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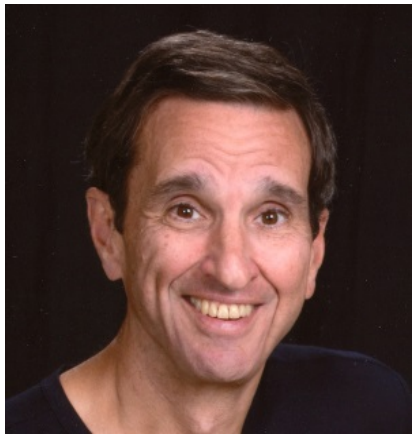
INCOSE Webinar Series

Wednesday 15th August 2018– Webinar 115

Bridging the Gulf of Execution





Thomas McDermott, Jr, Sunil Bharitkar & Christopher Nemeth

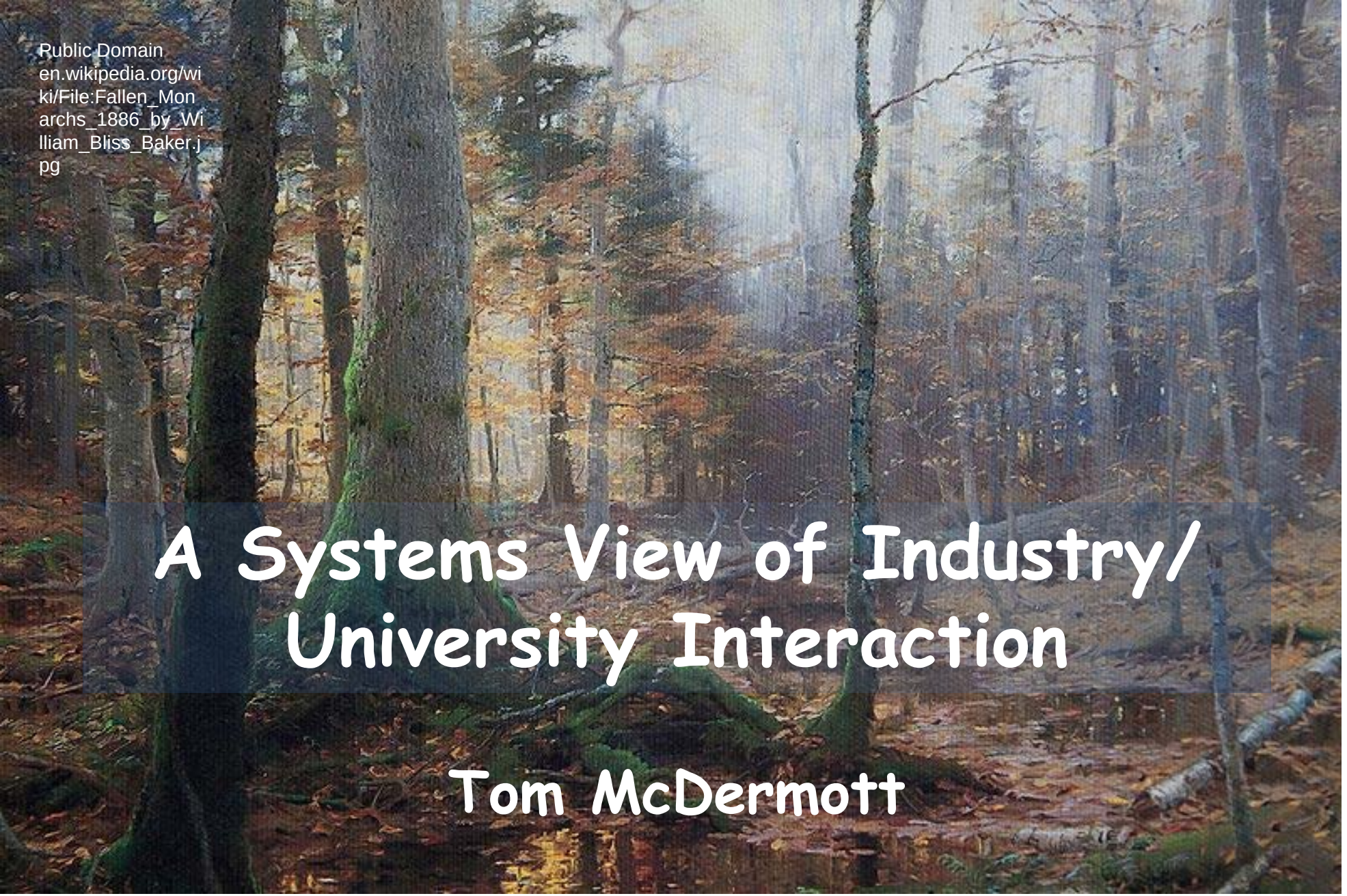
Overview

The Gulf of Execution

A Systems View of Industry/ University Interaction
Tom McDermott

Solving the Gulf of Execution
Sunil Bharitkar

Building the Bridge
Christopher Nemeth



Public Domain
en.wikipedia.org/wiki/File:Fallen_Monarchs_1886_by_William_Bliss_Baker.jpg

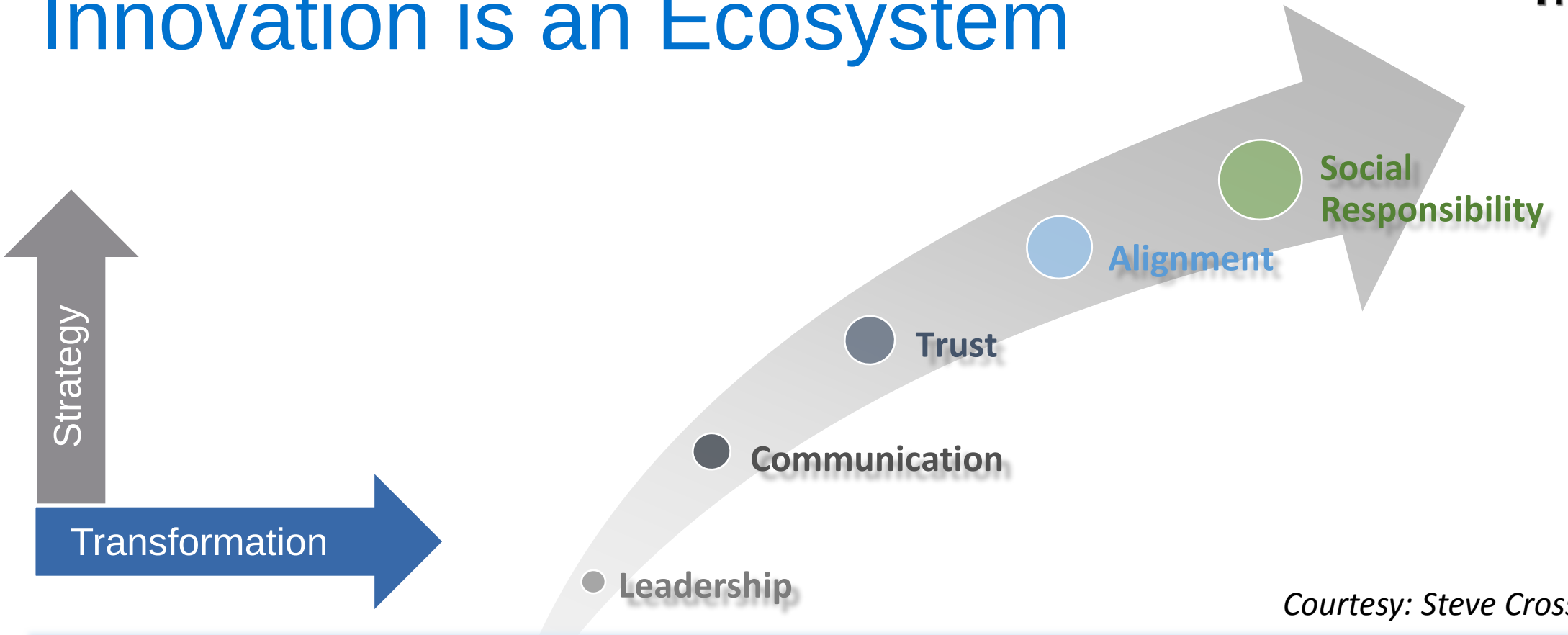
A Systems View of Industry/ University Interaction

Tom McDermott

Foresightful Modeling:

Better able to observe, to perceive and understand internal and external change, to align goals and purpose, and to respond holistically.

Innovation is an Ecosystem



Courtesy: Steve Cross

$$\textit{Innovation} = \frac{\textit{insight} + \textit{invention} + \textit{implementation}}{\textit{inhibitors (enablers)}}$$

Expanding Industry/University Relationships "insight – invention – implementation"

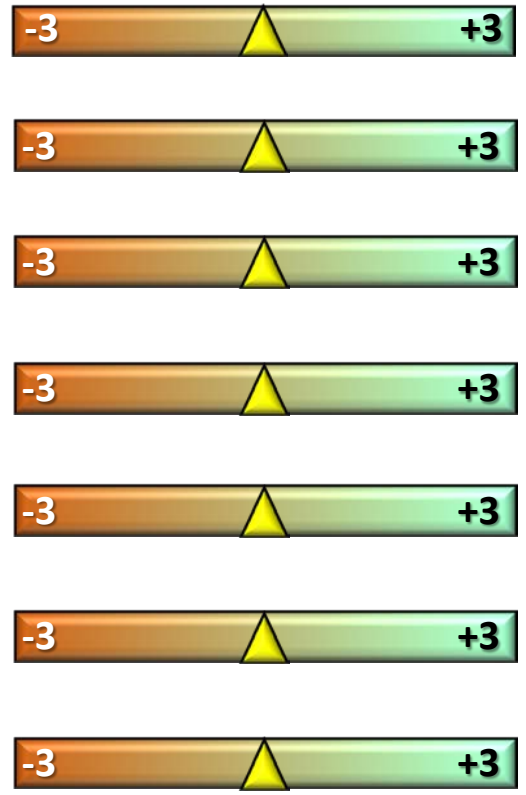
- Access to next generation technical talent
- Access to breakthrough/transforming technology for strategic positioning in growing markets
- Re-position current product/process to next-generation technology
- Virtual R&D Center: leverage partner assets
- Window on evolving/competitive technology
- Complementary technology to internal core research
- Accelerate commercialization via partnering to gain skill or market access
- Critical technical problem resolution

McConnell 2014

Major corporations are down-selecting to 6 - 8 key University Partnerships Increasing interest in co-locating research centers at key universities

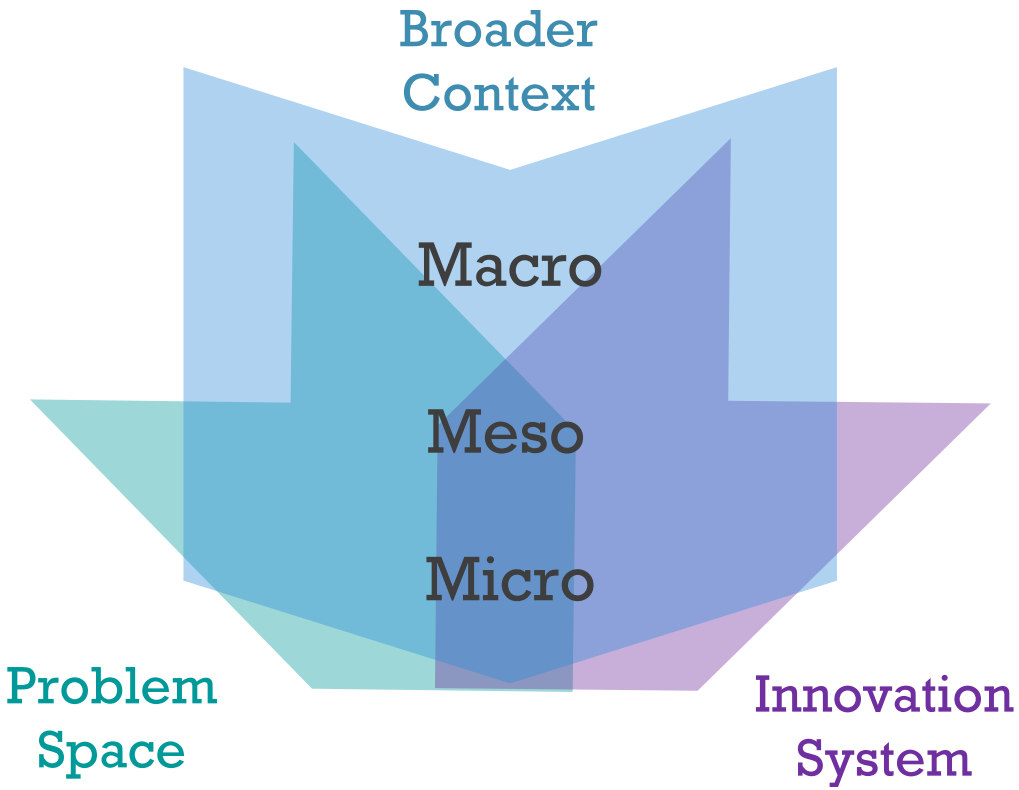
Interactive Industry/University Research Support "inhibitors – enablers"

1. Flexible IP / contracting practices
2. Clear understanding of industry needs
3. "High caliber" faculty
4. Proactive contact with relevant opportunities
5. Ease in navigating to key resources
6. Focus on both short & long term outcomes
7. Flexible publication policies



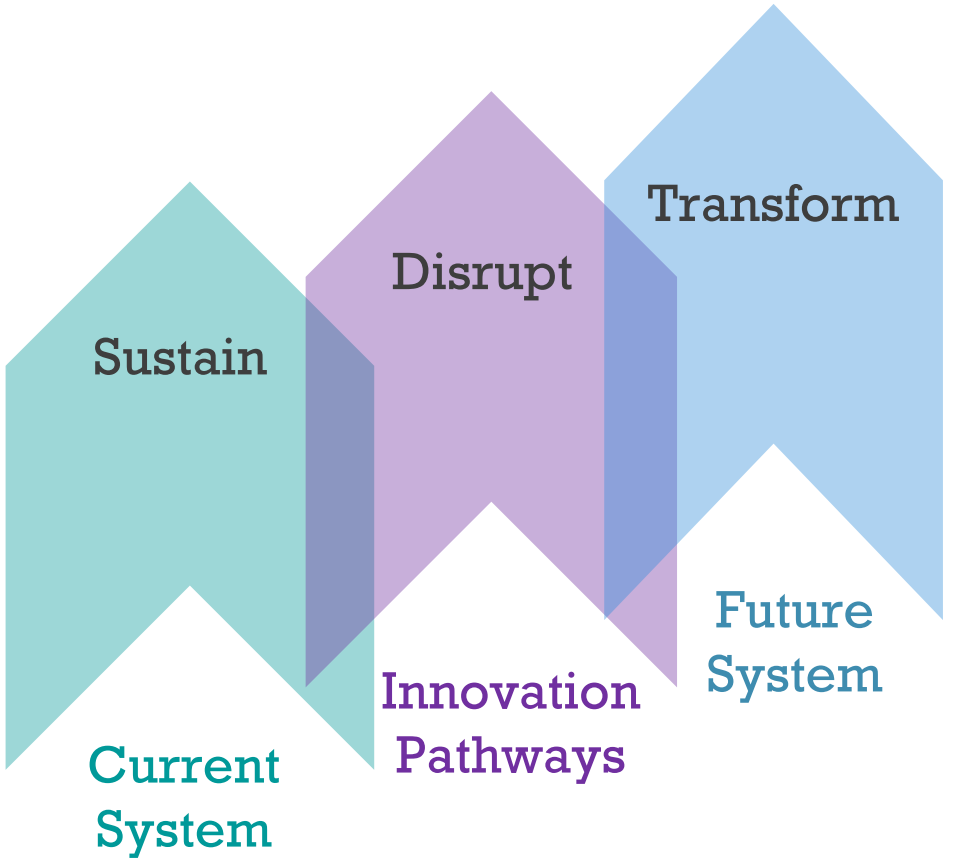
McConnell 2014

Innovation Ecosystems – “The Three Systems Models”



Design - Three
Scales of Transition

Farley & McDermott



Strategic Fit - Three
Horizons of Innovation

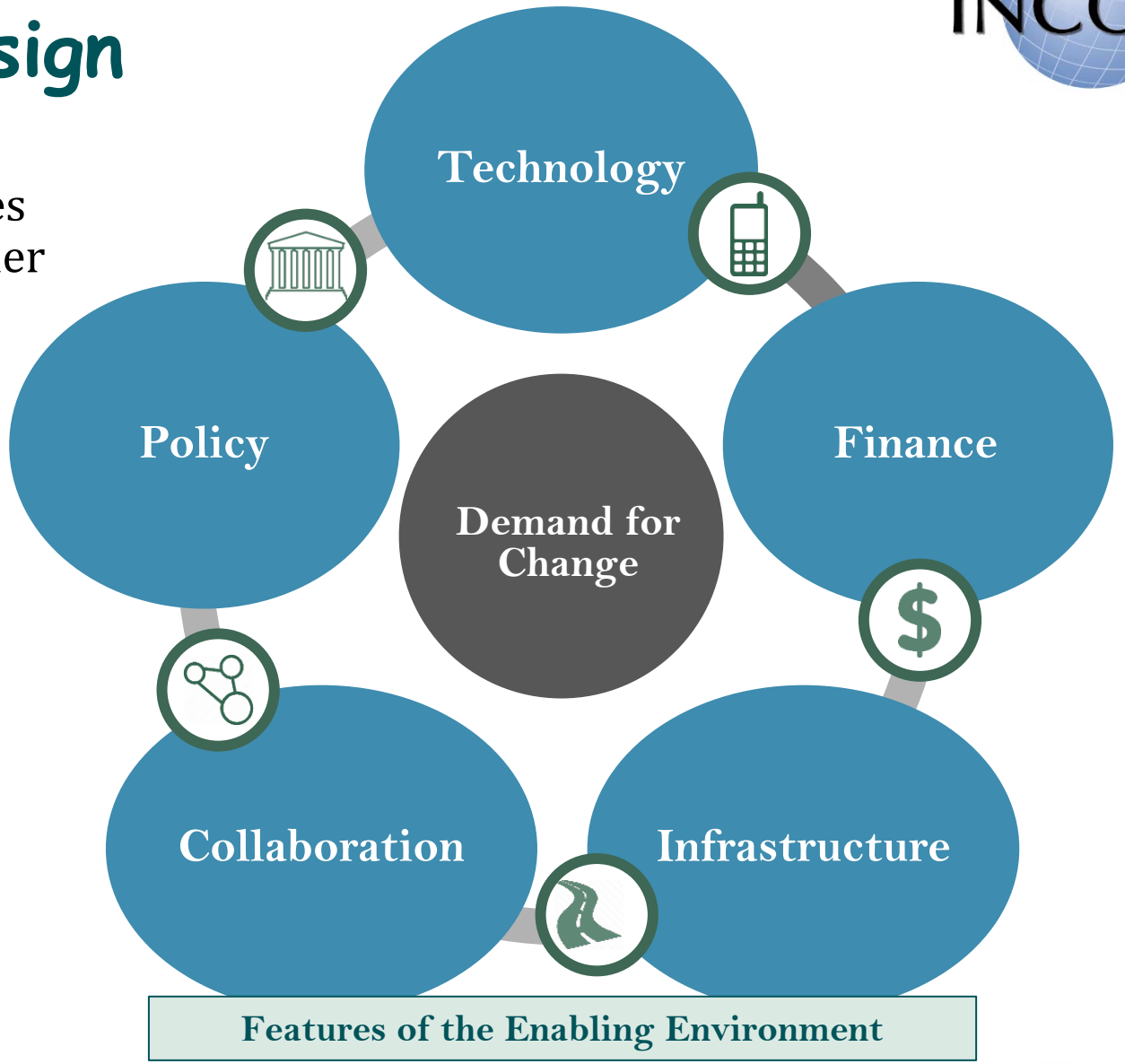
International Futures Foundation

Innovation System - Design

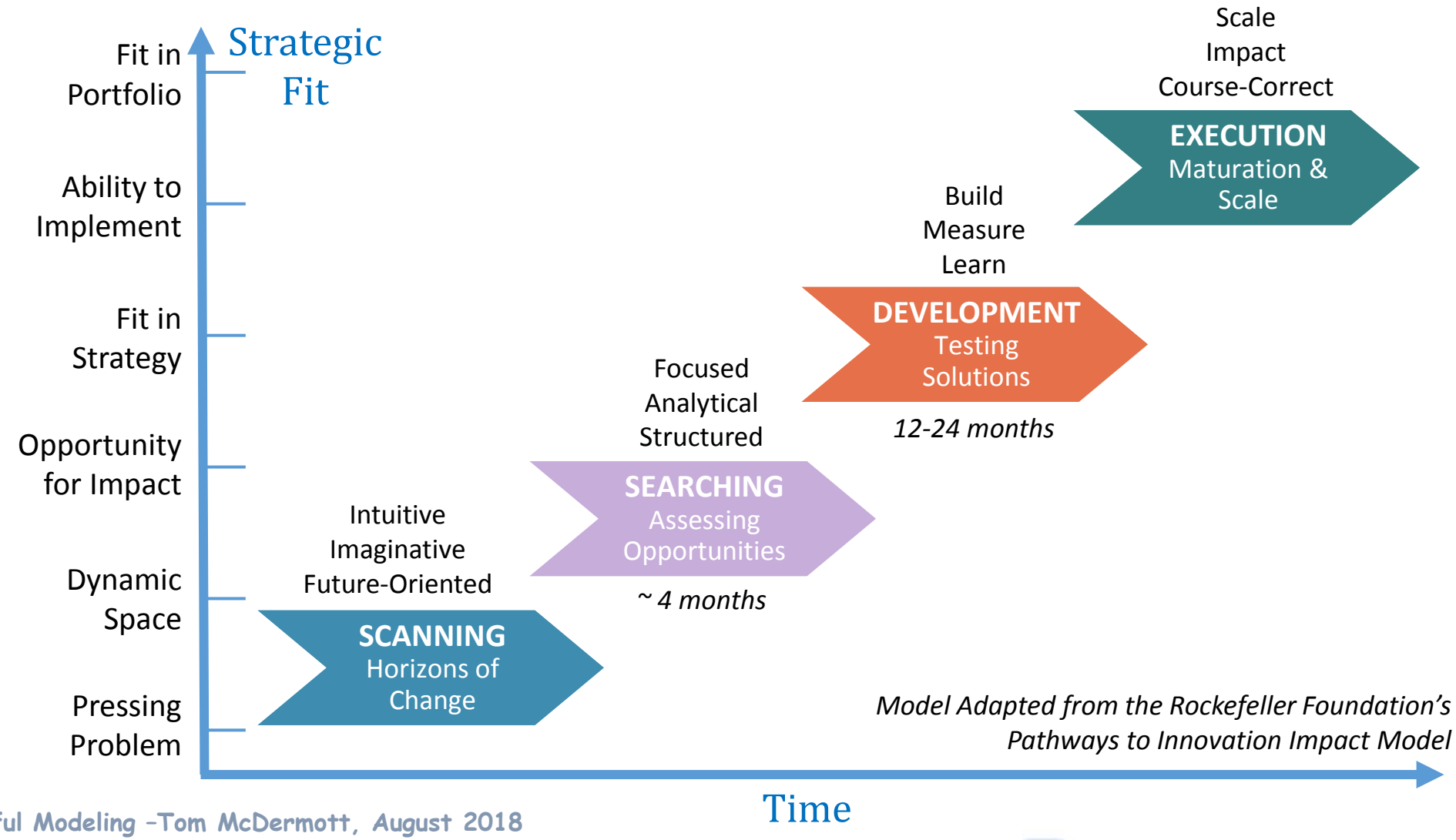
The players, resources, institutions, and rules that comprise an innovation system can either enable or block innovation.

+ Key Enablers to Innovation

- Key Barriers to Innovation



Innovation Pathways – Strategic Fit



Model Adapted from the Rockefeller Foundation's Pathways to Innovation Impact Model

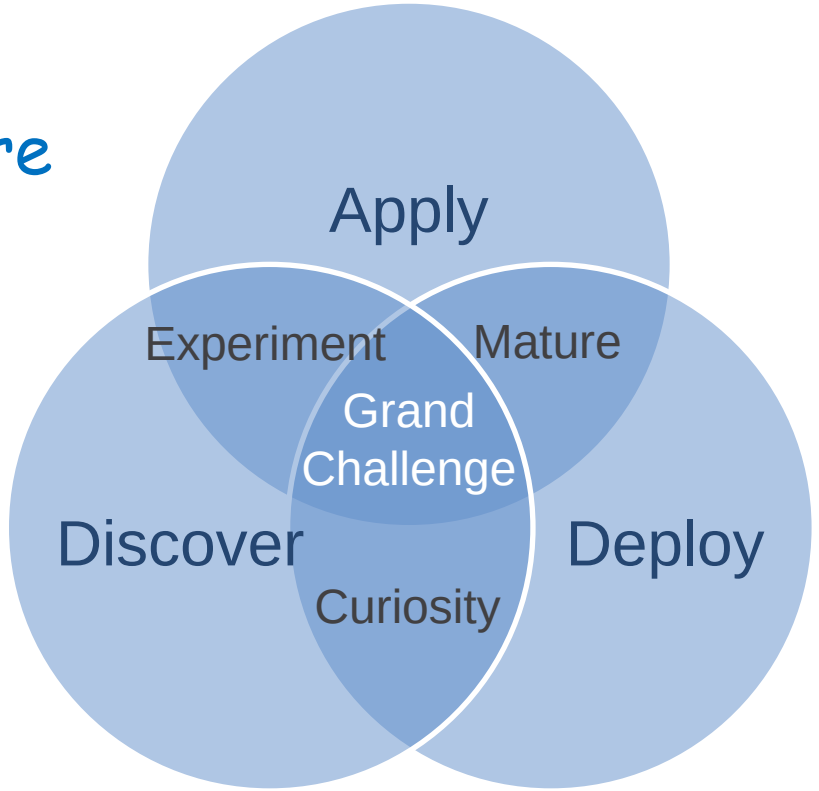
Research Collaboration is one of Seven Major Aspects of a University/Industry Relationship…

1. Recruiting skilled and talented students
2. **Sponsoring & advising academic research**
3. Supporting schools, chairs, programs, initiatives, campaigns & endowment
4. **Connecting with startups**
5. Continuing education
6. Vendor relationships
7. **Major innovation centers/establishing a sustained university presence**

McConnell 2014

Universities can Focus on High-Risk/High-Payoff Research Problems motivated by Industry Need

1. Building team experience with similar problems – Grand Challenges
2. Building team experience with new & mature technologies - Curiosity
3. New & unproven technology from emerging research results - Experimentation
4. Requirements with unknown solutions – Discover and Apply
5. New market opportunity - Unprecedentedness



Cross 2012

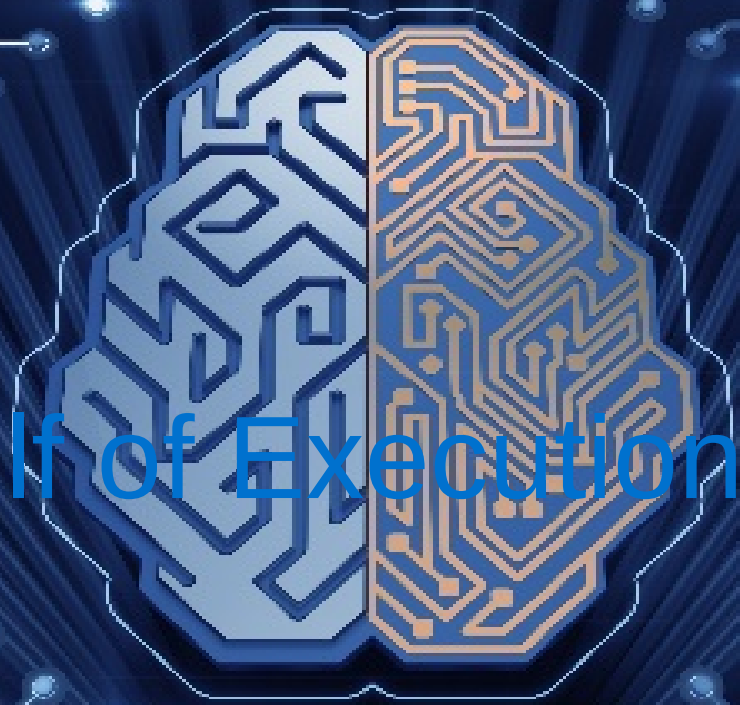
Case Study

Grand Challenge: Industry 4.0 Digital Transformation

1. Innovation competitions – student defined scenarios and experiments
2. Innovation Centers – facilities with classroom exercises and experiments reflecting industry challenges
3. Innovation System Design – technical experiments combined with business experiments for Discovery

Decompose the existing system – experiment with enhancements – create unprecedented solutions

Cross & Felis 2016



Solving the Gulf of Execution

Sunil Bharitkar, Ph. D.
Emerging Compute Lab (ECL)
HP Labs

- August 15, 2018

ECL RESEARCH

M. Anthony Lewis, Ph. D. (Lab Director)

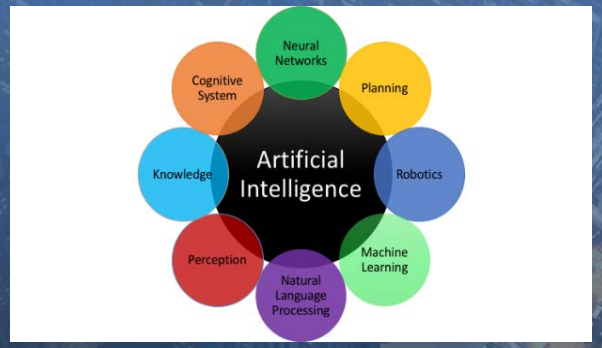
Edge Compute

Enabling new compute paradigms

Emerging compute tech
Secure ML at the edge
Distributed AI

AI & ML

Advancing AI, ML state-of-the-art



Intelligent Agents
NLP, Audio, Computer Vision
Deep Learning

Cyber-physical Systems

Blending digital & physical

Real-time control of Cyber-physical Systems

KEY THEMES: Agility | Alignment | Thought Leadership

Agenda

Overcoming GoE

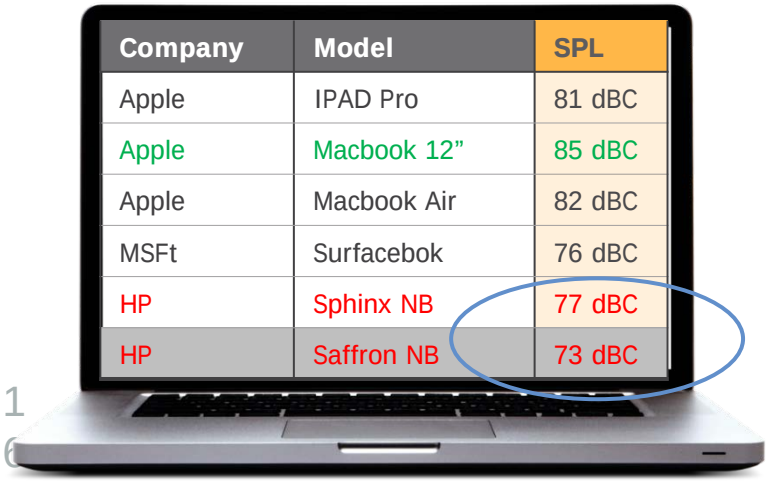
- Identifying Problems
- Immersive Audio (IA)
  - Research
  - Development
  - Scalable Deployment

Objective Testing

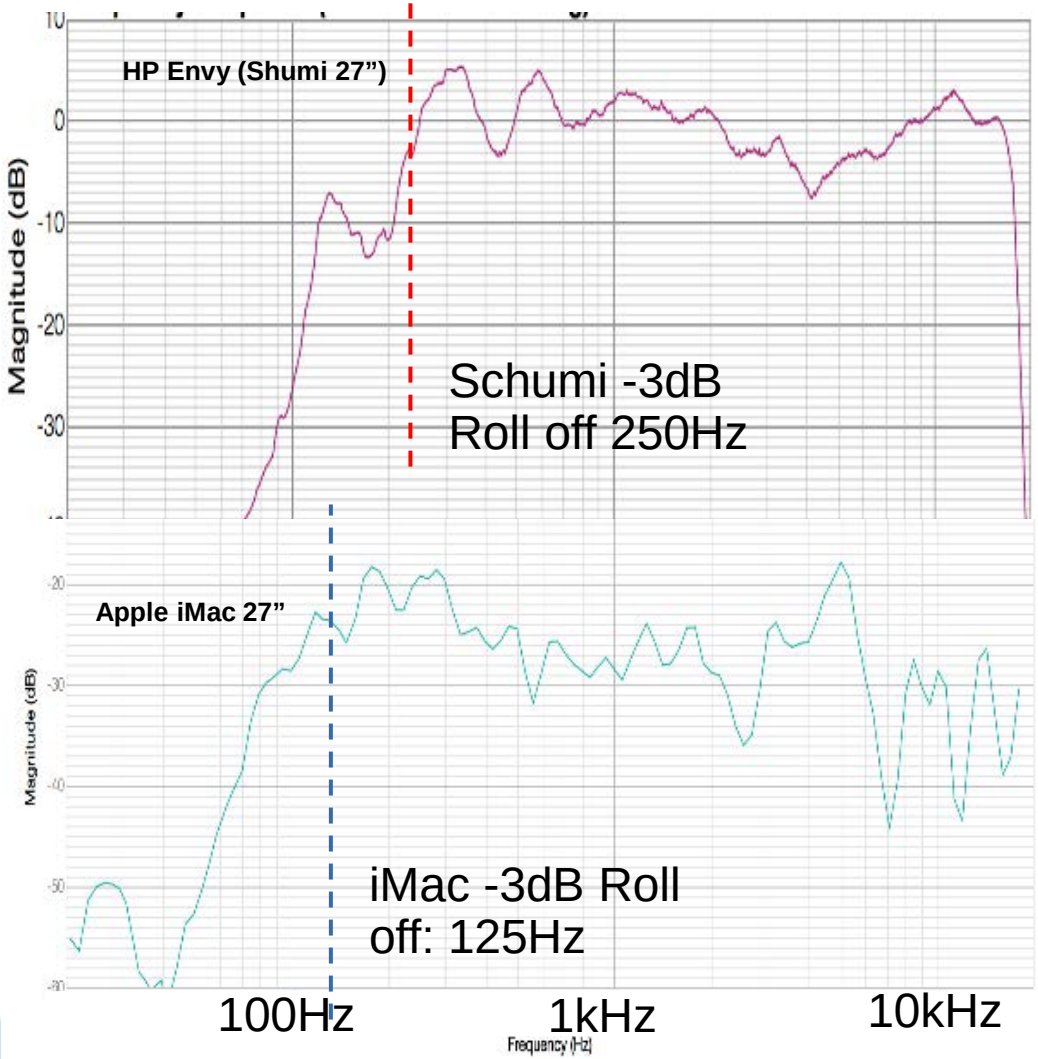
Illustrates audio gaps and opportunities for improvement

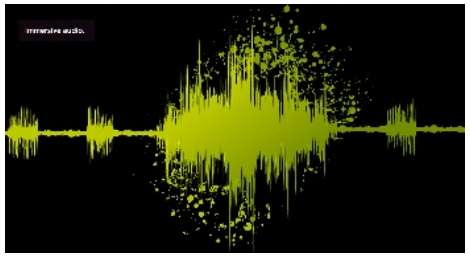
#1 Defined Standard Metrics

Subjective Attribute	Objective Metric
Loudness	SPL (dBC), -18dBFS pink noise
Distortion	THD, Log-sweep
Quality/ bass	Frequency response, Log-sweep



#2 Identified Gaps





Systems Performance Standards (ECL+PS)

Signal Processing Algorithms (ECL)

Perceptual Testing (PS-PQE)

Product Implementation & Testing (Sound Research + PS)

BANG & OLUFSEN

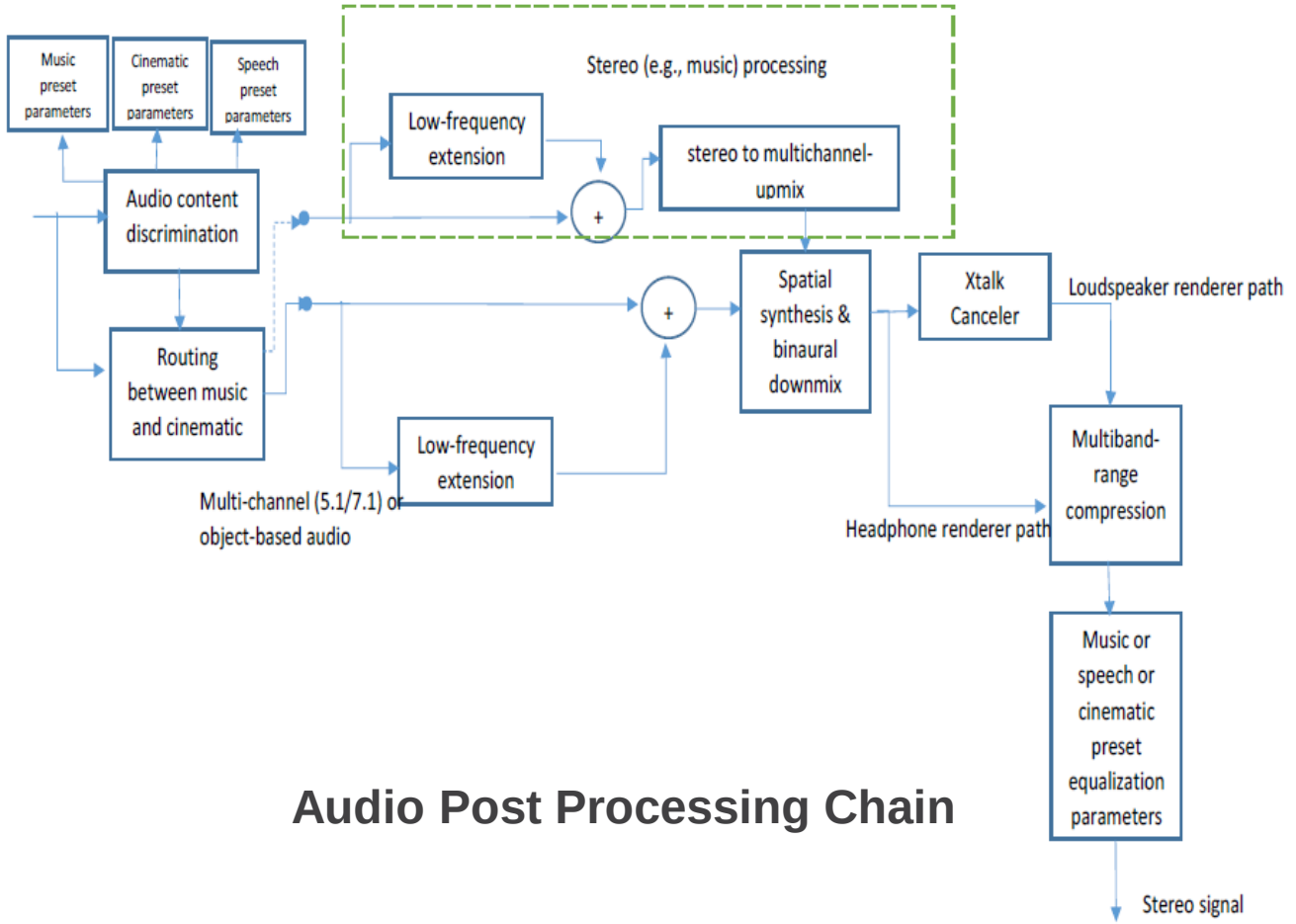
Building Blocks for IA
Signal Processing, Acoustics, Perception, ML

Signal Processing to Improve Audio Experience

- HP Immersive Audio

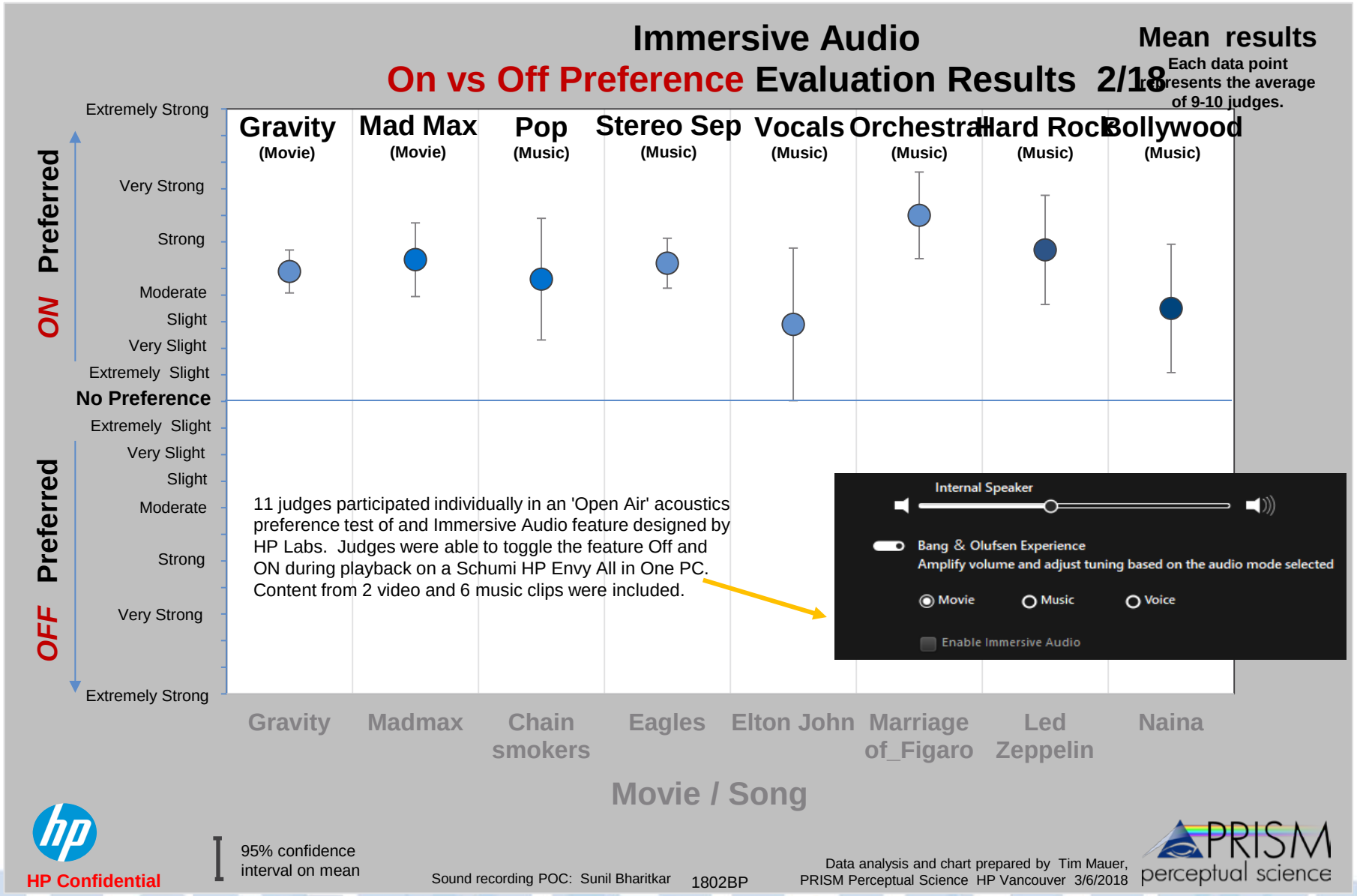
Addresses shortfalls in four domains

1. Low Frequency Extension
2. Spatial Rendering
3. Preset Selection by Content Classification
4. Loudness
5. Assess Compute (MIPS/CPU) & Memory (for 1-4) on the Edge



Audio Post Processing Chain

Immersive Audio Subjective Testing (MVP)



Product Status (IA MVP)

HP Envy Curved AiO 34”: FCS Launch July 6,2018; Rado 24” & 27”: FCS Launch Aug. 3, 2018

Product, subj. testing, engineering, marketing, & strategy team:
TDC: P. Robineau, D. Hsu, J. Kao, J. Chen, L. Atkinson,
Labs: M. Athreya;
CEPS: B. Pickering, K. Singh, S. Chau;
Print: T. Mauer, T. Wells, D. Berfanger, C. Oppenheimer;
SR: C. Chin, T. Paddock, E. Abramian,

Building the Bridge

How did we get a gulf between research and development?

- Research focus on problem domain, development focus on solution
- Professional isolation
- Process issues: requirements need to be clear to be useful
- Time pressure

Building the Bridge

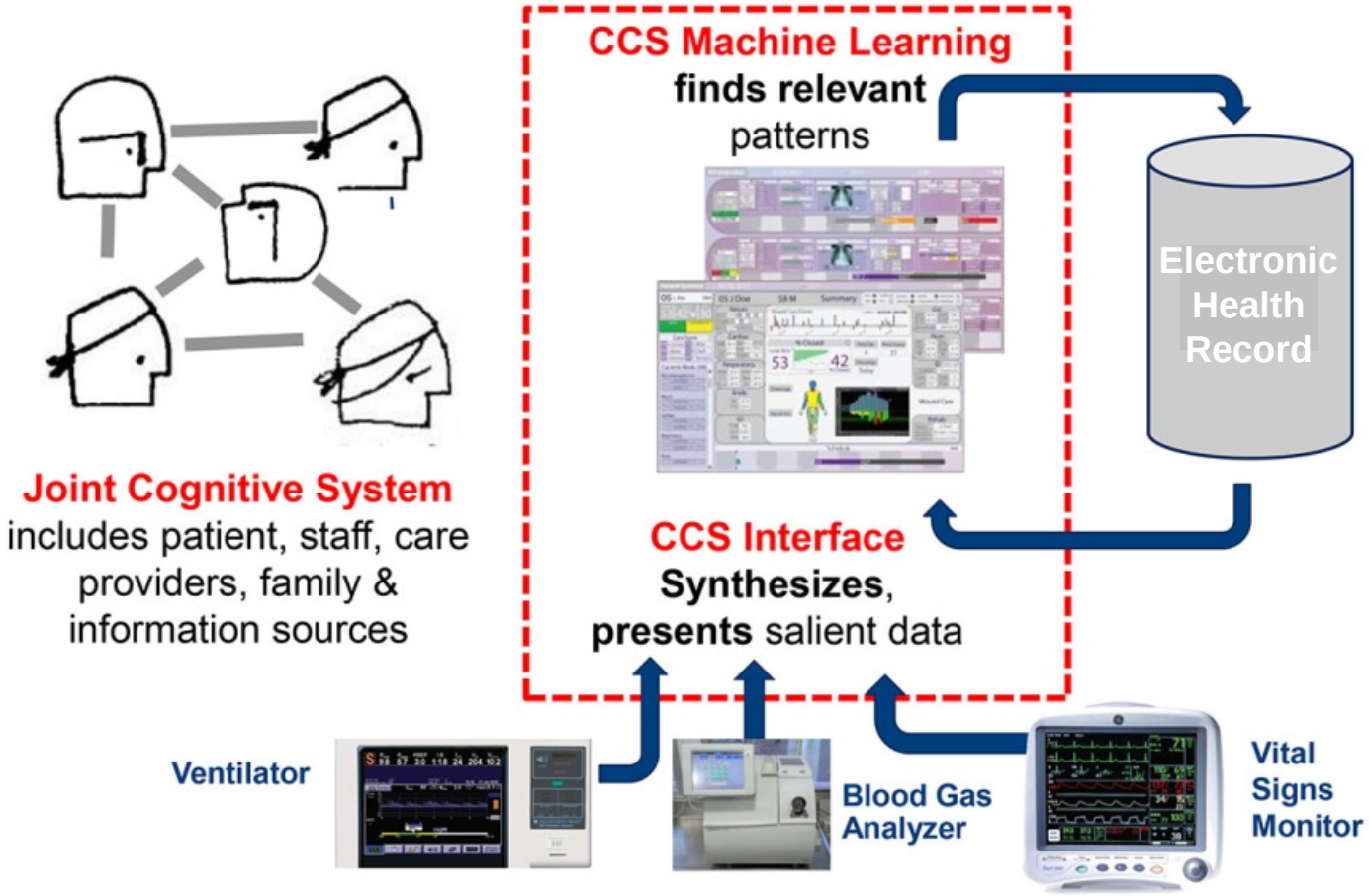
What aspects of research and development can be changed?

- Attention to transition between research and development at 3 levels:
  Technical team members

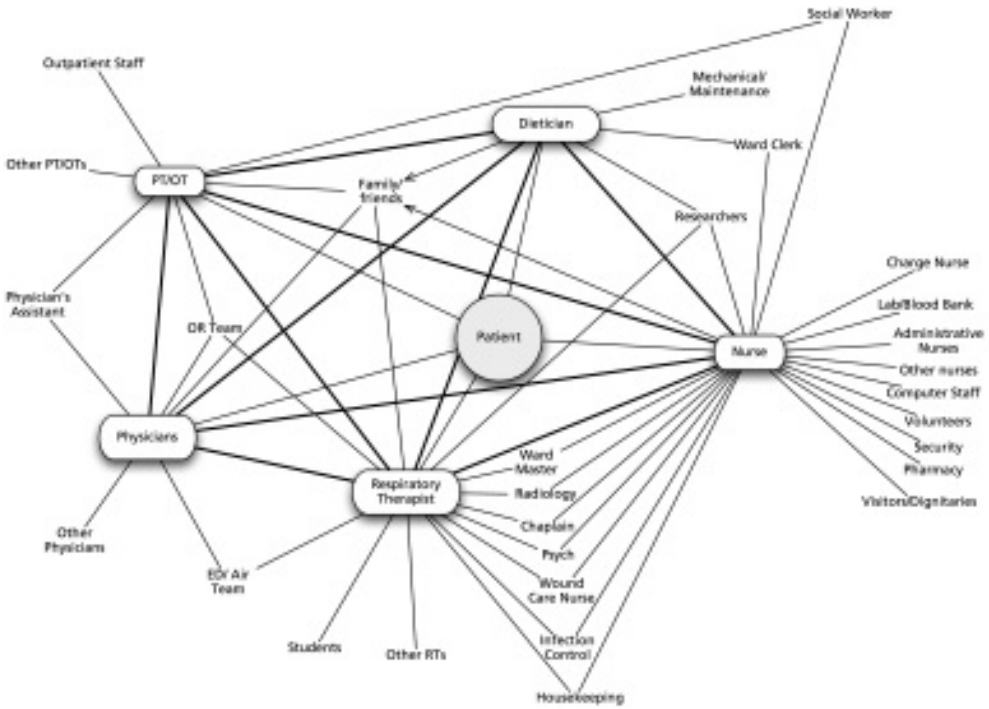
  Technical team leaders

  Managers
- Team composition that brings diverse professional skills together in a collaborative setting

Cooperative Communication System (CCS)

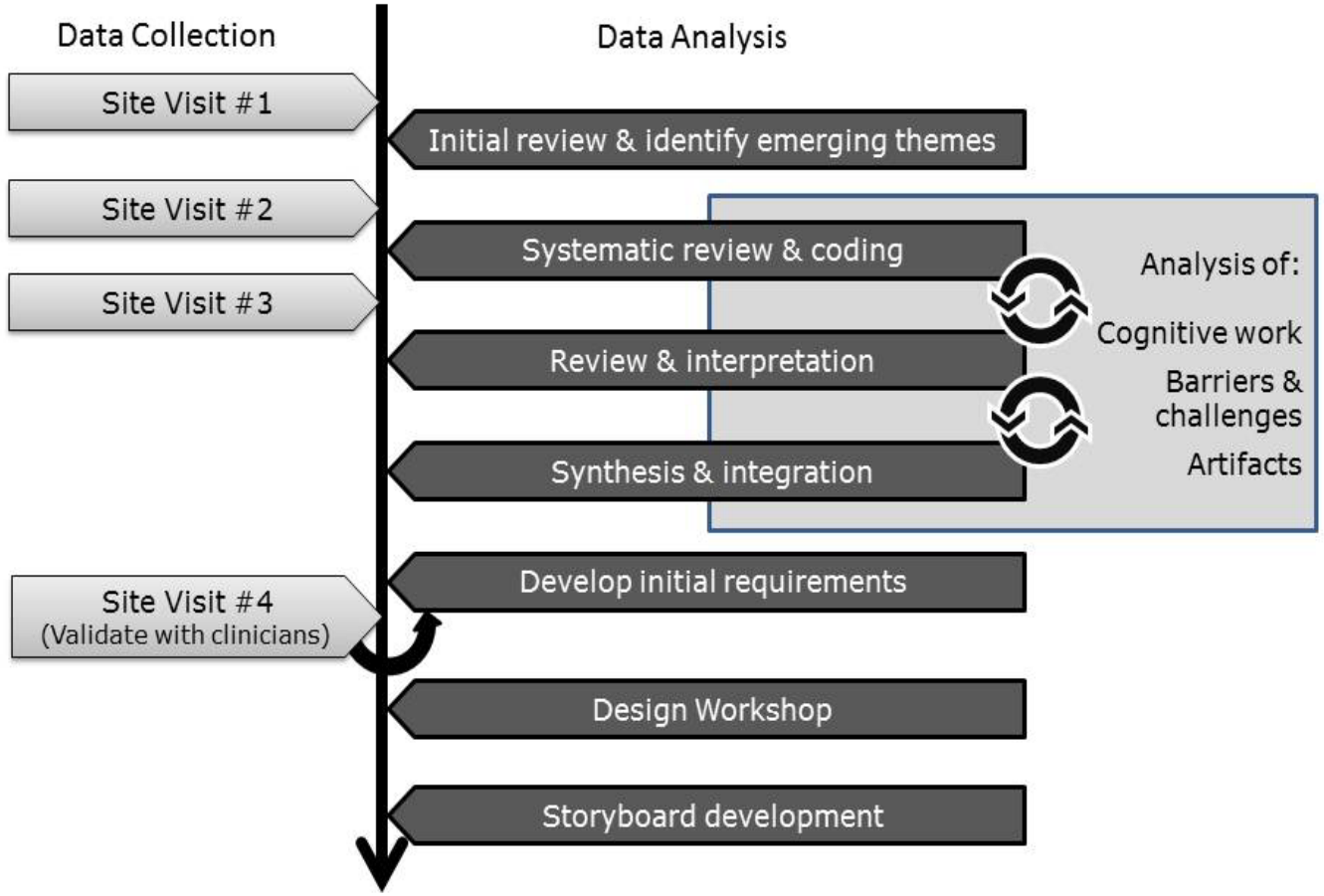


Phase 1: Understand the Work Domain



Function Unit Members Perform	*Activities Unit Members Perform*	*Tasks Unit Members Perform*
Synchronization	**Clarification**	Reduce uncertainty Manage ambiguity Manage conflicting agendas Manage communication
	Coordination	Develop shared awareness of the Patient Get and keep common ground Manage the care plan and treatment goals Coordinate resources
	Negotiation	Identify alignment, gaps/differences (e.g., agendas) Manage conflicting agendas Manage communication
	Anticipation	Forward thinking

Phase 1: Understand the Work Domain

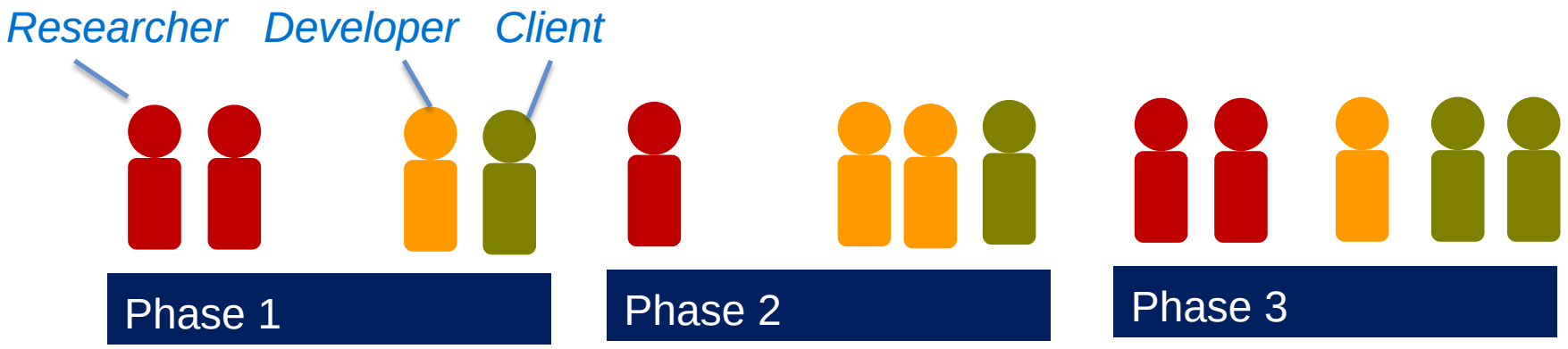


Phase 2: System Development

Phase 3: Evaluation

What Worked to Bridge the Gulf

- Built trust and understanding among team members from various disciplines and cultures
- Explicitly matched data to needs to requirements, and demonstrates through use cases
- Overlapped research and development team members to both anticipate downstream issues, and get buy in from all concerned



Bridging the Gulf of Execution

Please share your comments or questions

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Coming soon!

INCOSE Listening Session

SMCS2018 Symposium
Miyazaki, Japan

William Miller, INCOSE
Rodney Roberts, Christopher Nemeth SMCS

Tuesday 9 October, 1420-1800

You are welcome to contact the presenters to further discuss issues related to Bridging the Gulf of Execution.

- Tom McDermott -- tmcdermo@strevens.edu
- Sunil Bharitkar--sunil.bharitkar@hp.com
- Christopher Nemeth—cnemeth@ara.com