simpathē:
A Computational Model to Facilitate Human Systems Integration Evaluations

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Human Systems Integration Domains

- Human Factors Engineering
- Manpower
- Personnel
- Training
- Habitability
- Safety and Occupational Health
- Force Protection and Survivability
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• **Systems Integration of Manpower, Personnel, and Training for HSI Evaluations**

• Technical process model and decision support aid for MPT trade space visualization and exploration
Manpower, Personnel, & Training Analysis

• Task Analysis
  - Timing / Duration, Frequency
  - Difficulty, Importance / Criticality
  - Knowledge, Skills, Abilities (KSAOs)

• Resource Analysis
  - Human resource elements (roles, jobs, individuals, etc.)
  - Technology resource elements (weapons, CSCI, controls/displays, etc.)
  - Allocate resources to tasks

Importance Ratings

1 = Minor
2 = Marginal
3 = Critical
4 = Catastrophic
Manpower Calculations

• Equivalent Man-Week

\[ EMW_{task} = \mu_{task} \times eqp_{task} \]

• Full-Time Equivalent

\[ FTE = \sum \frac{EMW_{task}}{workweek} \times 0.75 \]
Personnel Calculations

• FTE for particular job roles

\[
FTE_{role} = \frac{\sum EMW_{task*role}}{workweek} \times 0.75
\]

• KSAO mismatch

\[
\Delta KSAO = KSAO_{requisite} - KSAO_{personnel}
\]
Training

- Knowledge and skill gaps can be addressed in training
- Task analysis elements can inform selection and priority for training

CDF Model

- Difficulty:
  - Low
  - Average
  - High

- Criticality:
  - NO
  - YES

- Frequency:
  - Low
  - Avg.
  - High

- Training:
  - NT = No Training
  - T = Training
  - OT = Over Training

DIF Model

- Priority for Training:
  - Very Frequent: High
  - Frequent: Very High
  - Infrequent: Very High

- Task Frequency:
  - Very Frequent: High
  - Frequent: Very High
  - Infrequent: Very High

Source: MIL STD 29612-2A
M-P-T (and HFE) Interactions

• The trade-space between Manpower, Personnel, Training (and Human Factors Engineering) quickly becomes complex when considering analysis of alternatives.
“What-if” Trade-space Analysis Example

• Do we have the appropriate manpower and personnel to operate, maintain, and support existing systems?
  - Given: data from Total Force Structure Management System (TFSMS)
    • List of all units, each with \{x\} systems assigned and \{y\} of each personnel type
  - Given: data from a mission task analysis
    • List and descriptions of all tasks, each with details related to \{duration, DIF, KSAOs\}
  - Show: utilization profiles, labor-to-task/function allocations, impact of alternate MPT allocations, KSAO coverage by personnel type
  - Explore: summary by selected unit(s), utilization/KSAO coverage impacts of alternate staffing concepts, optimization recommendations (re-allocate technology or human resources)
  - Compare: system or job design alternatives, MPT impact of technology or force modernization

\textit{simpathē}: demonstration
Other “What-if” Trade-space Analyses Supported

• What is the optimal number of systems the existing organizational force structure is able to support?
  - Details by unit at varying levels of hierarchy

• What are the MPT-related tradeoffs in relation to competing {system or job} design alternatives?
  - Differences in manpower, utilization/workload, personnel requirements, KSAO coverage

• What are the MPT-related impacts in response to a new or updated system?
  - How do tasks change in response to a new or updated system?
    • New tasks are added? (more people? different personnel/KSAO reqs? different training?)
    • Some tasks removed? (fewer people? less skilled/knowledgeable? reduced training time/cost?)
    • Same tasks, but different {duration, frequency, DIF, KSAOs}
Questions? Comments?

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