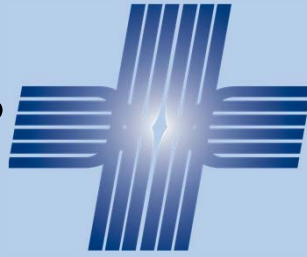




# *Center for Integrated Healthcare Delivery Systems*



The History  
and our Future

# CHOT

CENTER FOR HEALTH ORGANIZATION TRANSFORMATION



# *Center for Integrated Healthcare Delivery Systems*

Creating healthcare solutions  
through collaborative research  
education and outreach



**College of  
Engineering**

D. Wormley, Dean  
P. Griffin, IE  
*H. B. Nembhard, IE*  
*D. Medeiros, IE*

**Hershey - College  
of Medicine**

H. Paz, Dean  
*C. DeFlicht*

**Information Science  
& Technology**

D. Hall, Dean  
*M. Reddy*

***Center for  
Integrated  
Healthcare  
Delivery  
Systems***



**Health and Human  
Development**

A. C. Crouter, Dean  
D. Shea, HPA  
*D. Brannon, HPA*

**Office of the  
VP for Research**

H. Foley, VP & Dean  
P. Schiffer, AVP & Dir.

**Office of Economic and  
Workforce Development**

T. Franklin, Dir  
*J. DeOnna*

# CIHDS Founders



## Harriet Black Nembhard, PhD



Director and Co-Founder, CIHDS  
Assoc. Prof. of Industrial Engineering  
College of Engineering  
hbn2@psu.edu

## Diane Brannon, PhD



Co-Founder, CIHDS  
Prof. of Health Policy & Administration,  
College of Health & Human Development  
f8z@psu.edu

## Deb Medeiros, PhD



Co-Founder, CIHDS  
Assoc. Prof. of Industrial Engineering  
College of Engineering  
djm3@psu.edu

## Chris DeFlitch, MD



Co-Founder, CIHDS  
CMIO, Penn State Hershey  
College of Medicine  
cdeflitch@hmc.psu.edu

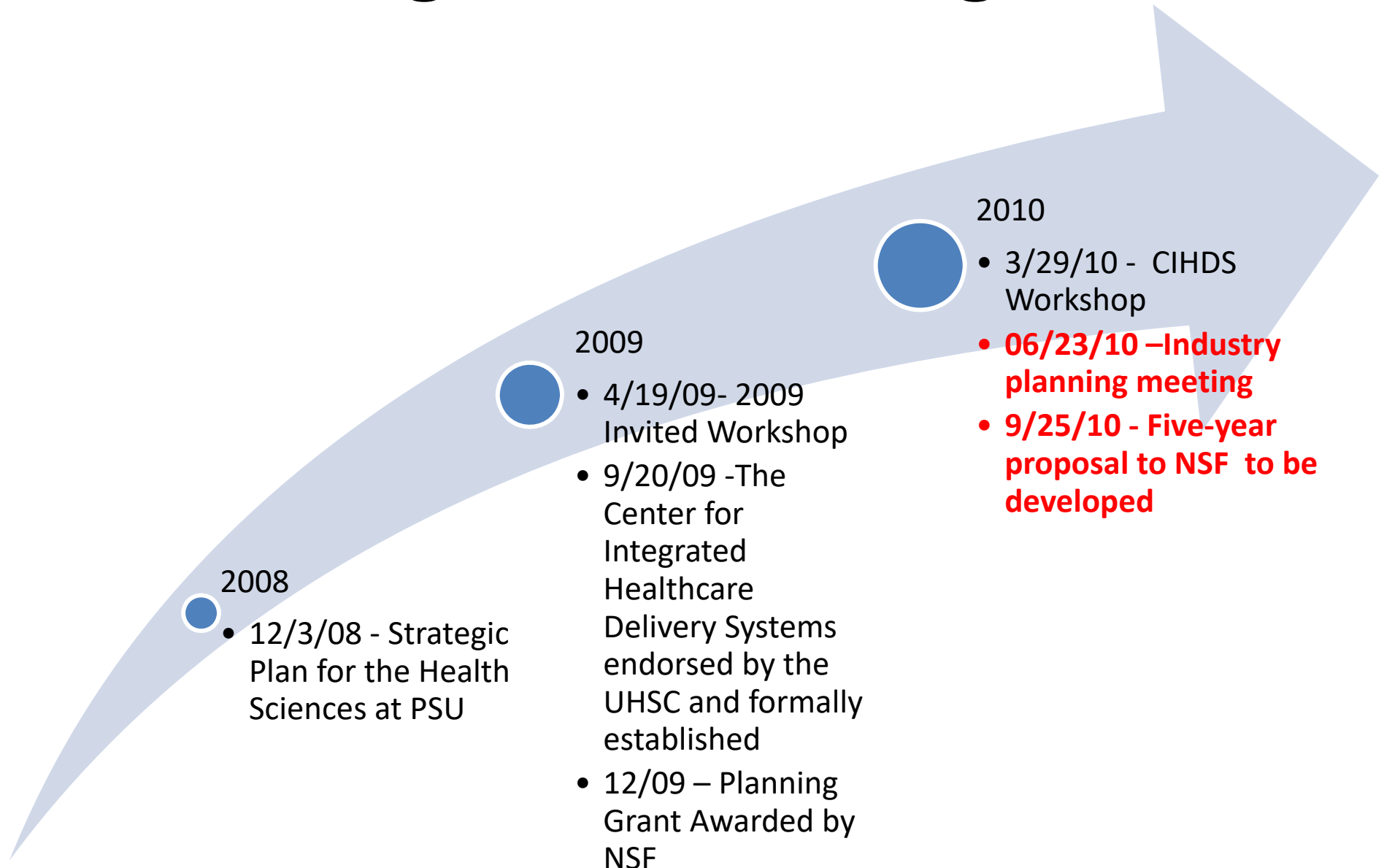
## Madhu Reddy, PhD



Co-Founder, CIHDS  
Ast. Prof of Information  
Sciences & Technology  
mreddy@psu.edu



# Strategic Plan / Background



# CIHDS



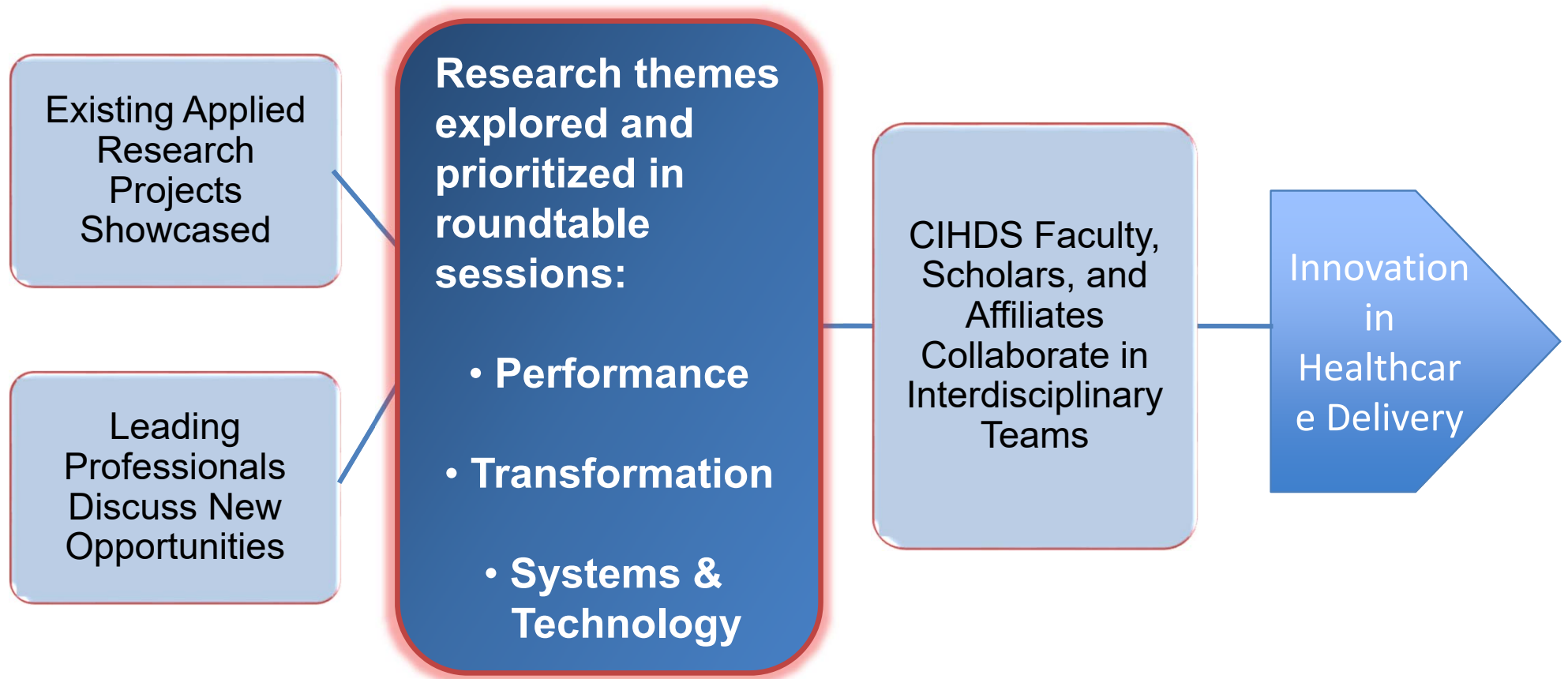
- PSU CENTER
  - Research
  - Education
  - Operations

“Sterile incubator for Industry and academic collaboration”

# CIHDS 2010 Invited Workshop

**Monday, March 29, 2010**

7-8am Breakfast; 8-5 Program; 5-7 Reception/Poster Session  
Penn State Nittany Lion Inn



# Current Research Initiatives

- Optimizing Patient Flow
- Identification of Medical Errors
- Patient Adherence to Therapies and Treatments
- Improving Healthcare Management
- Financial Incentives for Increasing Quality
- Active Aging and Aging in Place
- Chronic Care Intervention Strategies
- Health Information Technologies: Security & Privacy
- Design and Development of Medical Devices



# The NSF Industry/University Collaborative Research Center (IUCRC) Model



*Industry Strengths:* Commercializing and implementing scientific research

*Partnership Benefit:* Access to pool of groundbreaking ideas



*University Strengths:* Fresh approaches; nurturing next generation of leaders

*Partnership Benefit:* Access to industrial insights on research directions



*IUCRC Model Aim:* Support the merger of these unique strengths on research that can have a productivity impact for the Nation

[www.nsf.gov/eng/iip/iucrc/](http://www.nsf.gov/eng/iip/iucrc/)

# NSF IUCRC on Healthcare

# CHOT

CENTER FOR HEALTH ORGANIZATION TRANSFORMATION



Full Award: Aug. 2008  
**Dr. Larry Gamm, PI**



Full Award: Aug. 2008  
**Dr. Eva Lee, PI**



Planning Grant: Dec. 2009  
**CIHDS**

# Center Memberships/ Industrial Advisory Board (IAB)

## Current Partners

**SIEMENS**

**LOCKHEED MARTIN**



\$400,000/yr in industry commitments will be supplemented by \$80,000/yr in NSF funding.

A minimum of 3 industry partners is required.

## Potential Partners

**HIGHMARK**

**Johnson & Johnson**

**Microsoft**

**verizon**

# Impact the Healthcare Delivery System through CIHDS

## Benefits of Industry Participation

- Accomplishes research at a fraction of the cost of having in-house researchers
- Access to researchers, knowledge, and training to evaluate intervention design and implementation or product development and testing
- Participate in research studies using organization's own data to answer crucial questions which may otherwise not be done
- Exclusive setting for information sharing and networking with other innovative healthcare systems across the United States
- Supports CIHDS scholarly activity
  - Provide a field-site for CIHDS scholars projects
  - Undergraduate senior capstone team
- Provides an excellent recruiting tool for building the future of the healthcare organization

# Sample of CIHDS Projects

## *Designing the Emergency Department of the Future*

Students : Lisha Duan, Youyang Gao, Andrew Georgeson, Cameron Hand supported by faculty advisors Dr. Harriet Black Nembhard, Dr Chris DeFlitch

## *Exploring How Electronic Medical Record (EMR) Systems Support Non-Clinical Users*

Students: Alison Murphy, Nathan McNeese, supported by faculty advisors ; Madhu Reddy and Chris DeFlitch

## *Transitions of Care for Hospitalized Patients*

Students Hyojung (Emily) KangPraewpran Prayadsab, supported by faculty advisors Harriet Black Nembhard, Chris DeFlitch and Coleen Rafferty

## *Service Product Platform and Incentive Modeling for Complex Health Care Systems*

Students Tao Yao, with faculty advisors Robert Weaver( AgEcon) and Chris DeFlitch

## *Optimizing ED Patient Flow with Support of Healthcare Info. Technology*

Faculty advisors Chris DeFlitch, MD; Deb Medeiros, PhD; Janetta DeOnna, RN, PhD for students Allison Lancos; and Kathryn Wilt, RN, MSN

# Sample of CIHDS Projects

## *Urgicare Operation During Phase I Transition: A Simulation Study*

Students Allison Lancos, Allen Gaudelli, with faculty advisors Deb Medeiros, PhD, IE; and Chris DeFlitch, MD, Medicine

## *Information Visualization for Patient Management of Hypertension*

Students Siddarth Prakasam, with faculty advisors Harriet Black Nembhard, PhD, IE; Chris DeFlitch, MD, Medicine; and Madhu Reddy, PhD, IST

## *Investigating Barriers to Using Electronic Medical Records in Collaborative Work*

Students Arvind Karunakaran\*, IST; Young Hee Nam\*, HPA with faculty advisors Madhu Reddy, PhD, IST; Chris DeFlitch, MD, Medicine; and Harriet Black Nembhard,

## *Optimizing Patient Flow in the Emergency Department*

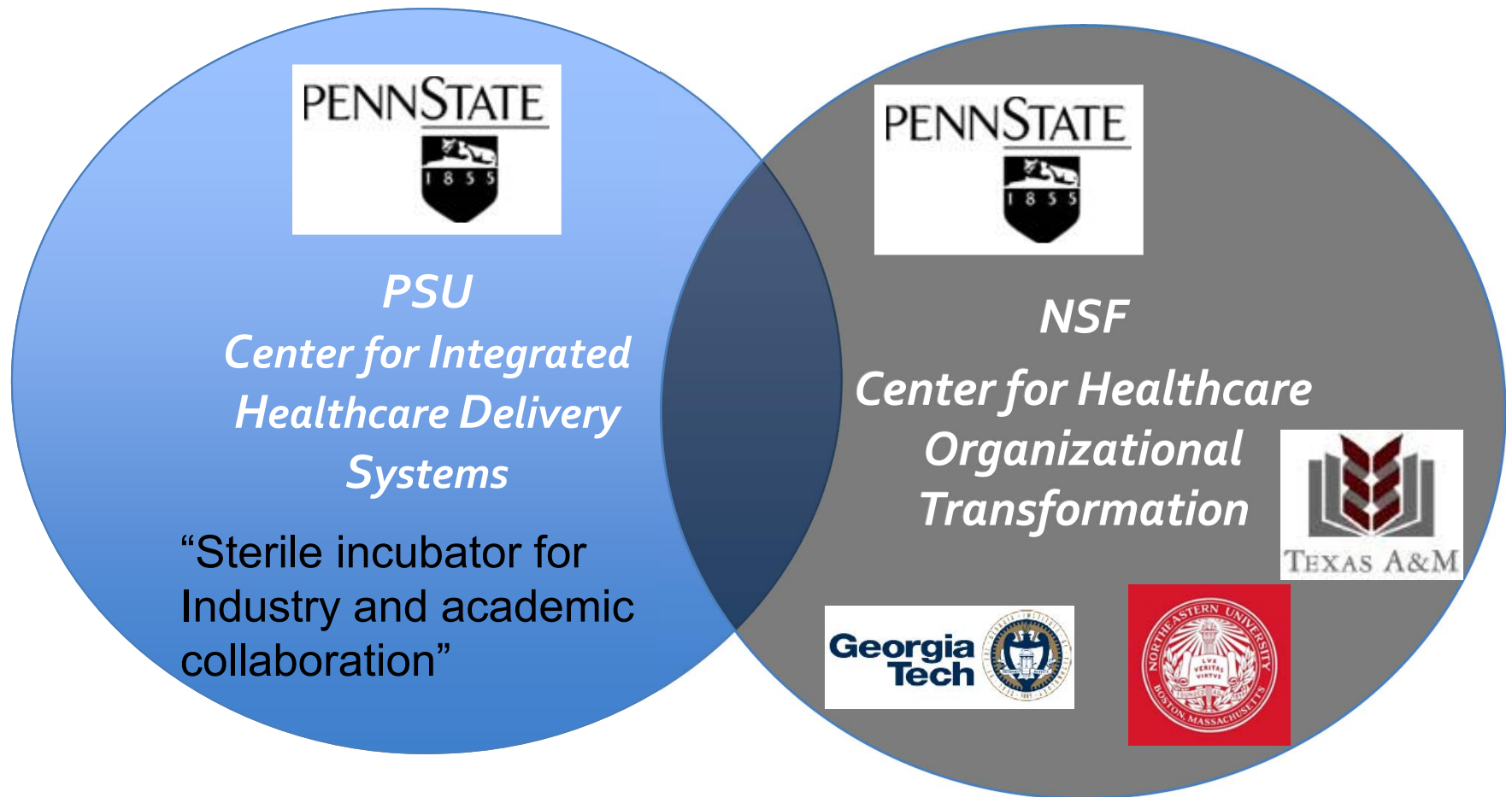
Faculty advisors Chris DeFlitch, MD; Deb Medeiros, PhD; Janetta DeOnna, RN, PhD for students Allison Lancos; and Kathryn Wilt, RN, MSN

## *Using Lean to Decrease Door to Doctor Time*

Students Jeffrey Penoyer, Health Administration. Elizabeth Olson Industrial Engineering Jessica Havern Health Administration with faculty advisor Chris DeFlitch



# CIHDS & CHOT interplay



# >80 CIHDS scholars

Osama Alotaik, PhD Candidate  
Industrial Engineering  
2015-16 CIHDS Scholar

Nathaniel Bastian, PhD expected Summer 2016  
Industrial Engineering  
2012-13, 2013-14, 2014-15, 2015-16 CIHDS Scholar

Linlin Ma, PhD Candidate  
Industrial Engineering  
2015-16 CIHDS Scholar

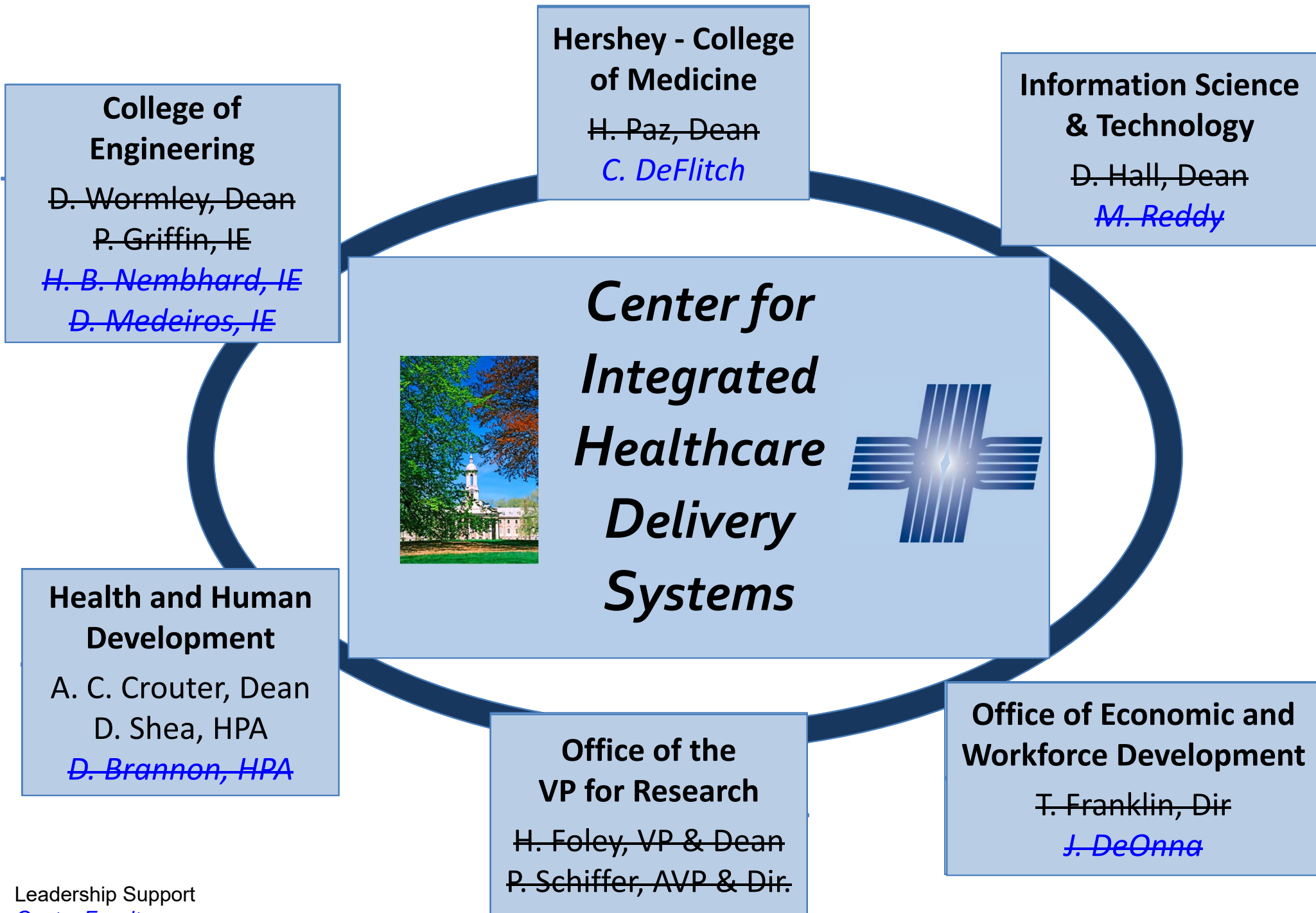
Abhinav Singh MS expected Spring 2016  
Industrial Engineering  
2014-15, 2015-16 CIHDS Scholar

Eric Swanson, PhD Candidate  
Industrial Engineering  
2015-16 CIHDS Scholar

- Many Colleges
- Many degrees
- Many Backgrounds
- Jpb Opportunities

- Nathaniel Bastian,  
PhD, Co-author
- Alison Murphy,  
PhD. IST Faculty
- Ashley Britton  
PennState Health





# CIHDS Founders

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Assoc. Prof. of Industrial Engineering  
College of Engineering  
hbn2@psu.edu

Oregon State U

## Diane Brannon, PhD



Co-Founder, CIHDS  
Prof. of Health Policy & Administration,  
College of Health & Human Development  
f8z@psu.edu

RETIRED

## Chris DeFlitch, MD



Co-Founder, CIHDS  
CMIO, Penn State Hershey  
College of Medicine  
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## Deb Medeiros, PhD



Co-Founder, CIHDS  
Assoc. Prof. of Industrial Engineering  
College of Engineering  
djm3@psu.edu

RETIRED

## Madhu Reddy, PhD



Co-Founder, CIHDS  
Ast. Prof. of Information  
Sciences & Technology  
mreddy@psu.edu

Northwestern U



# NSF CHOT expansion & Phase 2



**PennState**



UNIVERSITY of WASHINGTON



**Georgia Institute  
of Technology**



UNIVERSITY OF  
**LOUISVILLE**

**FAU** FLORIDA ATLANTIC  
UNIVERSITY

**UAB** THE UNIVERSITY OF  
ALABAMA AT BIRMINGHAM



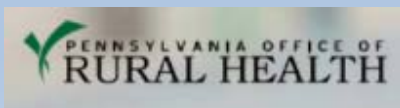
University of  
**Nottingham**  
UK | CHINA | MALAYSIA



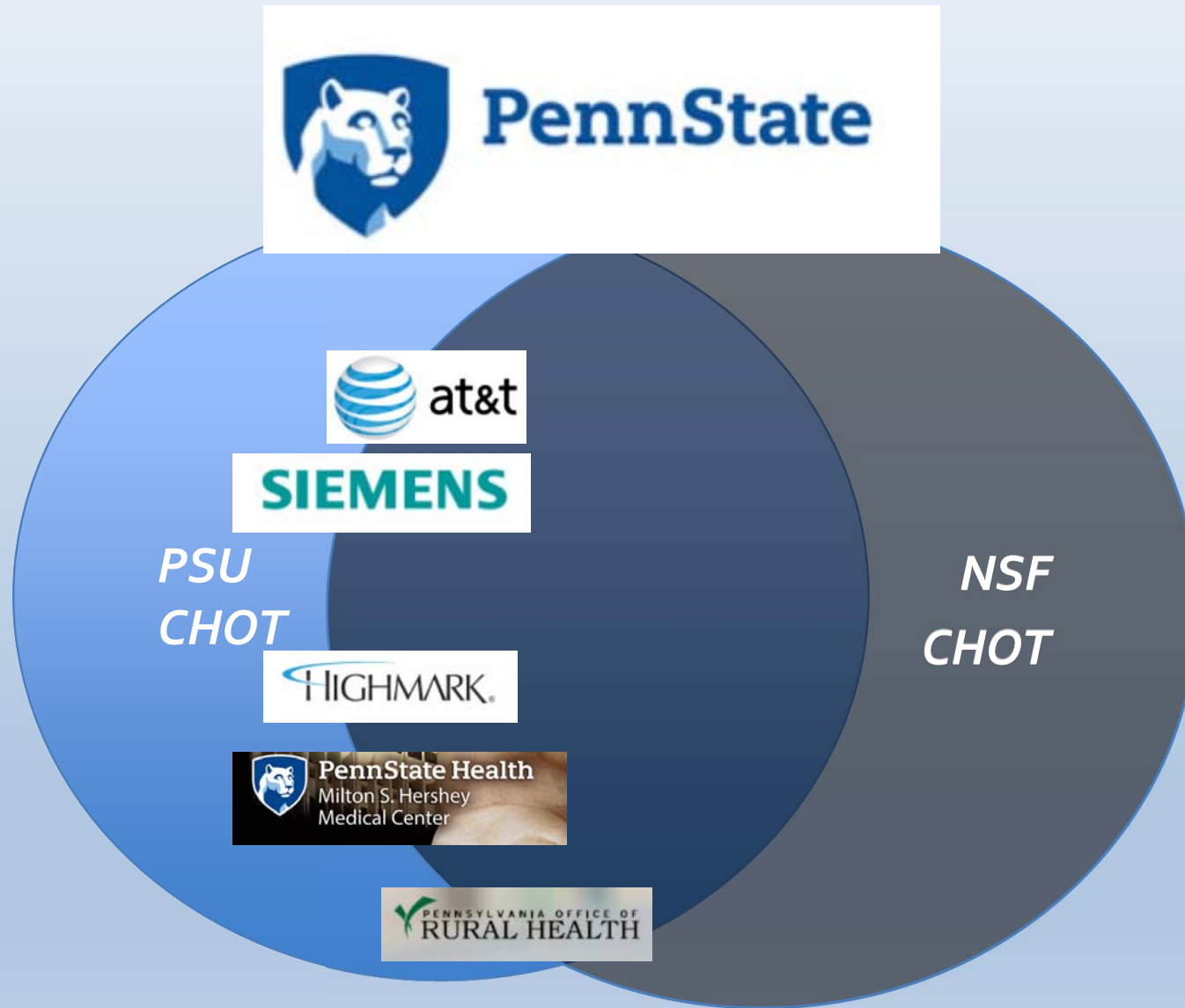
# Penn State CHOT 2016-17

- Rebranded – CHOT
  - Consolidated branding for consistency
  - Combined collaborations
- Maintain focus on education and research
- Continued I/UCRC concepts and model

# Penn State CHOT Partners

The Siemens logo, featuring the word "SIEMENS" in a bold, teal, sans-serif font.The Highmark logo, featuring the word "HIGHMARK" in a black, sans-serif font, with a blue swoosh above the "H".

# PSU and NSF CHOT interplay



# Penn State CHOT Leadership

**Conrad Tucker, PhD**



- Director, PSU CHOT
- PI, NSF CHOT
- Assoc. Prof. EDTPP, IE
- College of Engineering
- cst14@psu.edu

**Nilam Ram, PhD**



- Co-PI, NSF CHOT
- Professor, HDFS, Psych
- College of HHD
- nur5@psu.edu

**Chris DeFlitch, MD, FACEP, FAAEM**



- Co-Founder, CIHDS/CHOT
- Co-PI, NSF CHOT grant, phase 1/2
- VP & CMIO, Penn State Health
- Professor, College of Medicine
- cdeflitch@pennstatehealth.psu.edu

**Melissa Brannen**

- Research Project Manager
- PSU & NSF CHOT
- mir28@psu.edu@pennstatehealth.psu.edu



# Penn State CHOT Faculty Liaisons

- **Russell Barton, PhD**

- Senior Associate Dean, Professor of Supply Chain and Information Systems and Industrial Engineering , PhD

- **Kevin Black, MD**

- Professor and C. McCollister Evarts Chairman, Department of Orthopaedics and Rehabilitation

- **Mary Frecker, PhD**

- Professor of Mechanical Engineering and Bioengineering, University Park Campus  
Director of the Learning Factory

- **Lee Giles, PhD**

- David Reese Professor of Information Sciences and Technology, Graduate School  
Professor of Computer Science and Engineering

- **José Pinto Duarte, PhD**

- Stuckeman Chair in Design Innovation and director of the Stuckeman Center for Design Computing (SCDC)



# Penn State CHOT

- CHOT Research Faculty Advisors
  - Eun Kyoung Choe, PhD
  - Yuan-Han (rick) Huang, PhD
  - Greg Lewis, PhD
  - Yunfeng Shi, PhD
  - Andrea Yevdhak Sillner, RN, PhD
- CHOT Faculty and Affiliate Members
  - Larry Baronner, Dep Dir PA of Rural Health
  - Nathan Bastian, PhD
  - Maria Hamilton, Dir, HSSA, Penn State Health
  - Jen Kraschnewski, MD,
  - Soundar Kumara, PhD

# PSU CHOT

Research in transformational strategies  
for healthcare

Education of the next generation of  
healthcare delivery innovation