An Update on INCOSE UK’s Human Centric Systems Engineering (HCSE) Working Group

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INCOSE UK: Human Centric Systems Engineering Working Group

Coming Up

• Context
• Current SE Practices, Concerns and Opportunities
• HCSEWG Strategic Ambitions
• Key Objectives
• History
• Activities & Progress
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Engineering
- Mechanical Eng.
- Electrical Eng.
- Civil Eng.
- Chemical Eng.
- Process Eng.
- Software Eng.
- ... 

Specialist Engineering (SpE)
- Human Factors Eng.
- Safety Eng.
- Security Eng.
- Supportability Eng.
- ... 

Systems Engineering (SE)

Turns abstract ideas into physical reality

Context

Addresses Human-System concerns

Facilitates multi-disciplinary development of Complex Systems

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Sounds Good
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Engineering
- Mechanical Eng.
- Electrical Eng.
- Civil Eng.
- Chemical Eng.
- Process Eng.
- Software Eng.
- Specialist Engineering (SpE)
  - Human Factors Eng.
  - Safety Eng.
  - Security Eng.
  - Supportability Eng.
- Systems Engineering (SE)

Is SE a Specialty?!

Addresses Human-System concerns

Facilitates multi-disciplinary development of Complex Systems

But...many systems still delivered
Unfit-for-Purpose - they don’t work as expected; are unusable; unsafe; over-budget; delayed; even cancelled...

Observations
Addresses Human-System concerns
Turns abstract ideas into physical reality
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Current Practices, Concerns & Opportunities
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Current Practices, Concerns & Opportunities

Real World SE Practices Varied and Inconsistent

• Every nation, culture and business is unique, so every instantiation of SE is different
• All subject to business dynamics
• Some do SE better than others; All can do better!

Differences also apply to related Specialist Engineering (SpE) processes, e.g.: US Human Systems Integration (HSI) & UK Human Factors Integration (HFI)

Systems Engineering Observations

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Factors Integration (HFI)

Maturity / Immaturity of
SE Best Practice

• SE consensus still developing (ask what
  constitutes SE Research and diversity of
  views evident...)
• Incomplete Guidance / Standards (Some
  ‘Whats’ but little How, Who, Why, etc.)
• Inconsistent use of terms (e.g.
  Architecture: Views & Viewpoints)
• Much ‘standardised’ SpE Best Practice
  available (HFI over 20yrs old)
• Most poorly integrated into SE, so under-
  utilised
• Lack of parity between PM and SE Lead

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Relationship of SE to SpE

• Late entry in INCOSE SE Handbook demotes perceived value of SpE
• SpE seen as less important than SE
• SpE inclusion in SE often to chance
• SpE equated to extra cost & delay

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Poor Awareness and Understanding of SpE Value Mitigating / Managing Risk
- Risks mitigated by SpE poorly understood by SE Leads, SE Practitioners and Programme Managers (PM)
- Risks recognised too late

Concern

Systems Engineering Observations

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Systems Engineering Observations

INCOSE SE Vision 2025
- INCOSE desire to broaden SE applicability into new Sectors (non-traditional SE);
- Requires new SE Approaches, Tools, Methods, Practices & Behaviours ...

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Conclusion:
Need easier way to ensure human issues accommodated;
Need HF / SpE addressed in SE by default

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Strategic Ambitions

• Develop **Comprehensive Coherent HCSE Framework** to ensure human concerns are addressed across the SE lifecycle (from system conceptualisation to end-of-life)

  *Build on extant HF Applied Knowledge & processes; Incorporate essential SpE influences into mainstream SE activity (i.e. the SE ‘Core’) to reduce risk from accidental or ‘intentional’ SpE exclusion: Practice HCSE by default*

• Develop **additional mechanisms** to facilitate greater SpE inclusion

  *Early Systems Architecting and Model-Based Systems Engineering are 2 such avenues; Find and develop others*

• Identify **New Best Practice** in non-traditional SE sectors (e.g. health, energy)

  *Determine which to include in our new universal SE Core and which might constitute more sector-specific ‘flavours’ to complement it*

• **Raise Awareness**, Promote and Guide advocated HCSE Best Practices

  *Develop INCOSE information / technical guidance products, How-To workshops, etc.*

**HCSE is a Pathfinder** we hope may help other SpEs to integrate better with SE, driving the development of a more comprehensive SE Core.
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Applied Human Factors Knowledge (examples)

- HFI
- HSI (Defence Acquisition Processes, Standards & Guidance)
- JARs/FARs/CAPs (Civil Aviation Regulatory Frameworks & Guidance; e.g., Human Centred Design JAR/CS-25, EASA 145, CAP737)
- HSE (Health & Safety Executive Regulations & Guidance)
- Briefing Notes (Energy Institute Guidance)
- New Sector (non-traditional SE) / HF good practices & Guidance

SE CORE

New Human Centric Systems Engineering Knowledge & Approach

SE-related ISOs: 15288; 42010; 19450;

INCOSE SE Handbook & Other Guides

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Key Objectives

• Identify organisations across diverse sectors practicing Human Factors

• Review where possible what approaches, standards, guidance they follow

• Determine what constitutes best practice (develop criteria)

• Consolidate Best Practice findings into core elements of HCSE and sector-specific or sector-cluster 'flavours' of HCSE

• Seek opportunities to formalise HCSE and its Best Practice in relation to a 'universal' lifecycle approach and flavours of enterprise-based development processes

• Raise awareness of the HCSEWG and its HCSE developments:
  • Information products; workshops; WG website; other outputs and activities

• Develop cross-linkages with other INCOSE WGs and other Professional Bodies
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History

Q3 2014: Proposal for new INCOSE Human Factors Integration WG put to INCOSE UK Council (supported by UK MoD-Industry HFI WG). Case highlighted need to address failings in SE to adequately accommodate Human Factors. Extant HSIWG supported US DoD acquisition processes but nothing similar supporting UK MoD’s (different HFI) approach. 1st Step: Formalise HFI by bringing it into the INCOSE SE fold. WG Approved.

Q1 2015: 1st Meeting of INCOSE HFIWG. Members felt focus should be broader than HFI: humans as integral parts of Systems rather than add-ons to be integrated later. WG Renamed: HCSEWG. Vision for HCSE as overarching comprehensive framework addressing human issues in SE takes root.

Activities & Progress

• Building understanding between 2 core participating member communities:
  • SE
  • SpE (predominantly HF & Safety so far)

• Identifying key areas of concern, including:
  • Workshop 2015: New Sectors of interest and anticipated Types of BP
  • Workshop 2016: HF and Systems Architecting

• Information Products in development:
  • Introduction to Human Factors (INCOSE UK Z-Guide)
  • Human Factors Integration (INCOSE UK Z-or Omega Guide)
  • INCOSE Preview Article / INCOSE UK ASEC2015 and 2016 Posters

• Formal / reciprocal links established with external entities:
  • UK Ministry of Defence-Industry HFI WG
  • Energy Institute's Human and Organisational Factors Committee (HOFCOM)

• INCOSE WG Links:
  • Architecture, MBSE, Organisational Capability WGs

We hope to establish stronger links with our colleagues in the HSI WG too!