APTIMA®
HUMAN-CENTERED ENGINEERING

Knowledge & Experiences of Expert Labor (KEEL)

Presenters:

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www.aptima.com
Woburn, MA ▪ Washington, DC

NORTHROP GRUMMAN
DEFINING THE FUTURE

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Project Calling Card

- Title: Knowledge & Experiences of Expert Labor
- TPOC: Owen Seely
- Contract No: N00024-08-C-4107
- Period of Performance: 2007/12/12 – 2008/12/11
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Agenda

- **About Aptima (Who)**
- Background of KEEL (Why)
- Development Theory (How)
- Demo (What)
- Discussion

Aptima, Inc.

About Us

- Founded in 1995; 50% compounded annual growth
- Clients: 33 government, 41 commercial
- 250+ contracts with the DoD
- Offices in Woburn (Boston), MA and Washington, DC

Aptima's DoD Work

TRADOC: U.S. Army Training and Doctrine Command

DARPA: Defense Advanced Research Projects Agency

AFOSR: Air Force Office of Scientific Research

Naval Special Warfare Command

ONR: Office of Naval Research

NAVAIR: Naval Air Systems Command

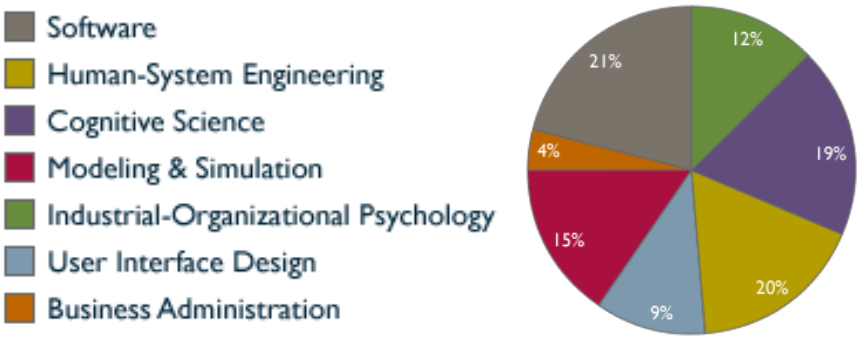
AFRL: Air Force Research Laboratory

NSWC: Naval Surface Warfare Center

And Many Others…

Interdisciplinary Small Business

Staff > 110 with 80% Graduate Degree



Human Centered Engineering Leader

- Analyze and design complex sociotechnical systems — military command centers, intel operations, operating rooms, air traffic control centers, etc.
- Combine social science theory with quantitative, computational methods

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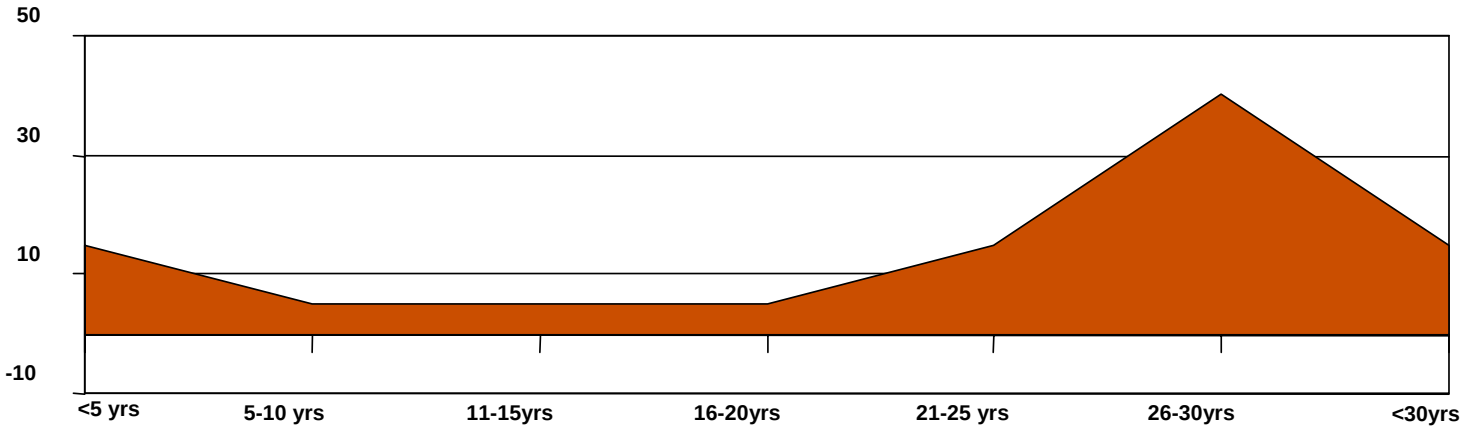
KEEL Problem

Notional Chart of Shipbuilder Demographics



- What makes someone an excellent shipbuilding employee was learned on the job – not in trade school.
- Most of the experienced shipbuilders are near retirement.
- A system is needed to capture their experience and make it available to future shipbuilders

Not Just a Shipbuilding Problem:

FAA -- DoD -- Nursing -- Nuclear Power

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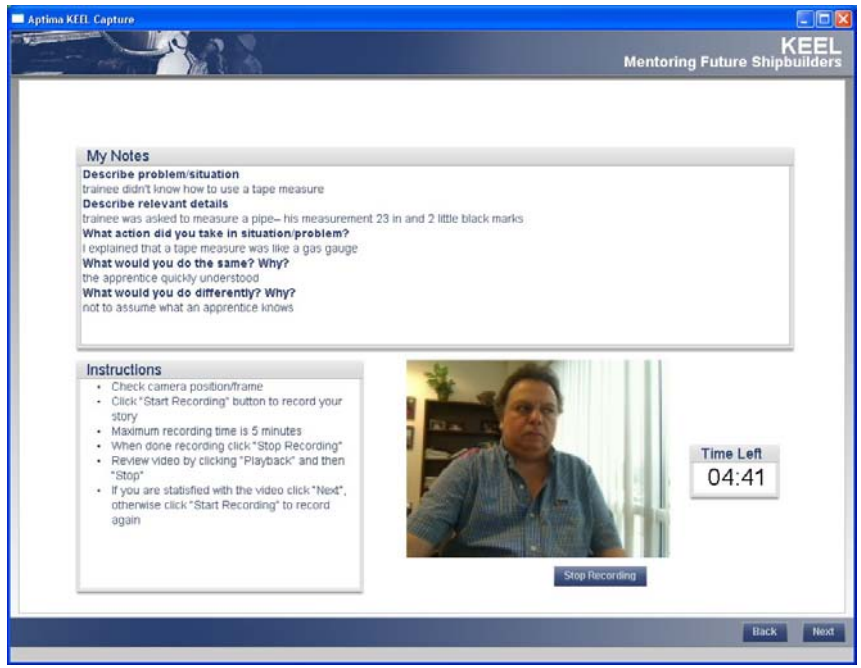
The Solution

KEEL is a Virtual Mentoring System that…

- Captures retiring shipbuilders' "Lessons Learned"
- Organizes these lessons in a framework based on scientific principles of competencies that
  - Allows for cross job learning of skills
  - Enables a great impact on productivity & efficiency
- Delivers these lessons to novice shipbuilders
  - Increases expertise more quickly
  - Provides on demand knowledge



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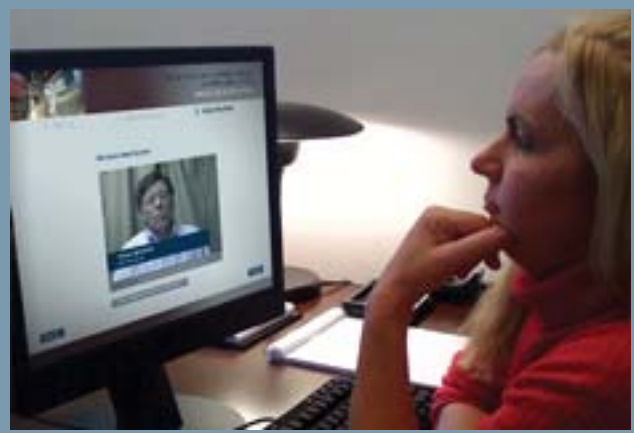
CONOPS

	Traditional Knowledge Transfer	KEEL Knowledge Transfer
Experienced Worker	 Photo from Bath Iron Works	
Novice Worker		

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Two Types of Knowledge

- Explicit Knowledge
  - Documentation of Work
  - Captured & organized by traditional KM tools according to projects or job titles

- Implicit Knowledge
  (Serfaty, MacMillan, Entin, & Entin, 1997)
  - Lessons Learned
    - Tricks of the trade
    - Previous failures
  - In the mind of an expert
  - Transferred verbally through mentoring or conversations

Knowledge Framework

Hierarchical Framework Populated with Successful Competency Modeling Process

- **Topic Areas:**
  - Themes that cut across the shipbuilding industry
  - Characteristics of everyone's job
  - When done well ensure the ship will be delivered on time and at or below cost.
- **Competencies:**
  - A set of KSAs that, when properly performed, facilitate the completion of a topic area.
- **Concepts (KSAs)**
  - Fine grain characteristics required to complete a job/task successfully:
    - Knowledge: a body of information that can be applied to a specific task
    - Skills: an observable sequence of actions that can be successfully executed
    - Abilities: attributes of an individual to perform a behavior

Topic Area: Communication

Competency	Concept
Consider Listener	Predict Reactions
	Read Body Language
	Don't Assume
	Tone of Voice
	Etc…
Communication Methods	Using Radios
	Using Cell Phones
	Face to Face
	Using Hand Signals
	Etc..
Etc..	…

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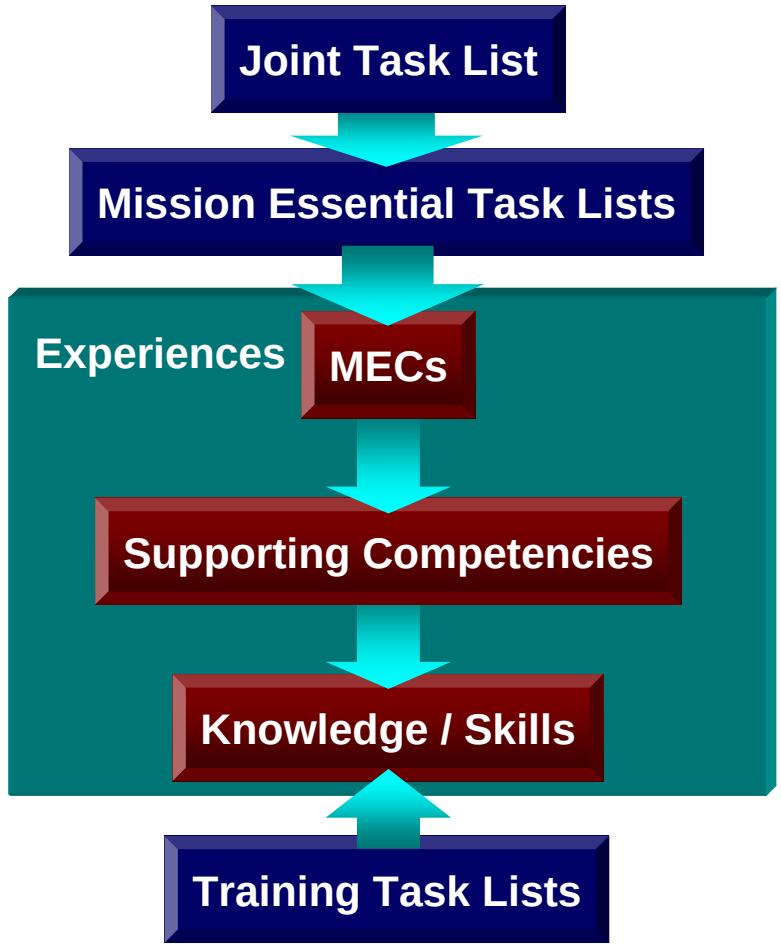
Competency Modeling

Process by which higher-order individual, team, and inter-team competencies necessary for successful mission completion under realistic conditions are derived.

- J-METL and METLs describe operational mission-level tasks and objectives
- MECs bridge the gap by describing what you need to know to perform in a given domain to achieve mission-level objectives
- Training Task Lists help teach how to "operate" a system



MECs Project lead Mike Garrity won 2007 M. Scott Myers Award for Applied Research in the Workplace

Designing for Exploration

Serendipitous Learning – Learning via Discovery

- Serendipity Is Important For: (Foster & Ford, 2003; Toms, 2000)
  - Building connections between topics
  - Increased creativity
  - Stimulate curiosity
- In Designing for Serendipity…
  - One must maximize ability to explore (O'Connor, 1988)
  - Allow users to assess what's available (Newman et al, 2002)

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Development to Date

- Framework Development
  - Review of NSRP Documents
  - Conducted Surveys, Interviews & Focus Groups with Northrop Grumman Shipbuilders
- Developed Experimental Prototype
  - Developed Video Capture Technology
  - Implemented Knowledge Retrieval Interface with Elastic List Design
  - Conducted Quality Assurance Testing

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Planned Development

- Allow supervisors to monitor which videos employees have watched
- Allow administrator to modify competencies and concepts of craft skills
- Allow users to view videos of preferred speakers
- Conduct Beta tests of system with shipbuilders

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KEEL Recap

- Easy to Use Virtual Mentoring System
- Captures Videos of Lessons Learned
- Captures Videos of Rare Skills
- Provide Insight into Cross Craft Connections
- Increases Expertise More Quickly
- Provides On Demand Knowledge

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How Can NSRP Help?

Be a Beta Test Site

Review the Framework

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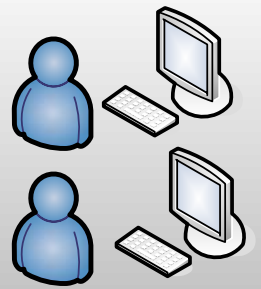
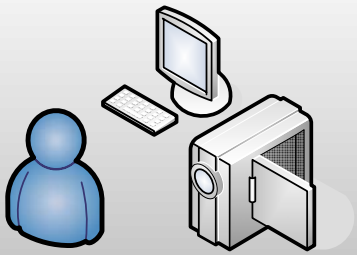
KEEL Architecture

Rich Client Technology
Adobe Flash/Flex

Knowledge Retrieval



Knowledge Capture



Internet or
Local Area Network

KEEL Content Storage
Microsoft Server

Flexible, Scalable Content Storage