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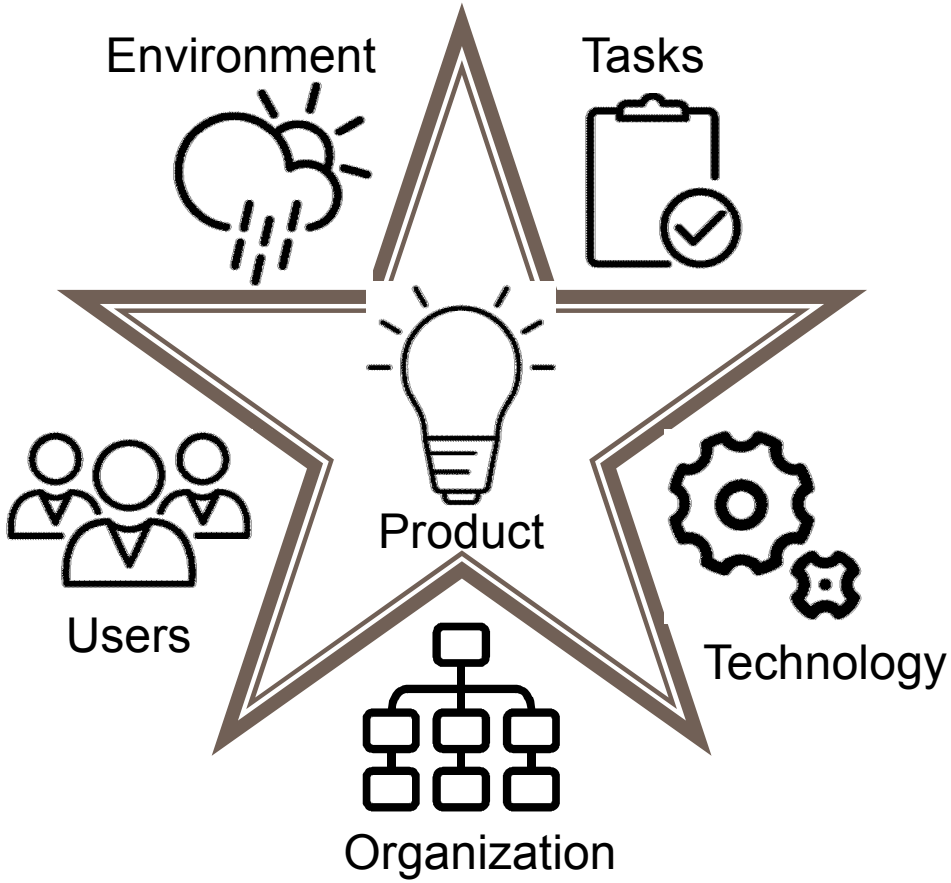
Human Factors Definition

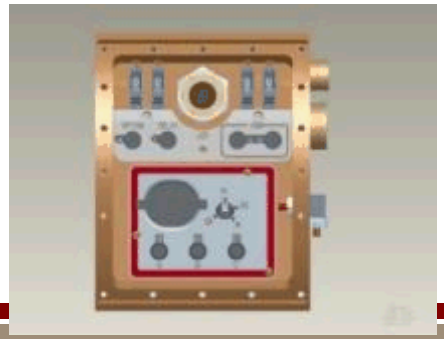
A scientific discipline that "discovers and applies information about human behavior, abilities, limitations and other characteristics to the **design of tools, machines, systems, tasks, jobs, and environments** for productive, safe, comfortable and effective human use" (Chapanis, 1985).

Human Factors Mission



On behalf of our nation, we direct and apply human research through the scientific method, human factors guidelines, and engineering principles in order to anticipate and solve the most challenging human-system problems that threaten safety, security, and effectiveness in the 21st century.

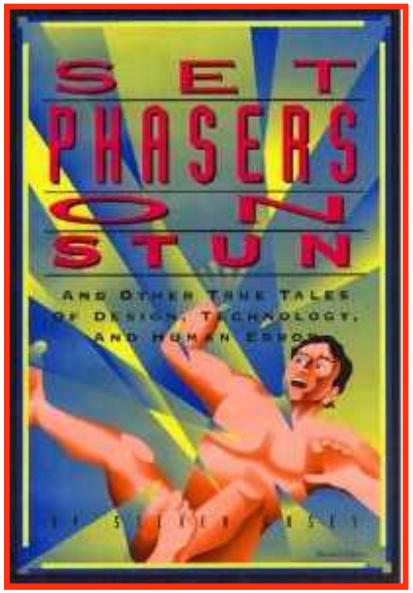
Human Factors Capabilities

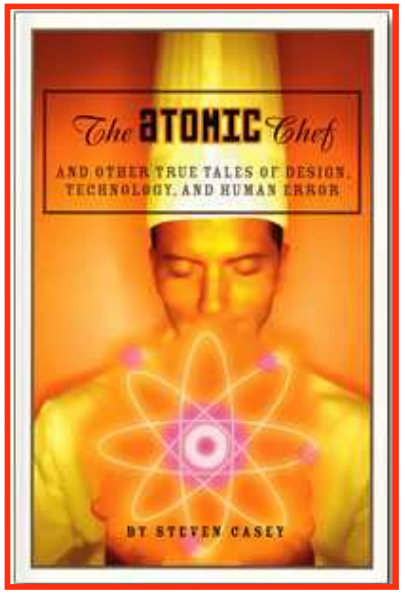


- Design of systems, processes and interfaces (e.g., hardware and/or software) to support effective and efficient human-system integration and human performance
- Reviews of system designs, processes, assembly procedures, handling procedures, test procedures, maintenance procedures
- Risk analysis
- Decision analysis
- Insider analysis
- Data science
- Customer needs analysis and task analysis
- Optimization of human-in-the-loop activities/automation
- Experimental design, data collection, and/or data analysis in support of safety programs, security related systems, or research programs
- Root cause and predictive analytics

Impact

- Quality
- Productivity
- Safety
- Security
- Personnel satisfaction

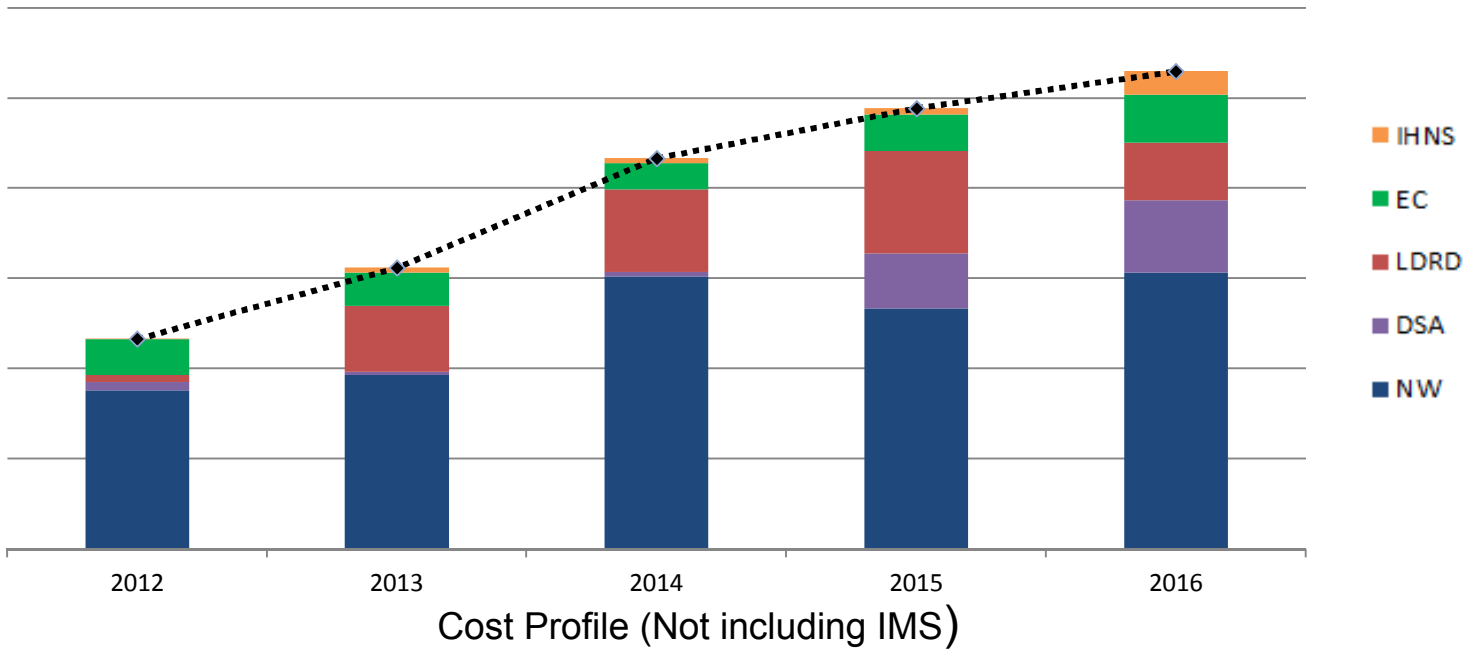




Return On Investment

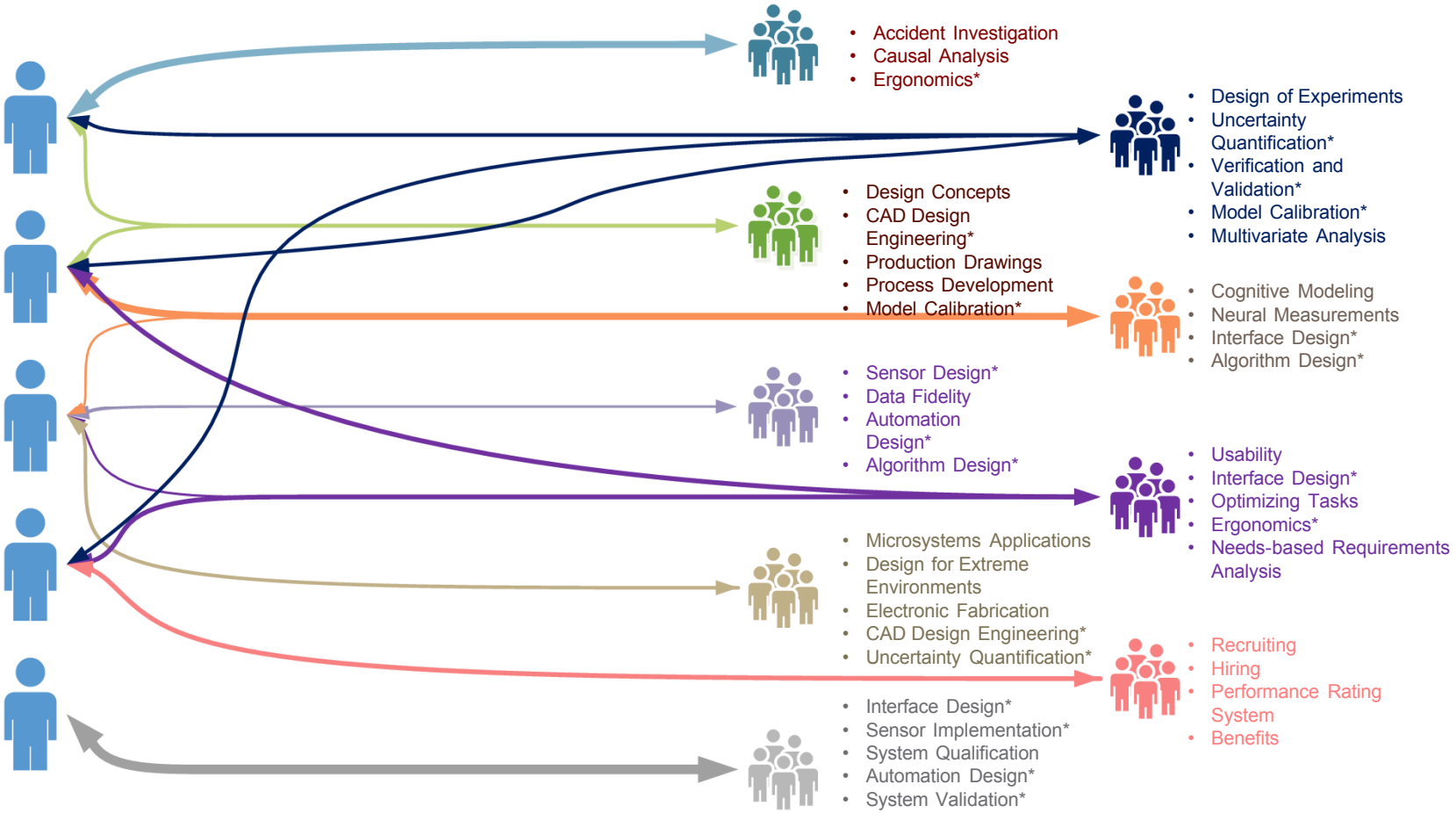
- **Literature suggests 10:1 ROI (Hinckley, 2001)**
- **PRT involvement = $784,000 investment resulted in $7,563,000 savings (Durham, 2014)**
- **Neutron Generator involvement = operator qualification reduced from 3 months to 1 month (Morris, 2013)**

Growth in Diversity and Funding



HF is a Foundational Capability

Current Approach to Solving Complex National Security Challenges



Proposed Approach: Apply a More Scientific and Effective Approach to Solving Complex National Security Challenges

Define

Human Factors and Statistical Sciences partner with domain experts to define customer needs

Scope

Human Factors and Statistical Sciences facilitate a systematic scoping of the problems

Systematic Selection

Human Factors and Statistical Sciences help integrate and optimize the right combination of capabilities

- Materials Science
- Weapons Response
- Nuclear enterprise assurance
- Climatology
- Risk Analysis
- Vulnerability Analysis
- Criticality Analysis
- Cyber Security
- Network Security
- Threat Analysis
- Sensor Fusion
- Nuclear Weapons Engineering
- Satellite Operations
- Counter Intelligence
- Signal Intelligence
- Multi-INT
- Grid Resilience
- Renewable Energy
- Monitoring & Surveillance
- Experimental Design
- Optimizing Workflow
- Statistical Analysis
- Designing Control Systems
- Usability
- Root Cause Analysis
- Modeling and Simulation
- Data Analytics
- Interface Design
- Needs-based Requirements

Innovative Solutions

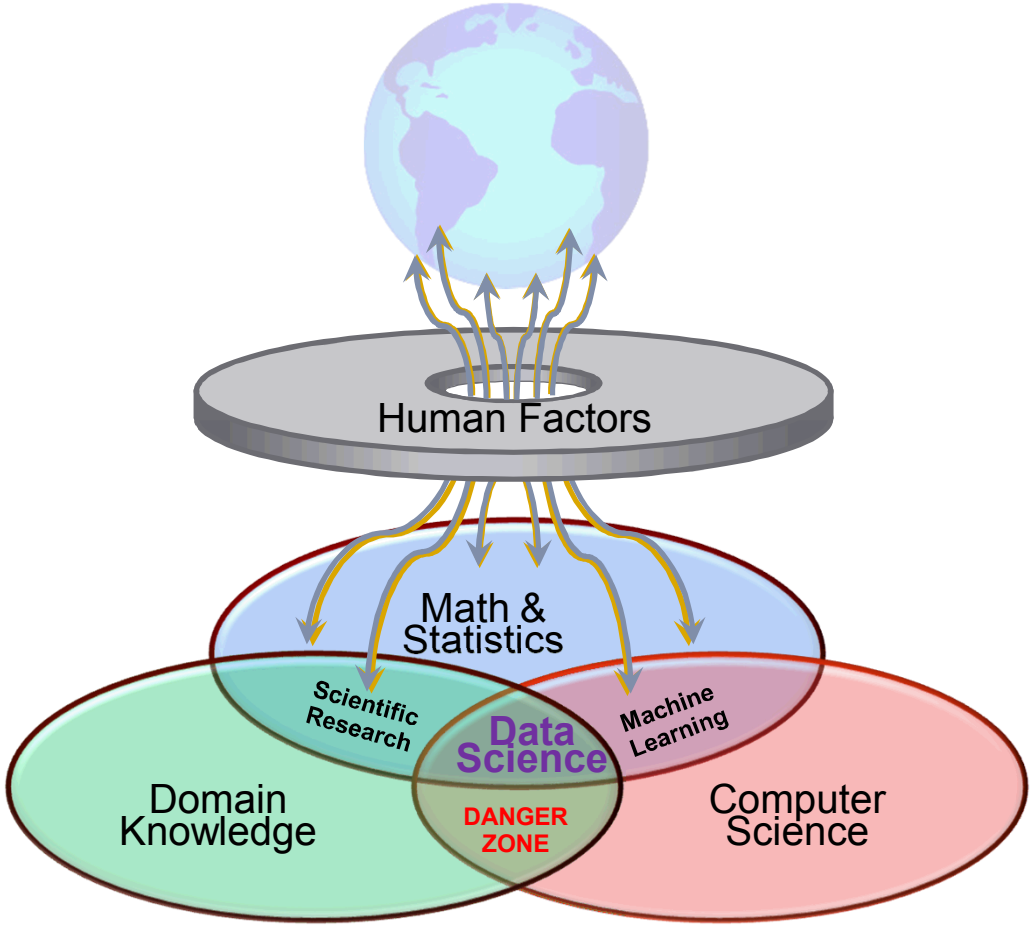
Human Factors and Statistical Sciences are foundational capabilities that enable innovative solutions to National Security challenges

[Customers] **[National Security Needs]** **[Problem Categories]** **[Notional Capabilities]**

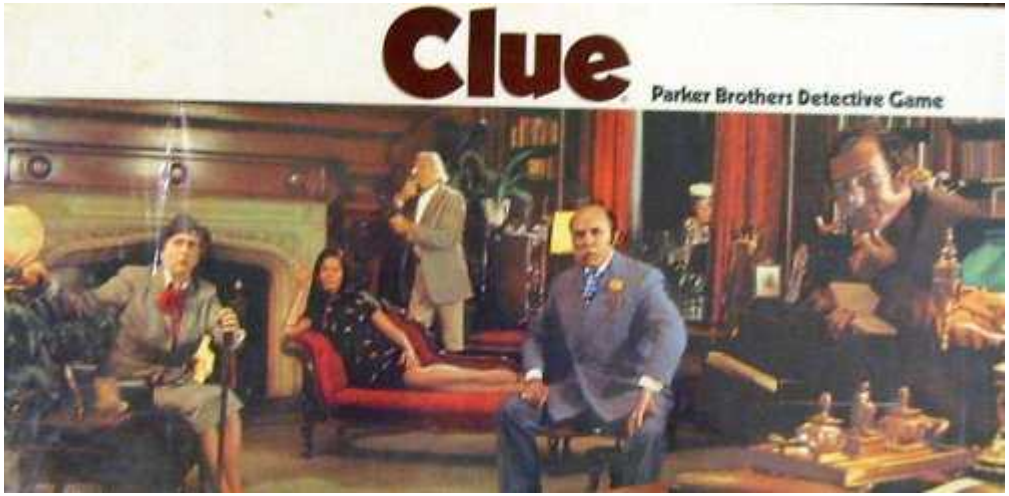
Human Factors and Statistical Science Experts come from an academic background focused on **scientifically defining hypotheses, characterizing needs, and providing innovative solutions to complex problems**

Sandia has Differentiating Capabilities for Data Science

Sandia National Laboratories

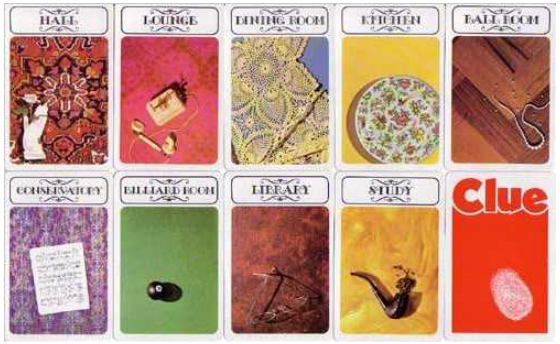


What is a capability?



Who?

Where?



Tools?