



**Modeling, Virtual Environments and Simulation;
Advanced Distributed Learning**

**Changing the Pace of
Evolution of
Academic and Research Programs**

CDR Joseph A. Sullivan, PhD USN

WARM-UP EXERCISE...

Evolution of Education Programs

- Based on a quick look at our environment:
 - Shift in resources,
 - Dramatic expansion in knowledge base,
 - Changes in social networking,
 - Increase in mission range,
 - Decrease in mission predictability,
 - Pace of change in technology....

Evolution of Education Programs

- 0% 1. The pace for evolving new programs is fine.
- 0% 2. Changing the pace would be helpful.
- 0% 3. Changing the pace is a pressing concern.

My Role in Evolution of Education Programs

- 0% 1. I can help improve the pace of evolution of education programs.
- 0% 2. That is beyond the scope of my influence.

**THANK YOU, NOW FOR SOME
BACKGROUND...**

Introduction

- CDR Joe ‘Sully’ Sullivan
 - (The Sully that didn’t hit the birds)
- HS community (1986-2001)
 - Carrier-based helicopters
 - Surface Warfare qualified
 - NPS Master’s in CS 1996-1998
- Military Faculty (2001-2004)
- Permanent Military Professor (2004-2014)
 - Director of MOVES at NPS...



NPS is...

- **Graduate University**
Responsive to joint, interagency, and coalition requirements
- **Research Institution**
Pursuing innovative technology and improving national security
- **Community of Alumni**
Leading and defending the Nation and transforming the Department of Defense (DoD) as well as other government agencies working for national security

History Highlights

- 1909** Founded at the U.S. Naval Academy
- 1951** Moved to Monterey
- 1951** Operations Research Department
- 1956** Systems Management Department
- 1972** National Security Affairs Department and War-Fighting curricula (e.g., Anti-Submarine Warfare)
- 1996** Information Warfare Curriculum
- 1999** Joint Professional Military Education (JPME) campus
- 2003** Homeland Security Curriculum
- 2004** Information Operations



NPS Mission

Provide high-quality, relevant and unique advanced education and research programs relevant to our national security.

- ... a vital component of CNO's strategy for informing and enabling transformation



**GREAT!... SO, WHAT'S THE MOVES
INSTITUTE?**



MOVES within NPS

A Systems Oriented Approach

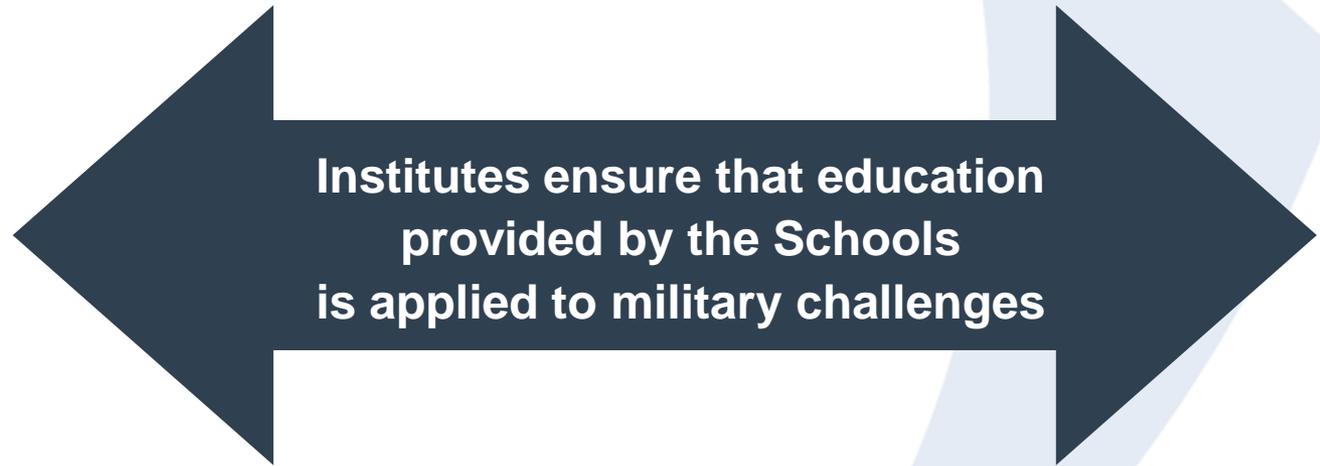
4 Institutes

The Cebrowski Institute for
Information Innovation and
Superiority

The MOVES Institute
Modeling, Virtual
Environments, and
Simulation

The Meyer Institute
National Security Systems
and Technology

National Security Institute
Partnership developed for
National Security research
and education



4 Schools

Graduate School
of Engineering and
Applied Science

Graduate School
of Operational and
Information Sciences

Graduate School
of Business and
Public Policy

School of
International
Graduate Studies



MOVES Mission

To enhance the operational effectiveness of our joint forces and our allies by providing superior training and analysis products, education, and exemplary research in the field of modeling and simulation.

- Maintain and expand a leadership role in the evolution of Modeling Simulation and Virtual Environments. Define a Research Agenda and Academic Program to enable...
- ... Graduates effectively leading and managing M&S programs.



M&S for Defense and Security

- What's exciting in the global economy?
 - Increased pace of evolution in technical and operational environments
 - Era of reduced resources
 - Demand for rapid, flexible reshaping of capabilities
 - Increases demand for insight in structure and planning; equipping; training and operating
- What does this mean for the M&S community?
 - Provides interoperable and DoD-focused tools for generating insight, improving collaboration and honing critical thinking skills
 - M&S has become an imperative based on demand



M&S Education and Research

- Continued and expanded leadership requires identification of:
 - New application areas
 - Related academic disciplines
 - Technical and social/cultural advancements
 - Research challenges to meet future applications
- More flexible identification and response to education and research opportunities
 - Senior leader courses
 - ‘All hands’ training
 - Hybrid – with mobile education teams
 - Strategy and partnering are vital to meet expanding demand



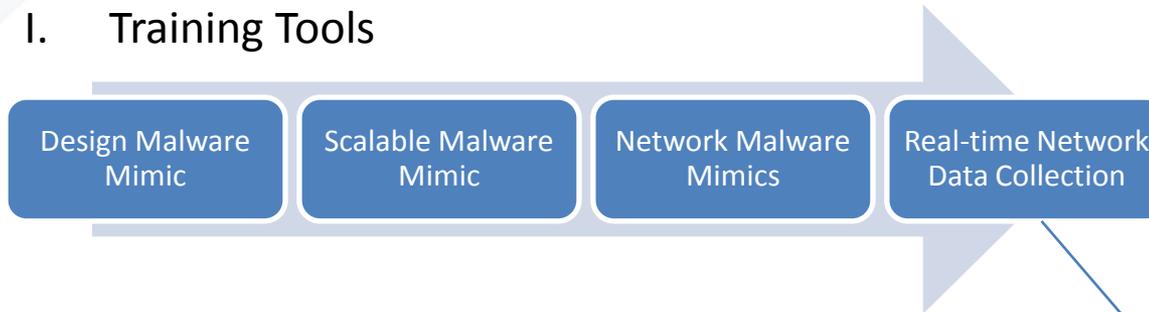
Some Sample Projects

- Certificate (Master's) in Medical Modeling and Simulation
- Cyber Security
 - Training tools
 - Readiness assessment and correlation
 - Mission integration and evaluation
- ROGUEVIDEO
 - Unique industry/government collaboration
 - Crosses DoD and DHS
- MMOWGLI
 - An experiment in generating collective intelligence
 - Building knowledge accidents
- Gateway Project
 - Team with DLI to improve authoring delivery of language training



Cyber M&S Research

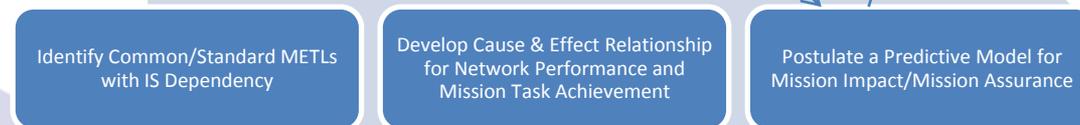
I. Training Tools



II. Causation Analysis

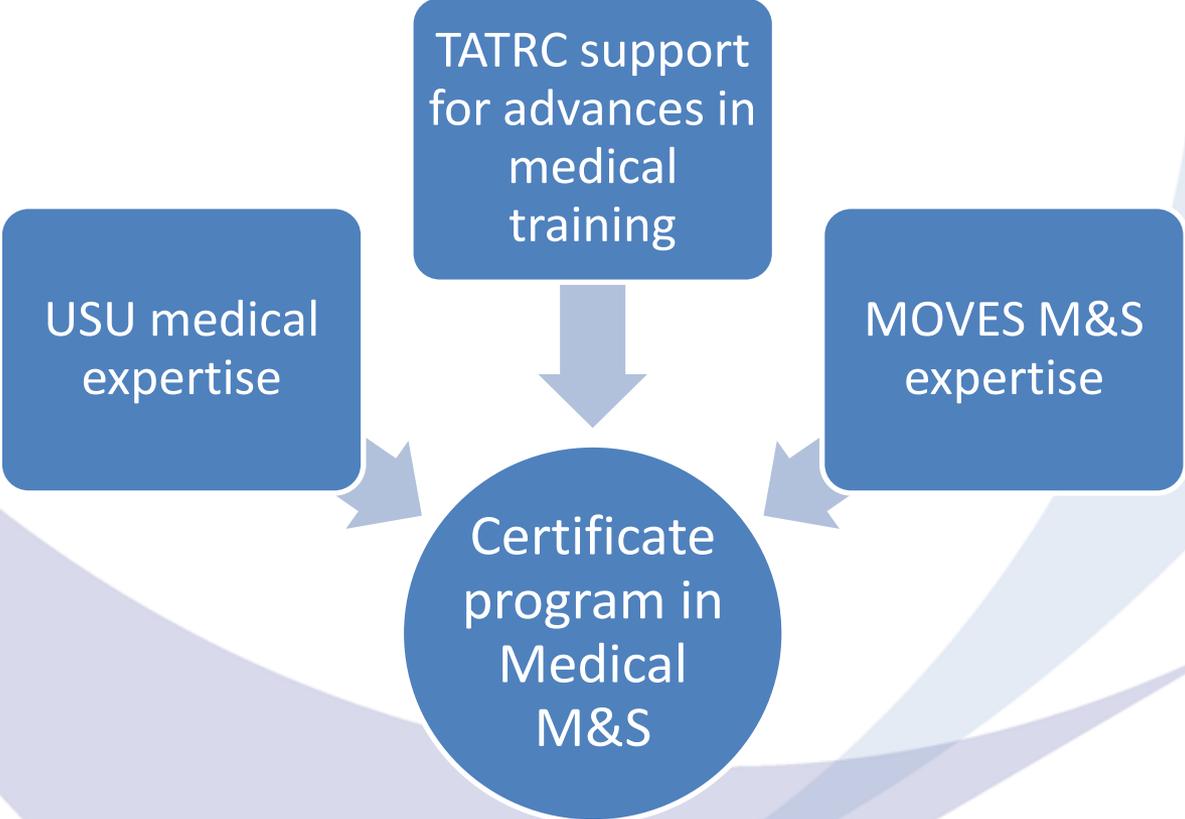


III. Mission Effectiveness Evaluation





Medical M&S





Alignment of MOVES/USUS Certificate Program with TATRC's Goals

TATRC vision and goals

Curriculum-aligned, metrics-driven assessment of skills.

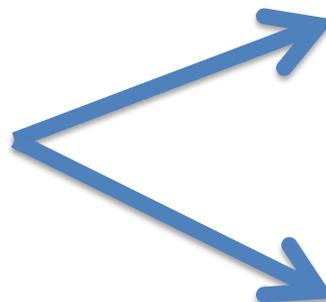


MOVES/USUS certificate program

Create an accredited curriculum in military medical M&S.

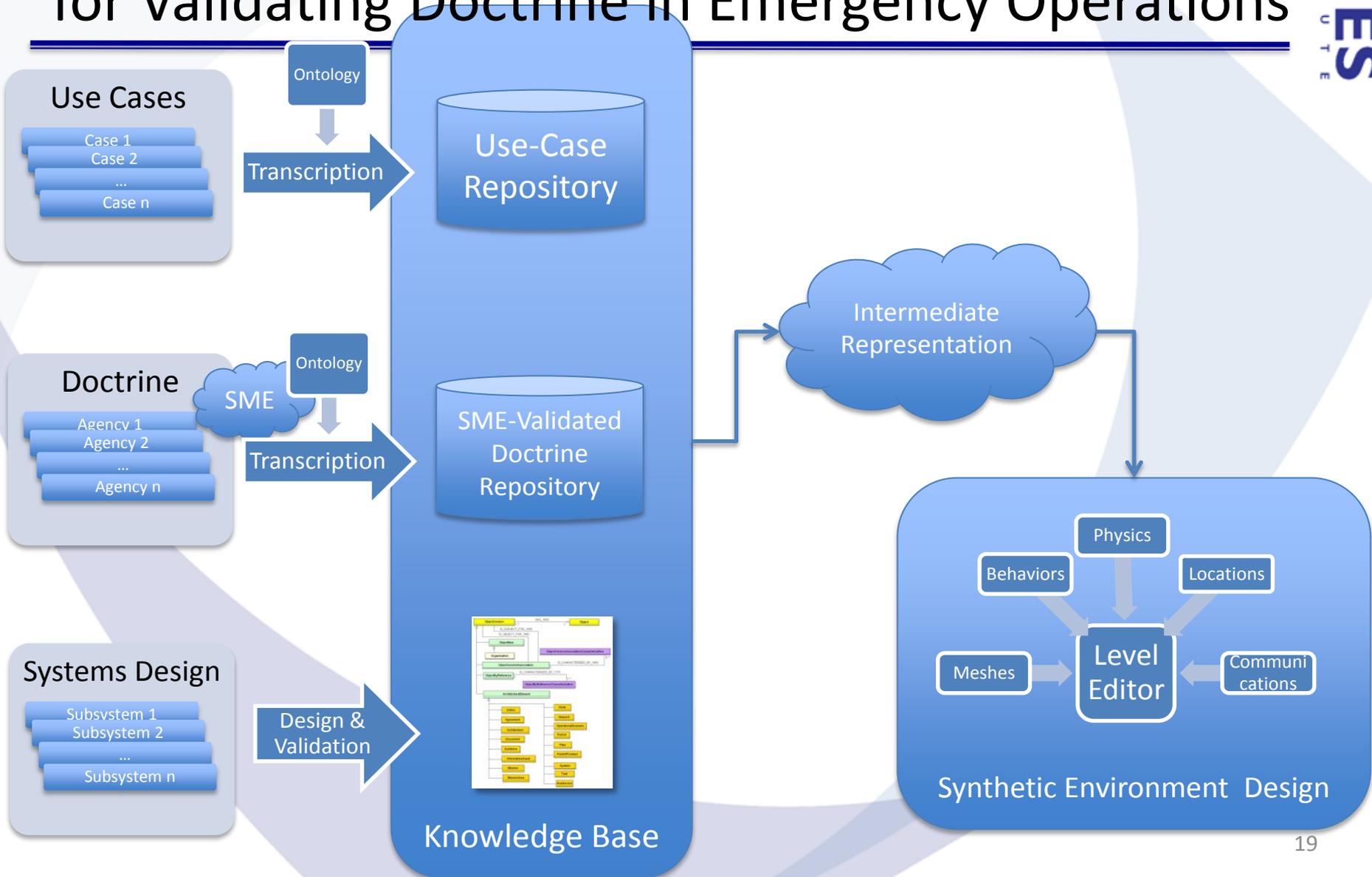
Students learn how and which types of medical M&S can be used effectively to improve battlefield trauma via simulated exercises.

Improve trauma training and reduce medical errors.



Students learn how to scientifically assess the pros and cons of current and new medical technology and methods.

Real-Time, Online Gaming and Use-Case Engine for Validating Doctrine in Emergency Operations





MMO(WarGame) Leverging the Internet

EXPAND	COUNTER	ADAPT	EXPLORE
EXPAND Build on this idea to amplify its impact	COUNTER Challenge this idea	ADAPT Take this idea in a different direction	EXPLORE Something missing? Ask a question
EXPAND Demonstrating the capability to take warships will make EPIC countries spend more \$\$ to protect their assets TheMasterChief 07/05 09:18	COUNTER Engaging in conventional warfare, even with just mines, can lead to a massive NATO bombing campaign/invasion mnela001 07/05 10:54	ADAPT Maybe not mines or a precision munition. Staying low tech would be harder to trace. Use a small boats to swarm and overwhelm a target TheMasterChief 07/05 09:13	EXPLORE Severe damage to USS Cole resulted in new looser ROE. How will 2014 ROE develop? mario 69 07/05 11:12
EXPAND Make protracted conflict with mobile enemy politically untenable for EPIC countries. Increased casualties/expenditures = less EPIC roy 07/05 09:10	COUNTER Mining is indiscriminate...bringing international support to EPIC. ie. Iranian mining Kuwait harbor, bringing Europeans into the fight. starship123 07/05 08:20	ADAPT Purchase (1) precision-guided munition from North Korea et al. Lure EPIC forces into range. Sink a major warship. nova nation 07/05 09:08	EXPLORE A hijacked warship could also be added as a capability to protect our own vessels TheMasterChief 07/05 09:14
EXPAND The central point is not mines, it's the sinking of a EPIC ship IOT convince member electorates that the juice isn't worth the squeeze. nova nation 07/05 09:09			EXPLORE Maybe not damage - hijack it instead! TheMasterChief 07/05 08:14

ACTION PLAN:
Title of Action Plan goes here
lorem ipsum dolor sit amet.

Rate this Plan:
Average Rating: [stars] Your Rating: [stars]

Related Plan numbers:
Number 01.1
Number 01.2
Number 01.3

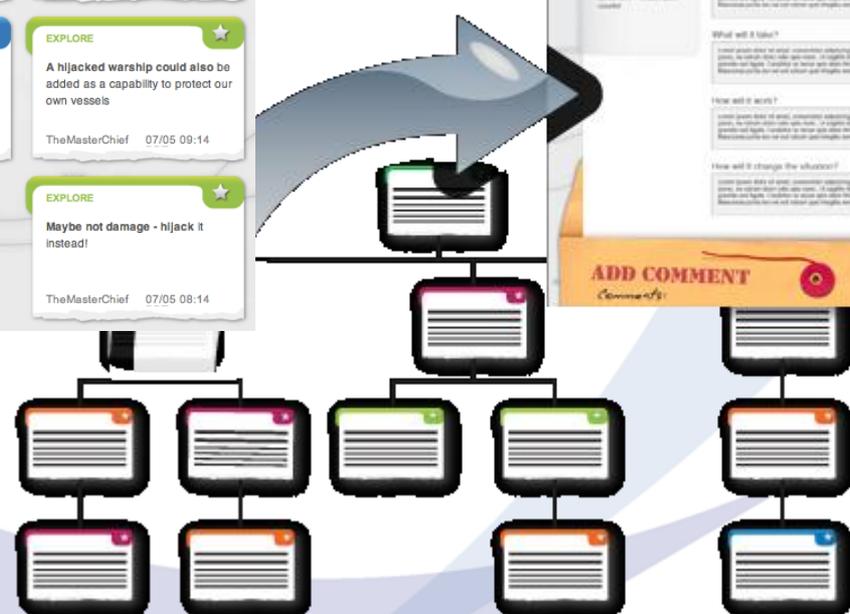
Your Mission:
Lower level: dolor sit amet, consectetur adipiscing elit.

What will it do?
Lower level: dolor sit amet, consectetur adipiscing elit.

How will it work?
Lower level: dolor sit amet, consectetur adipiscing elit.

How will it change the situation?
Lower level: dolor sit amet, consectetur adipiscing elit.

ADD COMMENT
Comments:



MMOWGLI Participants?

- 0% 1. I've never heard of MMOWGLI
- 0% 2. I heard of MMOWGLI in press
- 0% 3. I heard of MMOWGLI through colleagues
- 0% 4. Been there, played that!



Academic Program

Year 1 (Core M&S)

- Probability & Statistics
- Programming
- Program Management & Acquisition
- Discrete Event Simulation
- Combat Modeling & Probability Models
- Simulation & Training
- Artificial Intelligence

Year 2 (Specialization*)

- Combat Modeling
- Visual Simulation
- Web-Based Simulation
- Agents & Cognitive Modeling
- Training Systems
- Human Factors
- System Engineering & Acquisition
- Discrete Event Modeling & Analysis
- Optimization

*Students select four from this list.



Core Competencies

- **Human Systems and Training**
 - Training system design and human factors
 - Human performance evaluation
- **Cognitive Agents and Adaptive Systems**
 - Learning agents in rich environments
 - Predictive agents
- **Computer Gaming, Visual Simulation, Augmented Reality**
 - Methods for game-based training design
 - Highly cost efficient software and simulation development
 - Mixed-mode, real and virtual, simulation environments
- **Standards and Interoperability**
 - Web-Based Simulation
- **Simulation Modeling for Analysis**
 - Composable models, large-scale reusability
 - Experimental designs for large studies

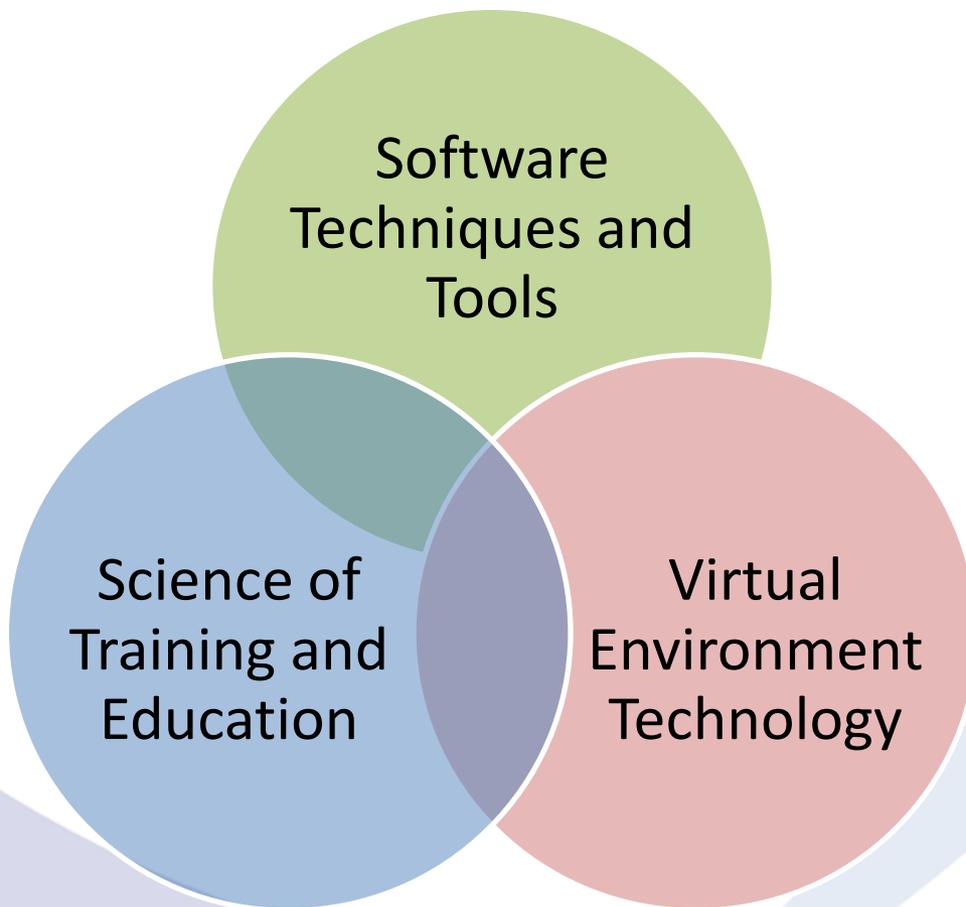




HOW DOES THIS FIT WITH ADL?



Shared DNA





ADL AND MOVES SHARED FUTURE...



Weathering the Perfect Storm



**MOVES and ADL Shared DNA:
Insight and transformation tool to navigate in clear skies**



BEYOND THE STORM...



Heard of this guy?



“We’re humanizing the classroom.”

- Sal Kahn

- 0% 1. I’m not familiar with Kahn Academy
- 0% 2. I am familiar with Kahn Academy



“The Revolution in Education”

- 0% 1. I've never heard of Ken Robinson
- 0% 2. I know of Sir Ken Robinson
- 0% 3. I have seen a TED talk (or RSA version)
- 0% 4. I know Sir Ken Robinson

Sir Ken Robinson



“We are educating people out of their creative capacities.”

“Creativity, the process of having original ideas which have value; more often than not **comes about through the interaction of different disciplinary ways of seeing things.**”

- Ken Robinson: Changing education paradigms (11:40, animated)
- Sir Ken Robinson: Bring on the learning revolution! (2010; 17:48)
- Ken Robinson says schools kill creativity (2006, 19:29)



“A hiatus exists between inventors who know what they could invent, if they only knew what was wanted, and the soldiers who know, or ought to know, what they want, and would ask for it if they only knew how much science could do for them. You have never really bridged that gap yet.”

-- Winston Churchill, The Great War

How do we discover multi-disciplinary opportunities?



What If....

We use the same technologies currently connecting Learners and Experts to connect across S&T domains and end-user communities....

... to...

achieve capabilities beyond the imaginations envisioned from the lens of individual technologies, disciplines or approaches?



SOME AIMS AND RESULTS OF MULTI-DISCIPLINARY WORK...

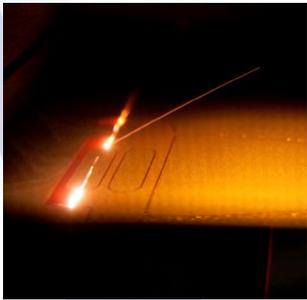
Additive Layer Manufacture



ALM-Airbike



Forcelndia Formula1 race car: Roll Hoop



Electron beam scanning the surface of titanium powder

- **ALM makes in 1 part what traditional methods make in 30 separate parts**
- **26 times more efficient extraction of raw materials**
- **From CAD to finished part in one step**



Additive Layer Manufacture

- [VIDEO](#)

VEHST





Summary

- ADL and MOVES share common DNA
- Both are tools for transformation
 - Providing insight
 - Delivering flexible readiness
- Advances in the shared technology will revolutionize content delivery
- These same advances may connect S&T domains, enabling definition of new multi-disciplinary efforts.



My Role in Evolution of Education Programs

- 0% 1. I can help improve the pace of evolution of education programs
- 0% 2. That is beyond the scope of my ability



Questions?