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Optimizing Warfighter Performance through the Development of HSI Metrics, Requirements and Collaboration

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Overview

- Army HSI
- Our roles
- Optimizing Performance
- Case Study: JTRS Manpack Radio
  - › Requirements & Metrics (R&Ms)
  - › Collaborative User-Centered Design Process

Army HSI Program Mission

Optimize total system performance, reduce life cycle costs, and minimize risk of soldier loss or injury by ensuring a systematic consideration of the impact of materiel design on Soldiers throughout the system development process.

Focus on the Soldier and Mission Success

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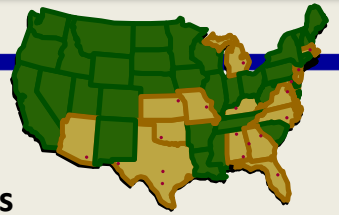
User-Centered Process



Early & Often

Understand

- SME Interviews
- Focus Groups / user juries
- Interviews / surveys
- Applied research

- Literature reviews
- Previous Army HSI Assessments
- Product reviews / competitive analysis
- Reverse engineering
- Task analyses (cognitive, heuristic, etc.)
- Observation (contextual, ethnographic)

Visualize

- Personas, scripted scenarios & storyboards (use cases)
- Job & training aids

- Conceptual design(s) / wireframes
- System architecture “system view” / “human view”
- Models / mock-ups (hardware & software)
- IMPRINT: workload modeling
- JACK: human figure modeling
- C3TRACE: information management network modeling

Evaluate

- Interviews / surveys
- Integrated product team working groups
- Source selection

- Expert reviews / discount usability techniques
- Usability testing / benchmarking / laboratory experimentation
- Psychophysiological measurements (e.g., eye-tracking, electrocephalogram, event-related potentials, neuroimaging)
- Comparative usability studies / participatory design techniques
- Large-scale experiments (NIE, Empire Challenge, etc.)
- SME Observation / inspection (contextual & ethnographic)
- System safety assessments /safety releases /safety confirmation

Adapted from Savage-Knepshield, P.A. (2009). Applying a warfighter-centric system design process to a DoD acquisition program. *Journal of Cognitive Engineering & Decision Making*, *3*(1), 47-66.

Our Roles are Critical

As researchers, engineers, designers and content developers,
we shape
how people learn,
how they accomplish their goals, and
how they connect with each other…

Users, Goals, Resources, Context of Use

Positive User Experience (UX)

- Useful: Enhance Effectiveness
  - › Support work practices
  - › Augment human performance
  - › Reduce burdens
- Usable
  - › Learnable
  - › Memorable
- Desirable/Compelling

Move
Shoot
Communicate

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Suboptimal HSI

System design tendency…

- overly complex
- difficult to train, learn to use, operate, & maintain
- contribute to injury
- contribute to fratricide

"… solutions are not designed for what we do … they need to understand what we do"

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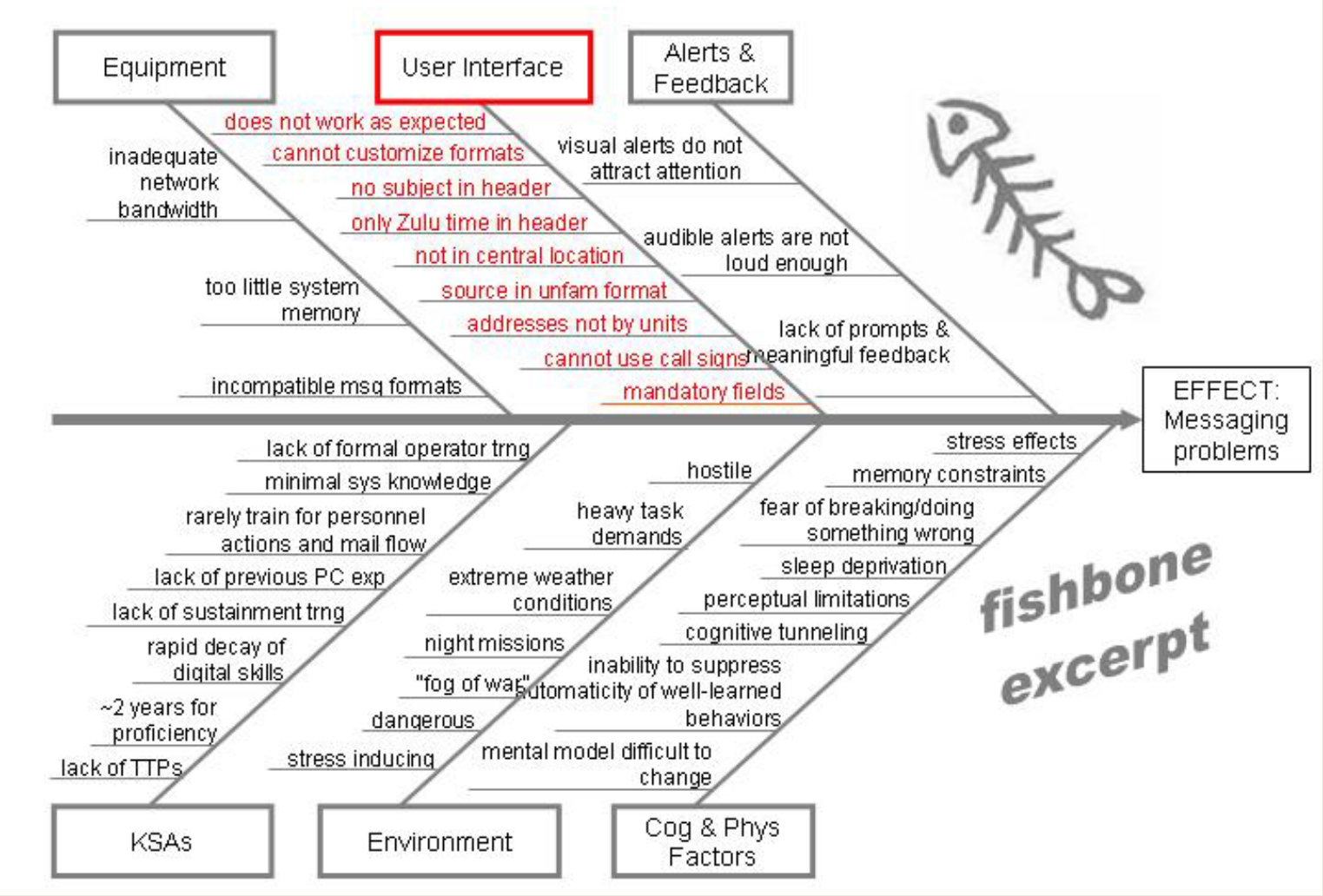
Suboptimal HSI: Root Causes



Savage-Knepshield, P. A. (2012). Solder-centered design and evaluation techniques. In P. Savage-Knepshield, J. Martin, J. Lockett III, and L. Allender (Eds.). (2009), Designing Soldier Systems: Current Issues in Human Factors (275-307). Farnham, Surrey, UK: Ashgate.

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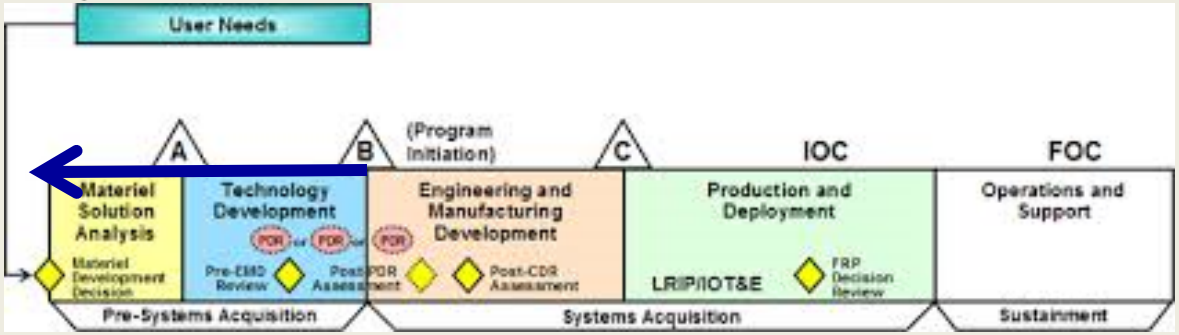
"Typical" Requirement



"The system capability design shall promote **effective Soldier-machine integration** for optimal total system performance. **Design principles, shall be incorporated**…taking into account human capabilities & limitations …The capability **will not interfere with the performance of common Soldier tasks**…"

Developing Effective R&Ms

- Develop relevant realistic human-system interaction & performance R&Ms
- What UX/UI aspects are critical?
  - Time on task? Accuracy? Other?
- Context of Use
  - Who are the users? Goals?
  - Critical & high frequency tasks/functions?
  - Work environment?
- User-Driven Research
  - Understand current work practices
  - Validate requirements

Case Study: Manpack Radio

Requirements:

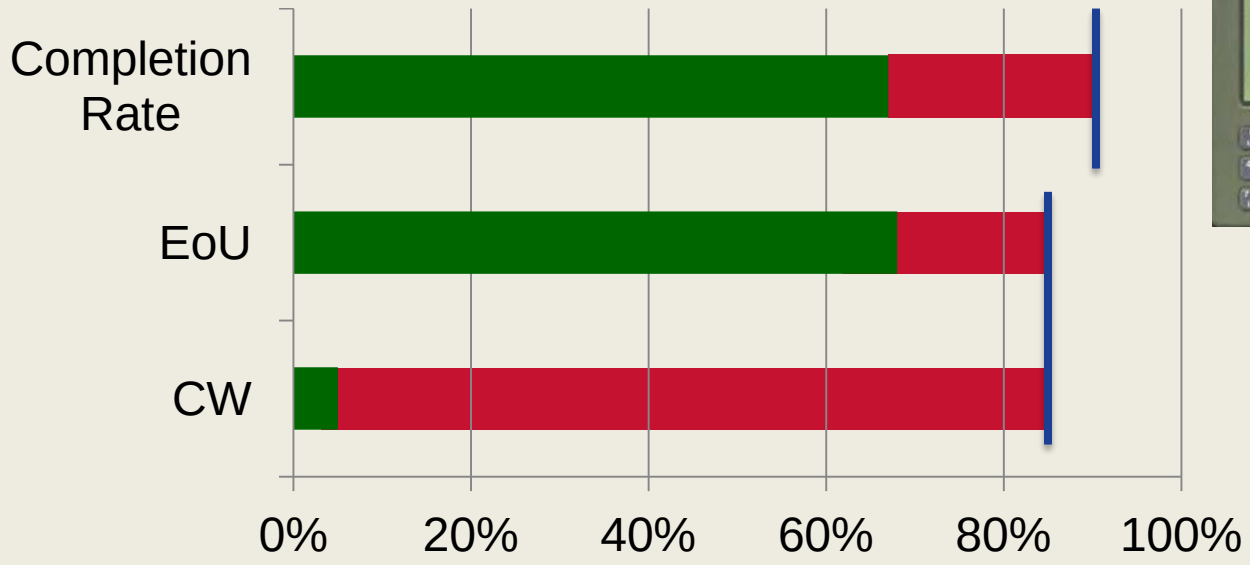
- "The design shall allow trained operators and maintainers to perform all critical tasks required to install, operate and maintain the radio correctly on the first attempt 90% of the time."
- "The design shall have a 3x4 button keypad."

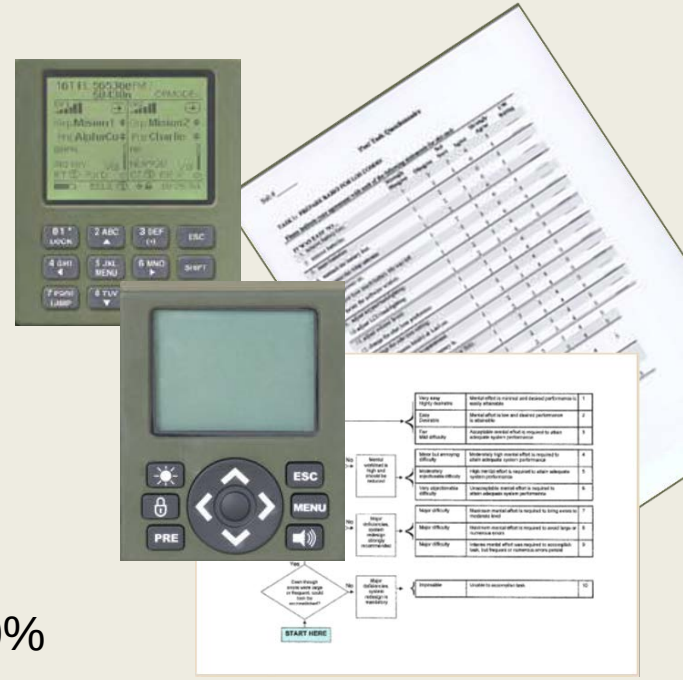
Metrics/Usability Targets:

(1) 90% accomplish critical tasks on the 1st attempt
(2) 85% judge ease of use acceptable
(3) 85% judge cognitive workload acceptable

Case Study: Manpack Radio

Metrics for Logging into the Radio





Benchmarking study: performance compared across design alternatives

- 128% more button presses
- 131% more time

Case Study: Manpack Radio

Evolution of the UI

Pre-Milestone B Prototype

Technology Demonstration Unit

Final Design

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Warfighter-Centric Process

Collaboration

Multidisciplinary

SE, HFE, Trng/Doc, Safety, SW, HW, T&E

Multi-organizational

PM, Contractors & Subs, ARL, TRADOC, Joint Services

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