Integrated Media Systems Center
Viterbi School of Engineering
University of Southern California

USC | IMSC

LESSONS LEARNED IN PROJECT MANAGEMENT IN THE UNIVERSITY ENVIRONMENT: THE IMSC EXPERIENCE

Isaac Maya, Ph.D., P.E
Director, Industry and Technology Transfer Programs
213-740-2592, imaya@imsc.usc.edu

National Science Foundation Engineering Research Center

Integrated Media Systems Center

NSF Engineering Research Center:
a partnership in pursuit of *research and innovation* in multimedia and immersive technologies and their applications

28 Investigators and 260 students in partnership with:

National Science Foundation

University of Southern California

Viterbi School of Engineering

Ranked 8th in US, $115M/yr in grant funding

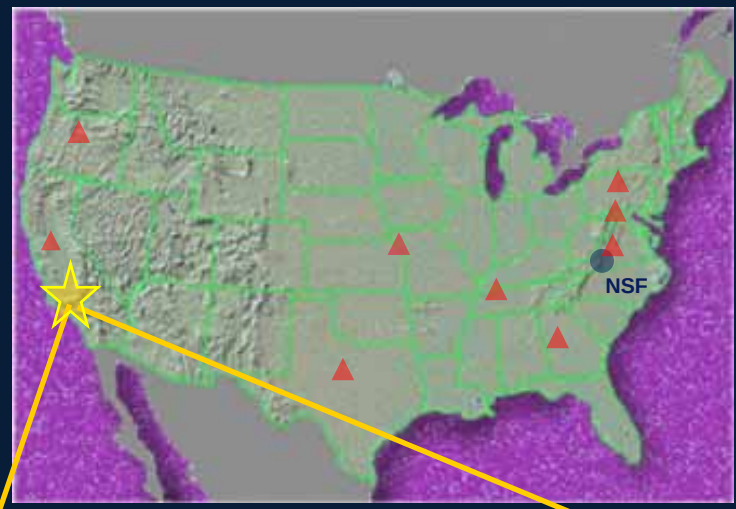
Annenberg Center for Communication

Commercial Partners

Computer Hardware and Software
Aircraft, Aerospace, Defense
Petroleum, Oil, Gas
Telecommunications
Entertainment

Other Government Agencies

DARPA, NASA, JPL, NIMA, ONR, U.S. Army



Education

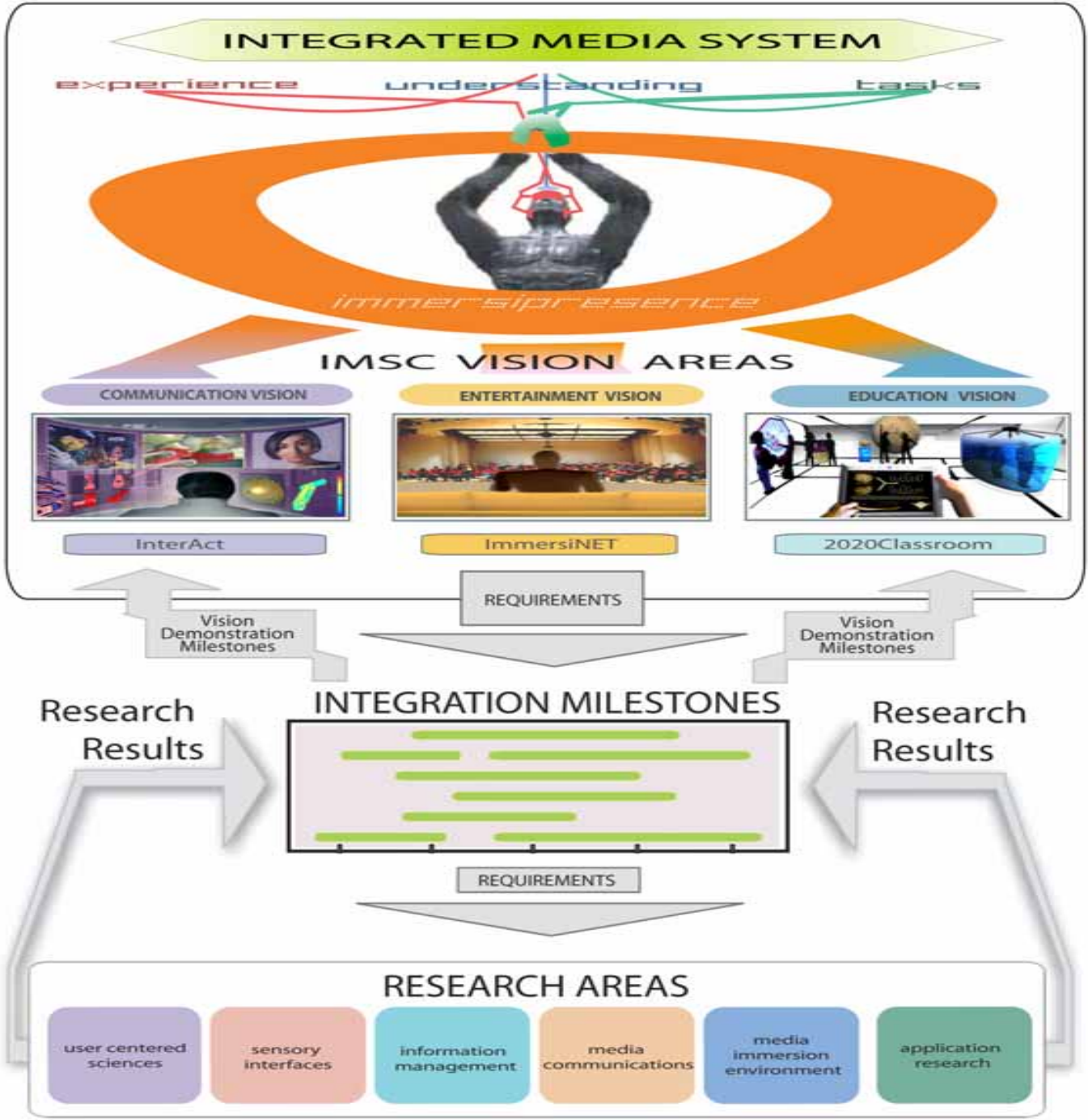
- 209 students graduated with IMSC providing funding, classes, and research aspects of their education experience
  - 112 with PhD, 82 with MS, and 15 with BS
- IMSC created six academic programs
  - 3 MS programs with 454 students enrolled (152 graduates)
  - 2 UG minor programs with 76 students enrolled (121 graduates)
  - BSEE (IMS) enrollment starts F03
- IMSC gave UG research fellowships to 44 students
- Created 23 new courses for IMSC and SoE programs
  - Human Factors in Integrated Media Systems
  - Integrated Media Systems - SAI project course
  - Engineering Approaches to Music Perception and Cognition
  - Intro to Art and Technology - SoE/FA course

Faculty and Academia

- IMSC has a high quality array of 28 investigators – 14 of whom (~ 50%) were sought specifically because of IMSC
  - working with 166 PhD, 56 MS, and 38 UG students.
- Investigators come primarily from EE and CS – others from Psychology, Industrial and System Eng., School of Cinema/Television, Annenberg School for Comm., School of Gerontology, Biomedical Engineering, and the Information Sciences Institute
- Two IMSC investigators have PFF awards
- Eight IMSC faculty have CAREER awards (2 CAREER awards this year)
- Alexander Sawchuk elected to Board of Directors of the Optical Society of America
- Gerard Medioni named a Fellow of Institute of Electrical and Electronics Engineers
- Mathieu Desbrun received the 2003 ACM SIGGRPH Significant New Researcher Award
- IMSC faculty published 52 peer-reviewed journal articles and 184 peer-reviewed conference papers
  - articles actually appearing in print over a 12 month period (2002-2003)

Strategic Plan

- Driving Application Research Projects
- Engineering and Integration
- Basic Research



Research Highlights

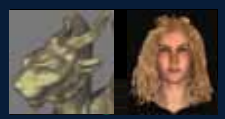
USC | IMSC

IMSC has produced ground breaking results and fundamental research in:

- **immersive audio**
  - multichannel and HRTF approaches - holistic DSP approach

- **streaming servers and multimedia databases**
  - distributed and scalable streaming architecture, immersidata analysis and query

- **computer vision**
  - computational framework for grouping based on tensor voting, tracking for augmented realities and SFX



- **graphics & animation**
  - 3D DSP mesh processing, compression, mesh operations, hair modeling and animation

- **multimodal emotive, 3D interfaces**
  - Speech and dialog, vision sensing of body and hands, facial expressions analysis and expressive avatars

- **virtual reality and simulations**
  - applications to psychology (ADD diagnosis), and user studies

IMSC Research Program

Theory of Perceptual and Cognitive Pleasure

Emotional Expressions

User State Sensing and Perceptual User Interfaces

Virtual Environments for Performance Testing and Training

Immersive audio

Speech Recognition and Synthesis

Facial Gesture Analysis and Animation

Robust Vision Analysis

Digital Geometry Processing

Information Integration

Immersi-data Content Extraction & Analysis

Customized Querying & Rendering

Immersive Media Real-Time Storage & Retrieval

Multimedia Networks, Transmission, and Comm-unication

Ultra Wideband Wireless

Compression

Remote Media Immersion

Software Architecture for Immersi-presence

ImmersiNET - fusion of internet and cinema

2020Classroom – immersion, authoring, and assessment

InterAct – aware computing and multimodal interaction

Enabling the Vision: Application Research Projects

ImmersiNet – *Entertainment*

Prof. Alexander Sawchuk (EE)

Prof. Roger Zimmermann (CS)

InterAct – *Communication*

Prof. Shri Narayanan (EE)

Prof. Isaac Cohen (CS)

2020Classroom – *Education*

Prof. Cyrus Shahabi (CS)

Prof. Chris Kyriakakis (EE)

2020Classroom

- The future of immersive technologies as applied to learning, encompassing:
  - Software and hardware architecture for distributed learning
  - Investigate innovative methods for student/teacher interaction with the curriculum
  - Dynamic curriculum content, specifically designed for this unique immersive platform
  - Development and assessment of high fidelity presence in learning

  - Our two testbed sites are used to study the requirements for interface design, computational complexity, visual and aural fidelity, network performance, and data acquisition of presence for learning applications

InterAct: Communications and Collaboration

- Media-rich integration of sensory modes to support human tasks and communication
  - *Multimodal interfaces* – speech synthesis and recognition, vision tracking and interpretation of human behavior, facial gesture analysis and avatar rendering, haptics, ...
  - *Tele-immersion* – Hi-fidelity low-latency robust communication over IP networks, graceful incorporation of PDA or low-BW
  - 3D/4D visualization and modeling of time-varying surfaces, volumes, and imagery
  - Data fusion – 3D models and video streams and sensor data
  - Data streaming, synchronization, analysis, and query

ImmersiNet: P2P Streaming Media over IP Networks

- A fusion of internet browsing with a theater-like immersive experience
  - HD Video at up to 45 Mbits/sec
  - 10.2 channel Immersive audio (12 Mbits/sec)
- Steaming on-demand over the Internet

Streaming media servers and recorders

Immersive audio capture and rendering

Protocols for error management

Synchronization

- Recent accomplishments:

Bing Theater I2 Conf

Live Duet

HD video NWS

Applications

Immersed in a college football game

Doctors assisting in a remote procedure

Business people negotiating like they are in the same room

Students visiting an aquarium a thousand miles away

IMSC Industrial Members and Collaborators

KDDI
Olympus
Japan

EverFocus
III
ITRI
Taiwan

BTG
UK

Microsoft
WA

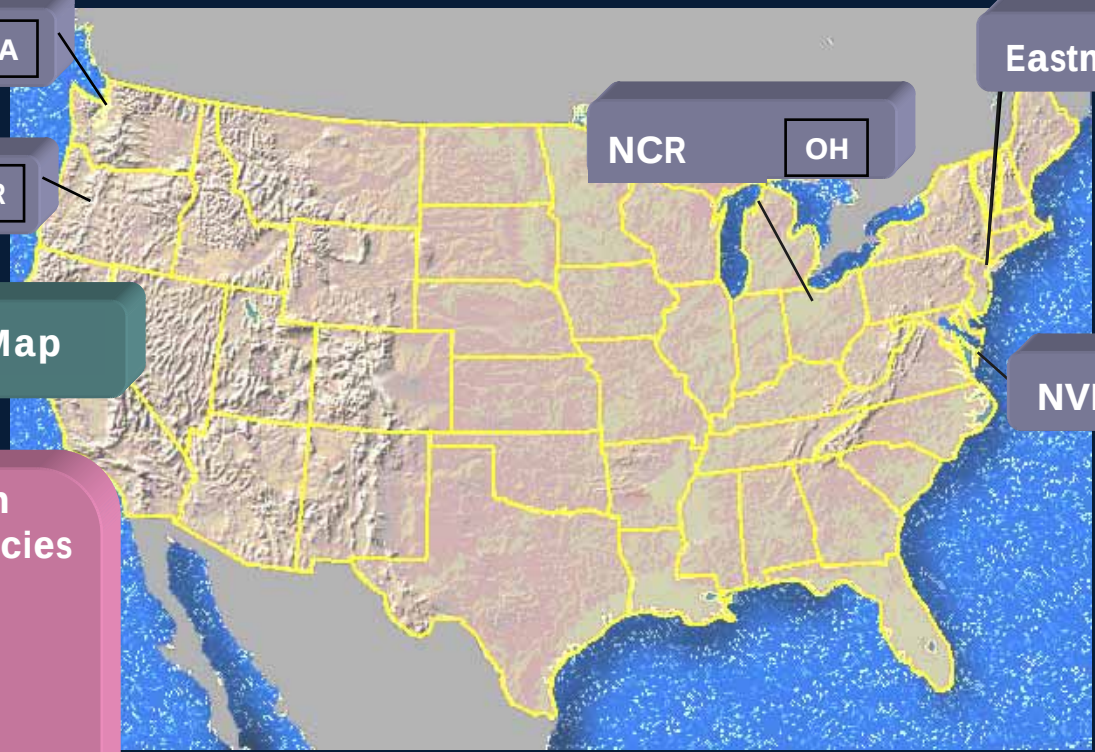
Eastman Kodak
NY

Intel
OR

NCR
OH

See California Map

NVIS
VA



Collaborations with Government Agencies and Foundations:

US Army
DARPA, ONR
NASA, NIMA
Toyota Foundation

IMSC Industrial Members and Collaborators

Silicon Valley

- ConceptLabs
- F-X Palo Alto Laboratory
- Hewlett-Packard
- IBM
- Lockheed Martin
- ChevronTexaco

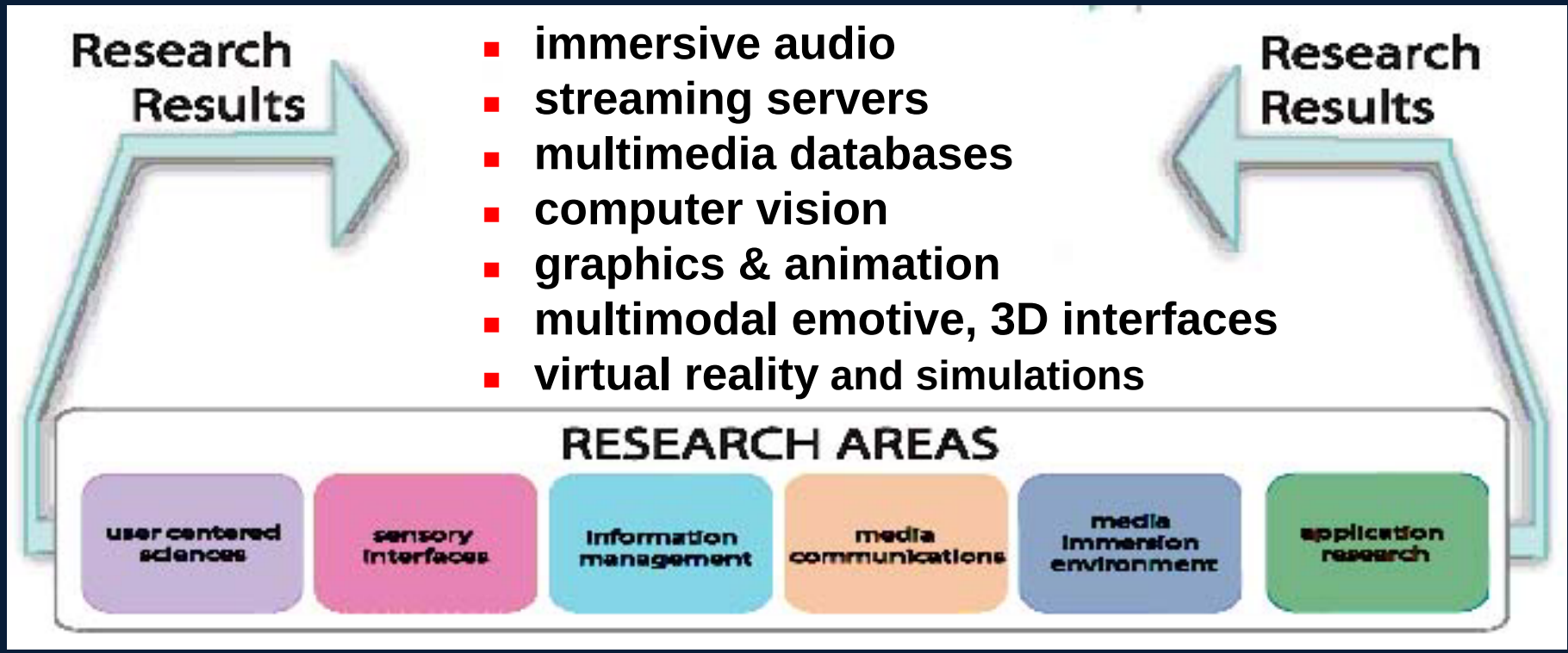
Los Angeles/San Diego

- JPL
- Lord Foundation
- Los Angeles Times
- Northrop Grumman
- TMH Corporation

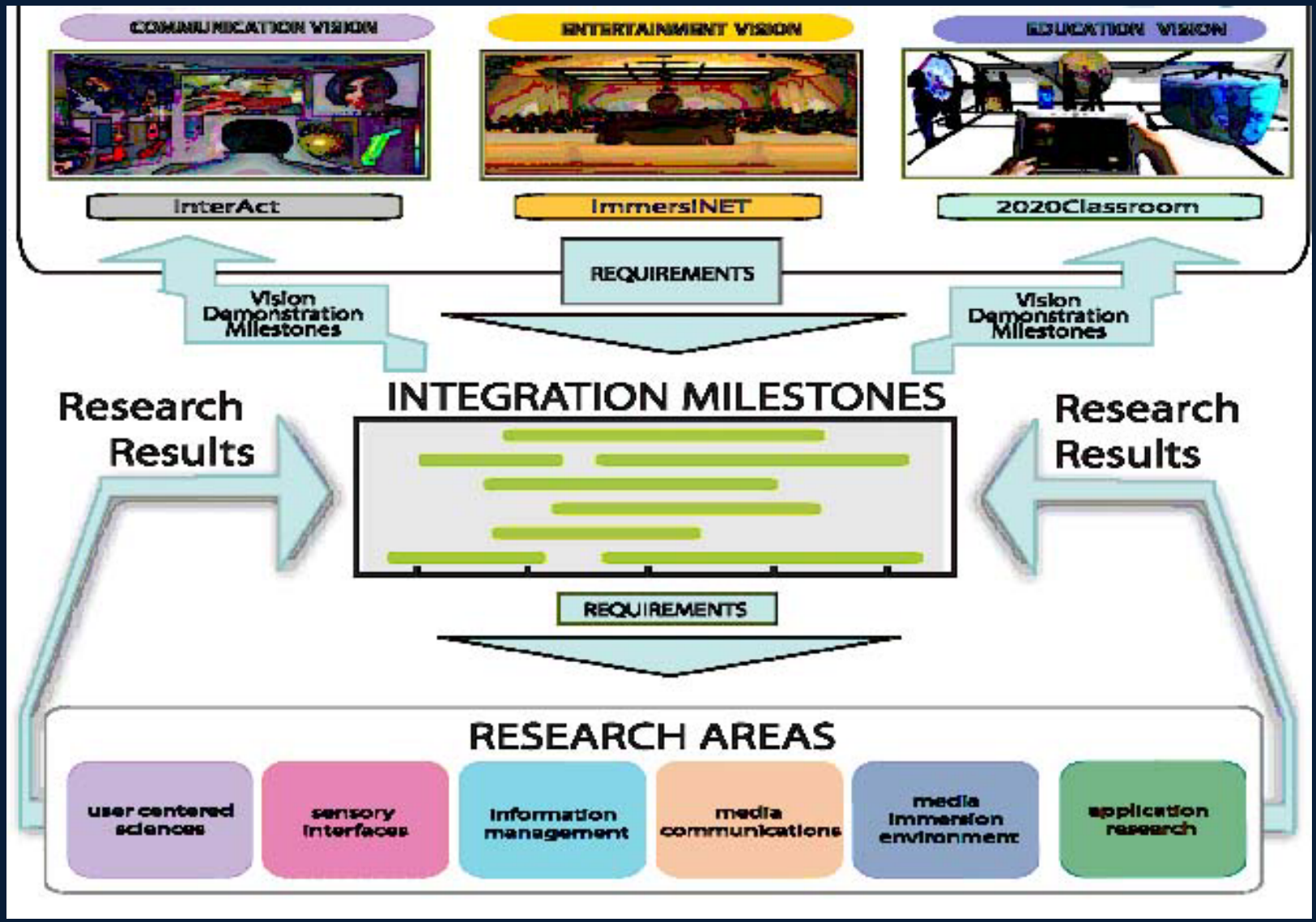
IMSC PROJECT MANAGEMENT APPROACH

- Organizational and Management Evolution
- Project Initiation
  - IMSC Vision + Faculty and Industry Research Interests => Projects of Mutual Interest
- Milestones and Schedules
- Scope <=> Requirements
- Monitoring and Control
- Intellectual Property Protection
- Lessons Learned

TRADITIONAL FUNCTIONAL ORGANIZATION IS USEFUL FOR MANAGING INDIVIDUAL RESEARCH EFFORTS



INTEGRATION OF R&D RESULTS INTO PROJECTS REQUIRES TRADITIONAL PM TOOLS



PROJECT MANAGEMENT HAS EVOLVED INTO A WEAK-MATRIX ORGANIZATION

- Sensory
- Comm
- Info Mgt
- HF
- MIE

MILESTONES AND SCHEDULES

- Normally driven by Academic Calendar
  - Fall and Spring Semesters, Summer months
  - Graduate Student hires
- Annual site-visit review
- IMSC instituted additional “major” calendar events
  - 2 Scientific Advisory Board meetings
  - Early Fall & Spring semester researcher retreats
  - After-site-visit analysis
- Additional 1-hour weekly Center-wide progress discussion meetings
- Schedule granularity controlled by PM

SCOPE <=> REQUIREMENTS

- To achieve Project Vision, early meetings used to clarify Vision, Scope and research requirements
  - What are we sure of? (Failure is not an option)
  - What are extensions? (What is go-no go?)
  - What is really hard?
  - What are some expected problems of integration with what you're sure of?
- Uncompromising on Quality of Deliverables – World-class research, innovative, new, …
- Risk – doing things never done before, so see above questions, identify risks plus back-up plan
- 5-Year Plan

PROJECT MONITORING AND CONTROL

- Weekly or bi-weekly formal Project Team meetings
  - Agendas a must
  - Round table discussions
  - Assignments/names
  - Follow-up items
  - Attendance “required”
- Periodic Technology Demonstrations and White Papers (in addition to journal publications)
  - Industry visits
  - Monthly Open House demonstrations
- “Management by Embarrassment”

PM LESSONS LEARNED

- Must have Faculty buy-in on projects, brainstorming and iterating on project selection and budgets
- Must assign lead PM or designee on each project
- Must adapt PM tools and techniques to university environment (e.g., quality, milestones and schedules, requirements/specifications, WBS detail level, etc.)
- Must have regular meetings, communicate progress and reasons to justify “hitting those milestones”
- Must do appropriate risk assessment (after all, this is research) and have viable back-up plans