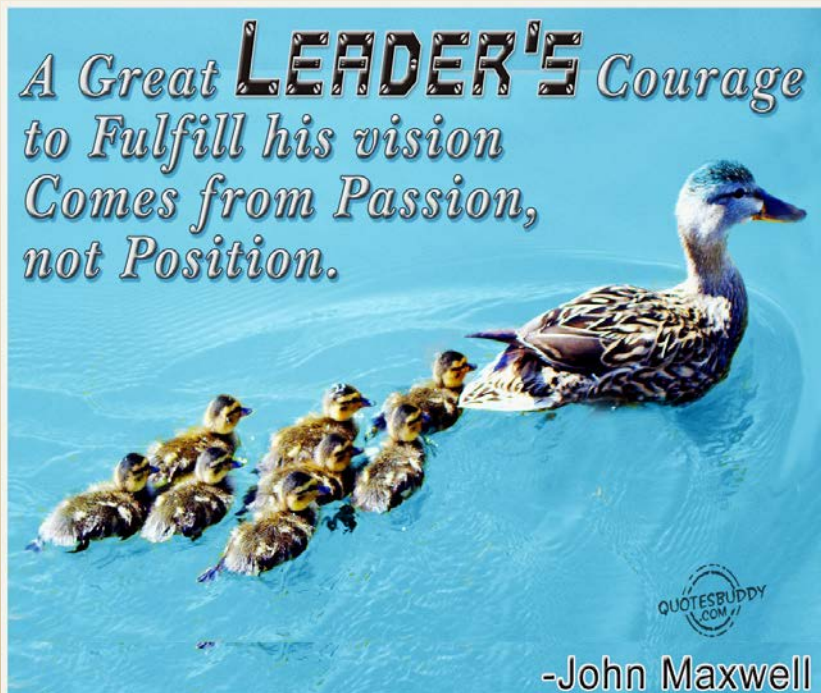


Genetic variability leading to susceptibility to adverse drug reactions can affect both pharmacokinetic and pharmacodynamic pathways.

# Leadership has no alternative : **let us learn to take the challenges of forthcoming changing scenario**

**Innovation distinguishes between a leader and a follower.**  
*Steve Jobs*

- Leadership is solving problems.
- The day soldiers stop bringing you their problems is the day you have stopped leading them.
- They have either lost confidence that you can help or concluded you do not care. Either case is a failure of leadership.
- *Colin Powell*





# How can pharmacist capacity is further developed and integrated into the US healthcare system:



- . Continual improvements to doctor of pharmacy (PharmD) training will be needed, especially the development of team-based, inter professional training that will help health care providers learn about and experience team-based patient care.
- . The rate of discontinuance of some community pharmacy business models and the adoption of new business models that could help pharmacists fulfill their potential in the health care system should be monitored.
- . Pharmacy practice acts and other health profession practice acts (that define scope of practice) should be updated on an ongoing basis to reflect and accommodate new roles for health professionals and for team-based care.

Read More:

<http://www.ajpe.org/doi/full/10.5688/ajpe77591>

# How can pharmacist capacity is further developed and integrated into the US healthcare system:



- Significant efforts should be made regarding the alignment of payment policies for not only supporting new pharmacist roles and services, but also to provide adequate payment for the providers of these services and evidence of cost-effectiveness for the payers of these services.
- The potential for flexibility in medical/health care home designs to create innovative and responsive practice structures that integrate pharmacist expertise in medication therapy coordination and management under varying geographic regions, practice setting types, and patient population types should be explored. Balancing such flexibility with the need for standards of care is a challenge that needs to be addressed in the reforming healthcare system.
- Access to necessary patient health and treatment records to support and inform patient care service and decision-making functions should be secured for all members of collaborative healthcare teams, including pharmacists.

Read More:

<http://www.ajpe.org/doi/full/10.5688/ajpe77591>

# How can pharmacist capacity is further developed and integrated into the US healthcare system:



- Discussion should take place regarding bundling pharmacists' services into "episodes of care." By packaging related services together in a way that supports high-quality, lower-cost care, providers, payers, and patients could begin to view episodes of care as a unified patient care experience rather than a series of disparate services.
- Efforts should be undertaken to educate US health consumers' regarding pharmacists and the roles they play in health care so that consumers have an accurate view of phamacists' true capacity for patient care.

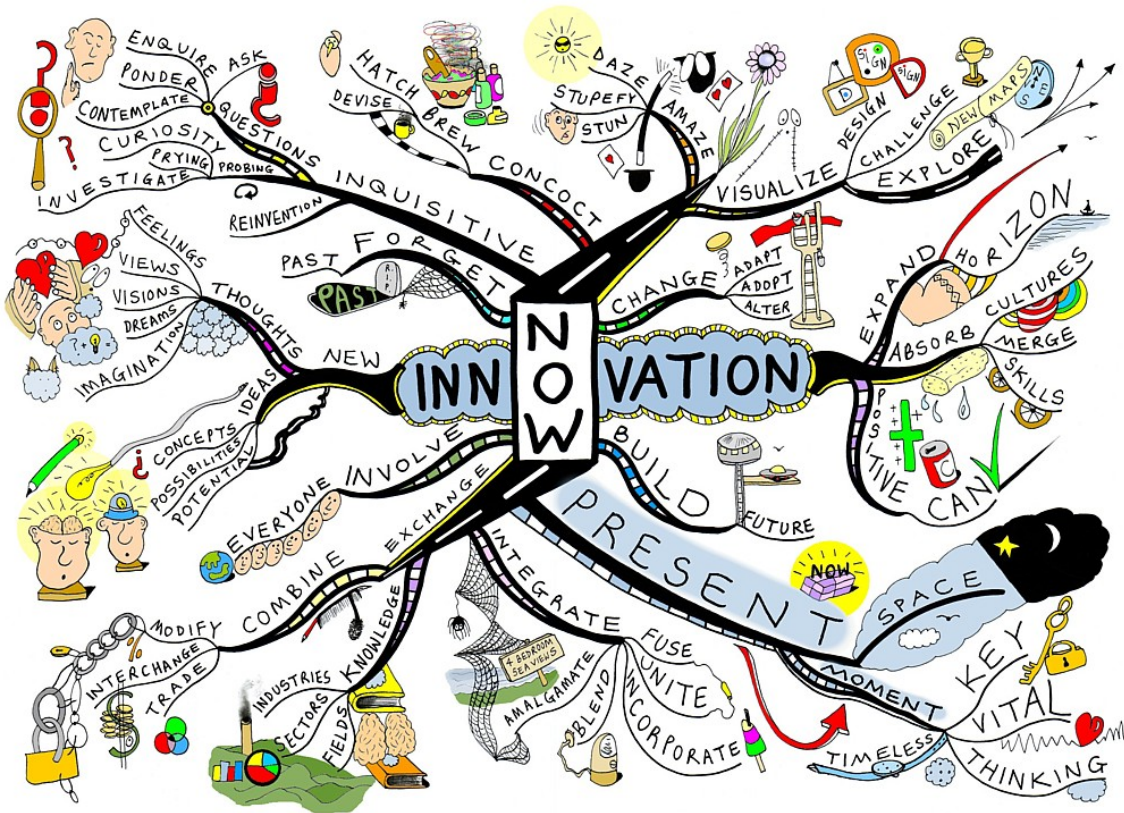
From: **Finding a Path Through Times of Change**, Katherine Knapp, PhD,<sup>a</sup> and Jon C. Schommer, PhD<sup>b</sup>



Read More:

<http://www.ajpe.org/doi/full/10.5688/ajpe77591>

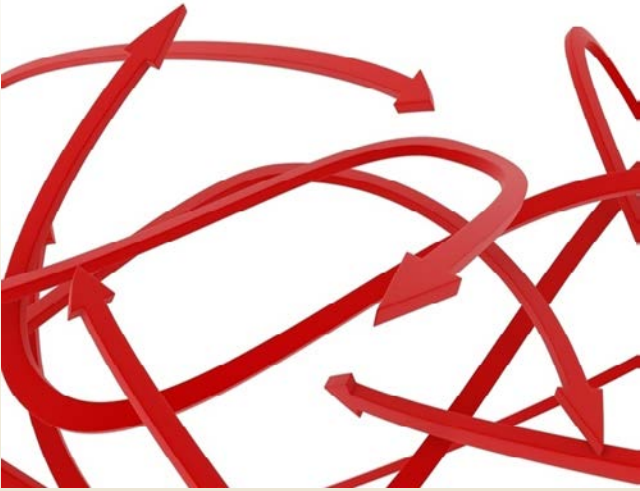
# How College of Pharmacy at USF is Different and addressing these challenges



- Empowered by innovation



# How College of Pharmacy at USF is Different and addressing these challenges



Boldly shaping  
tomorrow



Creating DNA for change



# Mission of College of Pharmacy , USF



- The mission of the University of South Florida College of Pharmacy is to develop outstanding pharmacist clinicians that provide educational, preventive, and therapeutic pharmaceutical care services to patients, communities, and health care providers with foundational principles based upon innovation, leadership, achieving inter professional collaboration, application of clinical evidence, and life-long learning values.

# Vision of College of Pharmacy



- The University of South Florida College of Pharmacy will create an academic and clinical learning environment known for:
- Producing outstanding pharmacist clinicians trained in advanced healthcare principles to provide exceptional patient-centered care
- Creating an inter professional academic healthcare environment that respects the significant contributions of pharmacists within the healthcare team
- Implementing patient-centered learning models for our faculty and students based on the active application of advanced technology
- Providing a collegial and nurturing environment where students will incorporate principles of life-long learning into their continued professional development and clinical pharmacy practice
- Developing cutting-edge research in pharmaceutical sciences, drug discovery, clinical translational research, and clinical trials participation
- Recognition of the need and develop strategies to provide community outreach to underrepresented and underserved communities



# PRACTITIONER EXCELLENCE

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# Goals of College of Pharmacy USF

- Create pharmacist clinicians to provide high-level pharmaceutical care services in various clinical and business arenas
- Strive to create clinicians that are trained in the most advanced medication therapy modalities encountered in the delivery of healthcare, with emphasis on aging populations
- Development of professionals recognized for their leadership abilities in various healthcare settings
- Enhance access by practicing pharmacy and healthcare clinicians to academic pharmacy resources through research opportunities, clinical activities, and continuing education
- Create a diverse learning environment for students and faculty
- Utilize emerging technologies for advanced learning opportunities for faculty, students, and healthcare professionals.
- Create outreach opportunities for students and faculty to serve in underrepresented and underserved communities
- Develop a system that strives for continuous assessment and improvement of teaching, clinical, and research activities to ensure the achievement of the mission, vision, and strategic initiatives.



# What College of Pharmacy can offer to School of Pharmacy to:.....



- Study material development:
  - Curriculum development
  - Teaching tools development
  - Sharing the experience
  - Explore the possibility of sharing the teaching using either video or electronic media
  - Help in procuring the study materials books, PPT, case studies and other to enhance the learning

# University of South Florida South Tampa Campus



USF South Campus

## University of South Florida, Tampa Florida



- 9<sup>th</sup> largest University in United States based on Number of students ( more than 47,000)

## University of South Florida, Tampa Florida



- In top 50 Universities in overall achievements in United States

## University of South Florida, Tampa Florida



- 23<sup>rd</sup> ranked by NIH based on total grants received by USF

## University of South Florida, Tampa Florida



- Ranked in top 10 based on Number of US Patents allotted



# University of South Florida, Tampa Florida



- USF Health : A Unique concept
- College of Medicine
- College of Public Health
- College of Nursing
- College of Pharmacy
- School of Physiotherapy
- Inter-professional and interdisciplinary Training of health care professional

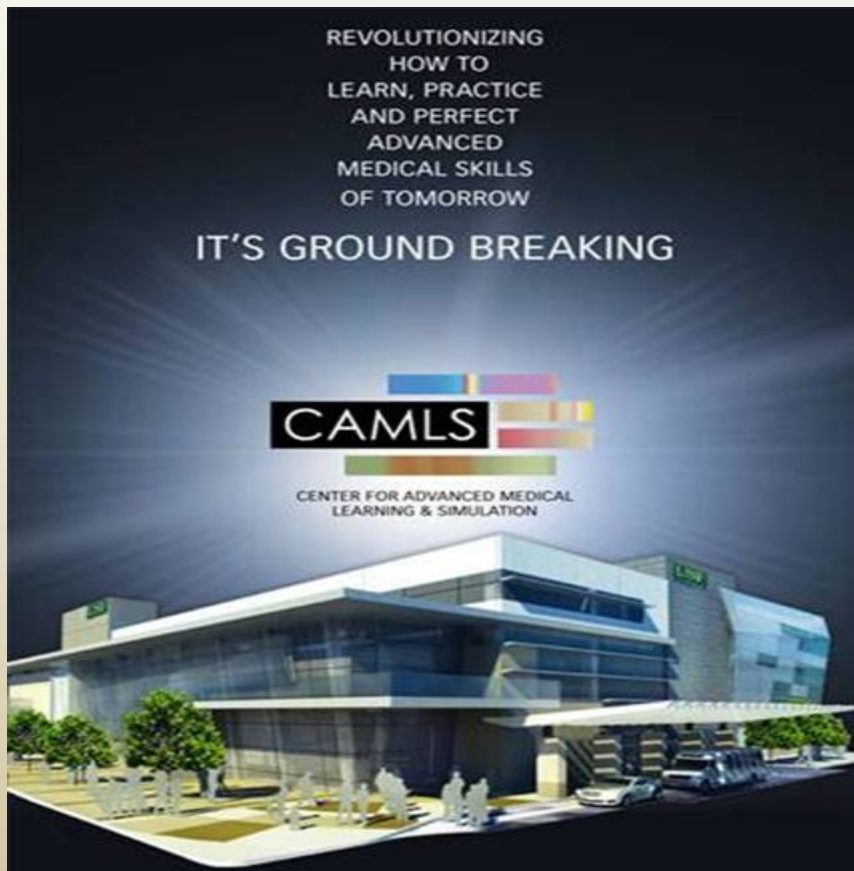
University of South Florida, Tampa Florida



# University of South Florida, Tampa Florida

Center for advanced Medical learning and simulation

- Advanced training to Physicians



# University of South Florida, Tampa Florida



- [Arts & Sciences](#)
- [Behavioral & Community Sciences](#)
- [Business](#)
- [Education](#)
- [Engineering](#)
- [Global Sustainability](#)
- [Honors College](#)
- [Marine Science](#)
- [Medicine](#)
- [Nursing](#)
- [Pharmacy](#)
- [Public Health](#)
- [The Performing Arts](#)

USF Offers 71 Undergraduate majors in various faculties

## University of South Florida, Tampa Florida



- Excellent graduate programs and Post doctoral opportunities

# University of South Florida, Tampa Florida



- Fun filled education of High quality
- Great weather
- Great learning atmosphere
- Unending opportunities
- Culturally diverse campus with 113 countries on campus
- Visit for more details:
- [www.usf.edu](http://www.usf.edu)
- You name it
- We have it

# Presentation Outline

- ❖ Highlights of NI – USF Interactions
- ❖ On-going CoE – CAMLS Projects
- ❖ NI – CoE – CAMLS Collaboration Objectives
- ❖ Global Academic Trends in Interdisciplinary/Innovation Labs
- ❖ Innovation Plaza @ UNM/ISTEC
- ❖ The InterDisciplinary Learning Lab (IDLL) @ The College of Engineering – USF
- ❖ CAMLS Partners
- ❖ USF/CoE Partners
- ❖ Open for Discussion

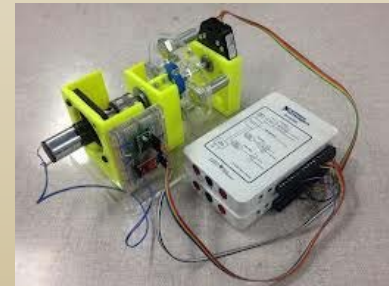
# Highlights of NI – USF Interactions

- 1988 – Darpa Grant: Center for Microelectronics Research (CMR)
- 1991 – EE Dept. Undergraduate Program for Honeywell technicians via FEEDS: “Most of the Senior Design were done using NI Software and Hardware tools - Honeywell then became the top NI customer in the South East”
- USF acquires the NI Campus Teaching License
- Summer 1999 – The EE Controls Lab was created and LabVIEW was included as the main software for instrumentation and controls



# Highlights of NI – USF Interactions cont....

- 2004 – USF hosts ISTECC XIV General Assembly where the EE Controls Lab was retrofitted with 10 ELVIS Stations
- 2007 – Controls Lab was updated with NI and Quanser hardware (Quanser DC motor controls, cRIO and PXI)
- April 5<sup>th</sup>, 2013 CoE will host a Hands-on workshop on the use of the cDAQ
- Fall 2013 – a new course is being developed to be offered to all majors: Cyber Physical Systems: An Electrical Engineering Perspective. myDAQ & LabVIEW are being proposed as the “Active Learning Platform”



# On-going CoE – CAMLS Projects

- ❖ Prof. Susana Lai-Yuen – Dept. of Industrial and Management System Engineering  
Dr. Stuart Hart – CAMLS
  - ✓ MRI-based automated pelvic floor modeling for pelvic organ prolapse evaluation.
  - ✓ Sensor-based bladder monitoring for injury detection during pelvic surgery.
  - ✓ Medical device design and development in undergraduate engineering education.
    - Integration of projects in engineering courses to design and develop medical devices to improve minimally-invasive surgical procedures and patient positioning on the operating table.

# On-going CoE – CAMLS Projects

❖ Dr. Richard Gitlin, Electrical Engineering Department

Dr. Stuart Hart – CAMLS

- ✓ To place the wirelessly controlled and communicating Miniature Anchored Robotic Videoscope (MARVEL) video system modules in TBRIC in order to receive feedback from surgeons. This knowledge will be useful to improve the design and implementation of the system

❖ Dr. Andrew Raij, Electrical Engineering Department

- ✓ Development of a new sensing and computational tools to identify, collect, review, and assess objective metrics of team performance in high-risk medical scenarios (in this case, Neonatal Resuscitation).

❖ Dr. Wilfrido Moreno – Electrical Engineering Department

Dr. Stuart Hart – CAMLS

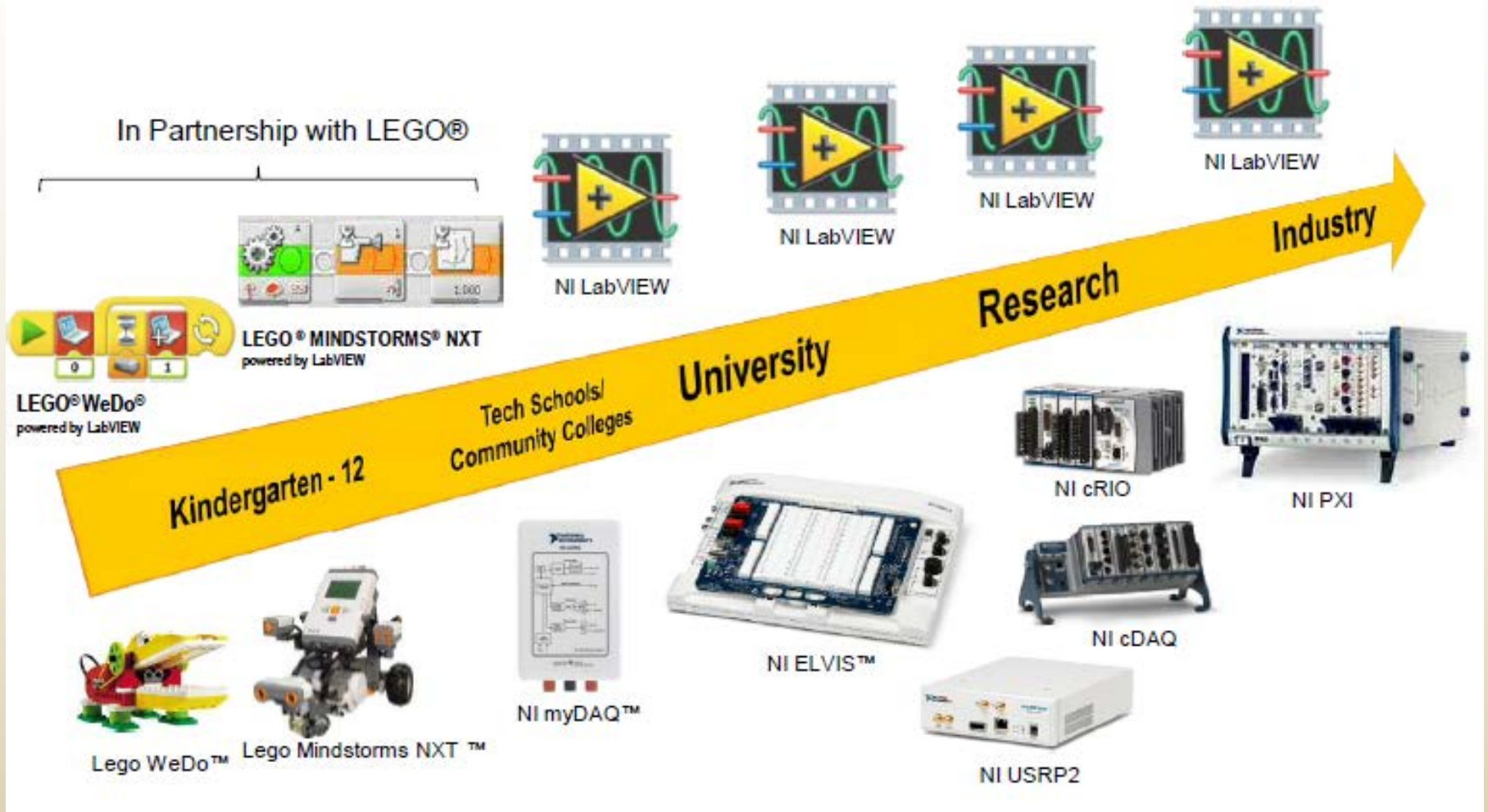
- ✓ Validation of a novel IV Stethoscope by developing real time signal acquisition, processing and analysis techniques for the acoustic/pressure based medical device
- ✓ Novel approaches for fetal/mother monitoring during labor and delivery

# NI – CoE – CAMLS Collaboration Objectives:

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- ❖ Furnish CoE and CAMLS with tools (software & hardware) that accelerate **learning**, productivity, innovation and discovery.
  - ❖ Offer students and faculty research opportunities in the biomedical field using the latest tools from NI
  - ❖ Serve as a vehicle of interaction between College of Engineering, CAMLS and NI's industrial customers –  
“More opportunities for student internships....”
-

# LabVIEW: a Lifelong Engineering Tool



# Global Academic Trends in Interdisciplinary/Innovation Labs



OEDK@Rice



NI Student Project Center @ UT-Austin

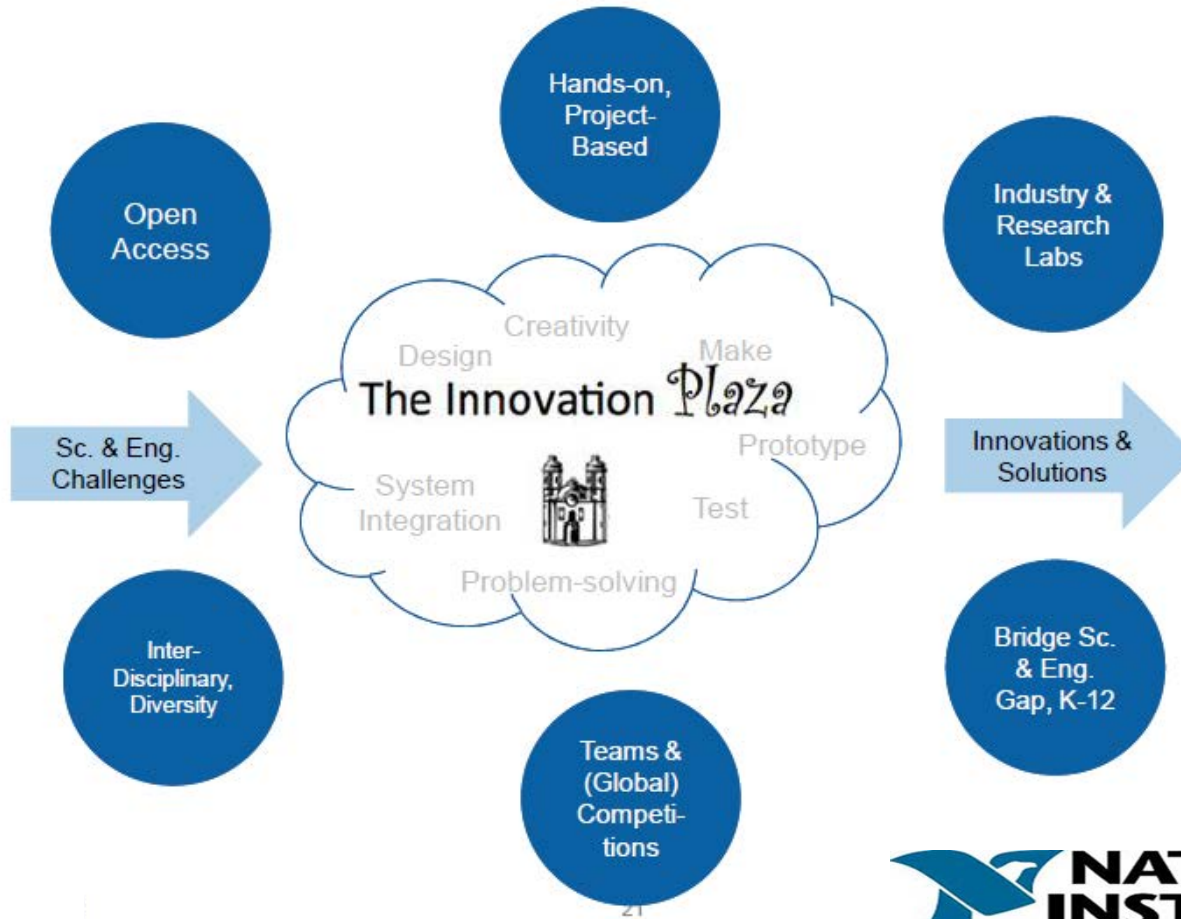


Active Learning Plaza @ UniAndes, Bogotta - Colombia



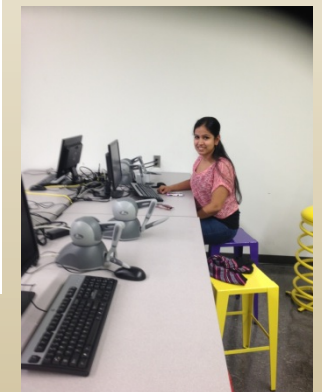
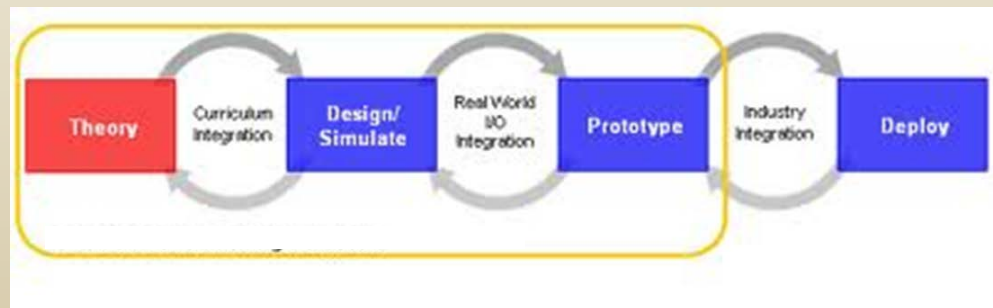
ITLL@CU-Boulder

# Innovation Plaza @ UNM



# InterDisciplinary Learning Lab (IDLL) @ The College of Engineering - USF

- ❖ A common facility has been created in order to enhance inter/multi/transdisciplinary collaboration among engineering graduate, undergraduate students, and faculty across our six engineering departments.
- ❖ This common area, will also welcome students who participate in our College's Research Experience for Undergraduates program as well as engineering freshmen in our first year Engineering course.





# InterDisciplinary Learning Lab (IDLL) @ The College of Engineering - USF

- ❖ The IDLL serves as a showcase Learning Center situated on the first floor of the main USF Engineering building.
- ❖ The IDLL space is organized into separate “pods” that are designed to support hands-on experimentation in multiple areas of engineering.

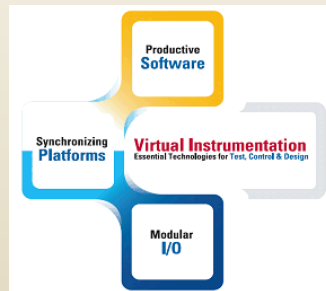


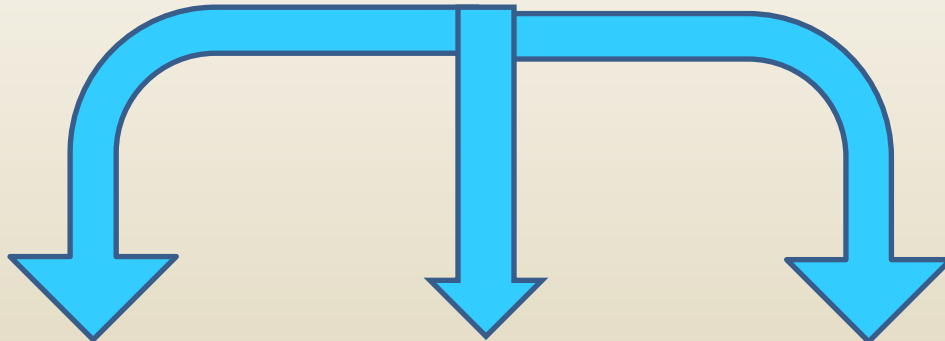
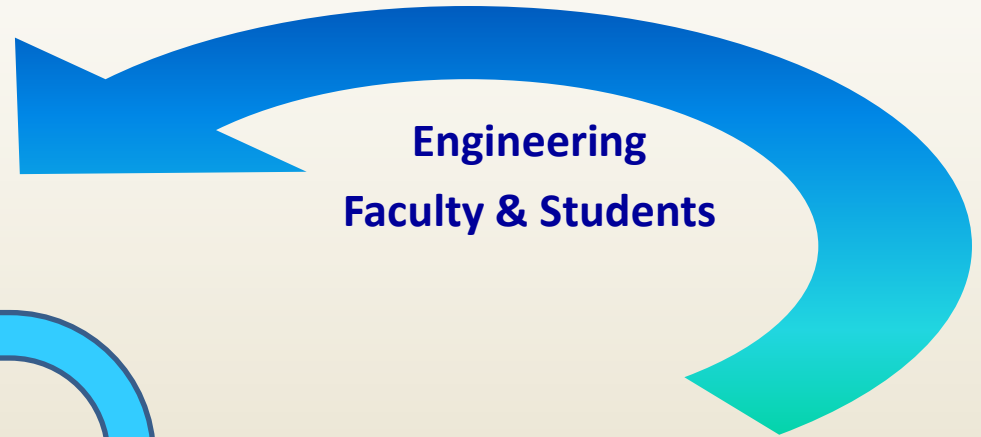
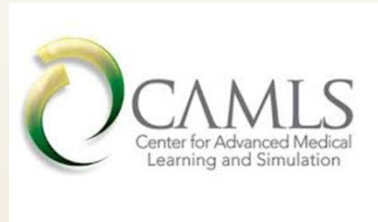
# InterDisciplinary Learning Lab (IDLL) @ The College of Engineering - USF

Software



Hardware



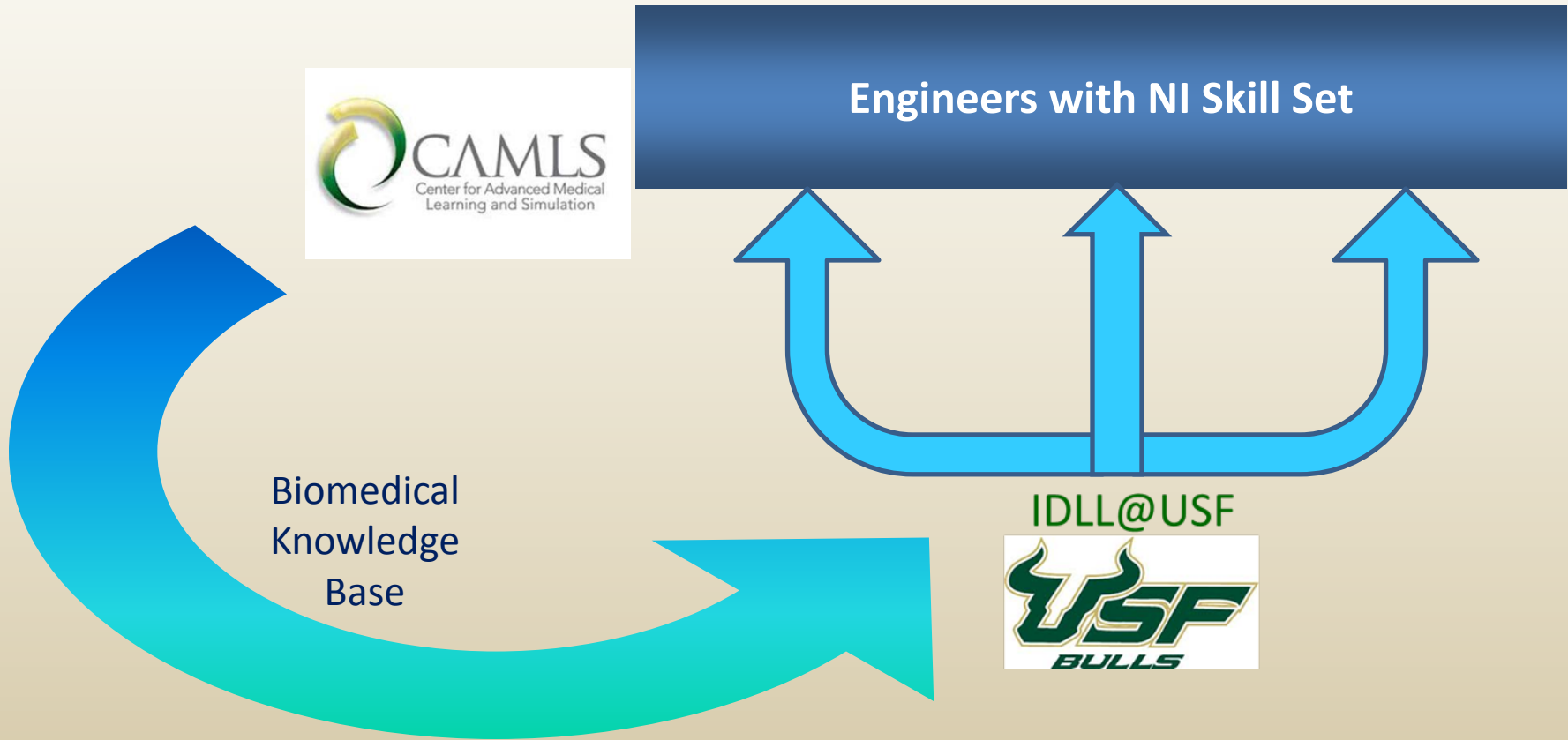


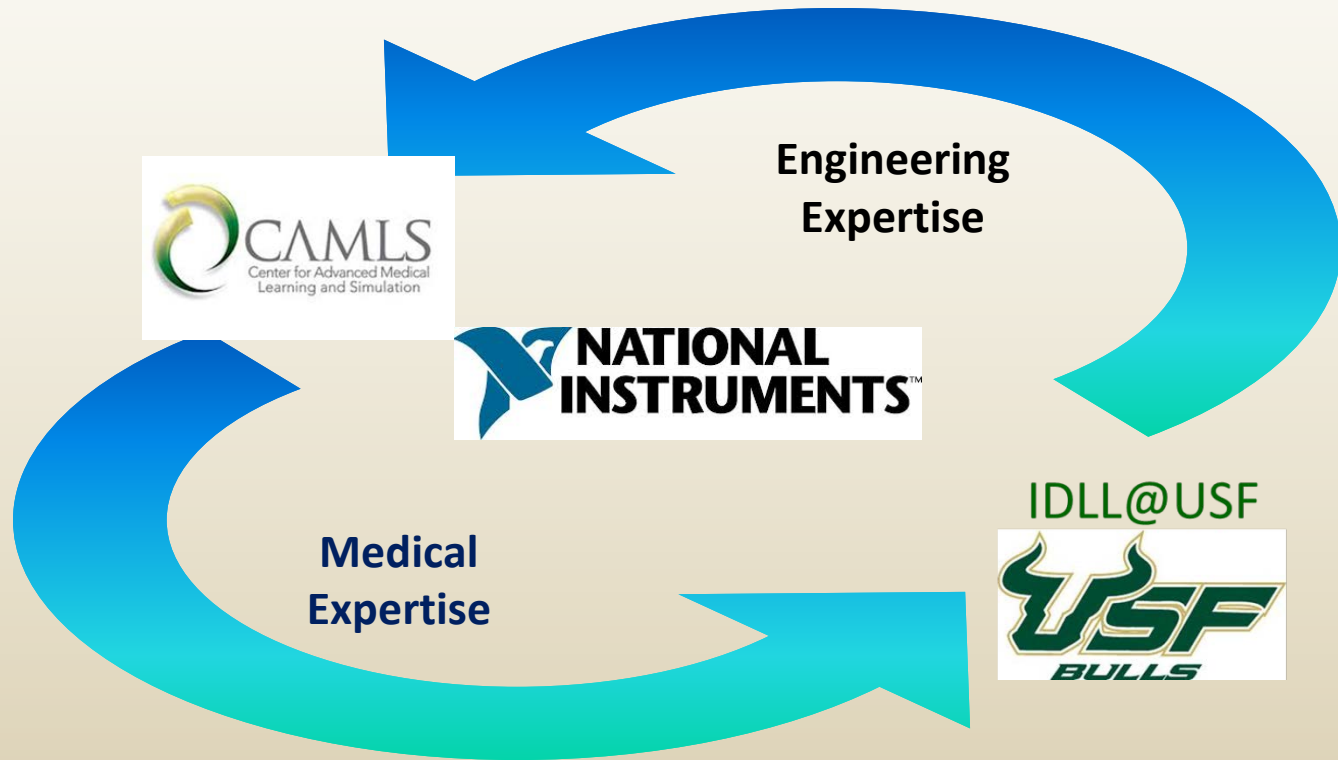
**Biomedical  
Projects**

**Exposure to  
Medical  
Devices &  
Simulators**

**Health  
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Interaction**







- ❖ Solidworks®
- ❖ ModernTech
- ❖ Tandel Systems
- ❖ Black Hägen
- ❖ USF College of Engineering



- ❖ IRX Industries
- ❖ Draper Laboratory
- ❖ SRI International
- ❖ The Nielsen Company
- ❖ Agilent Technologies

