

1 PURPOSE

Enterprises and human organizations are highly complex cybernetic systems of people and technologies that are entities in their own rights and that are prone to gross structural inefficiencies and failures to the extent of causing great societal harm and economic loss. Systems engineering is a disciplined interdisciplinary methodology for understanding, designing and enabling system solutions for complex problems.

Enterprises and human organizations depend highly on the intelligent interaction, creation, management and use of various forms of knowledge embodied in their organizational structures. Organizational entities that ensure their successes that do this well may be termed “intelligent enterprises”. As an understanding of the basic physical sciences provides the scientific framework within which physical systems are engineered, an understanding of the basic life and social sciences must provide an underpinning for the engineering of social systems such as enterprises and organizations. This must include a focus on tacit and intangible aspects of organization that may be alien to many systems engineers used to focusing on the tangible aspects of physical and electronic systems.

This working group (WG) seeks to apply the principles of systems engineering to develop a body of knowledge to identify and understand the behaviors and problems with complex organizations, to suggest short term interventions and solutions, and – over the longer term – to design more robust, efficient and safer organizational systems for stakeholders and society in general.

2 GOAL

The WG will work to build a generic understanding of the structural systems and their various roles comprising organizations and enterprises, and a set of systems engineering methodologies for applying this generic understanding to analyzing specific organizations and their problems. This will involve establishing cross disciplinary teams and consultations involving systems engineers, enterprise architects, people from the life and social sciences, and practitioners in areas such as management consulting, organizational knowledge management, business process reengineering, ICT and change management, amongst others.

Over the short term, the WG will seek to assemble existing knowledge and theories relating to organizational system as a body of knowledge that will be accessible to systems engineers.

Over the intermediate term, the WG will develop methodologies and templates to guide systems engineering approaches to developing solutions for problems affecting intangible and tacit aspects of organizational and enterprise systems.

Over the long term, the WG will develop training and certification packages for Enterprise Systems Engineering.

3 SCOPE

The concept of Enterprise Systems Engineering has some resemblance to the discipline of Enterprise Architecture that also incorporates some systems engineering principles. However, compared to architecture, which is largely a design activity, engineering, as in the case of mechanical or civil, is closer to its scientific foundations in the realization of physical law in material products. Thus, it is anticipated that enterprise systems engineering will be much closer to scientific foundations in the life and social sciences in realizing these understandings in the intangible structural systems of enterprises and human organizations.

The initial scope of the WG will be to survey relevant the scientific foundations, to assess and prioritize concepts, and to match with systems engineering concepts and principles for incorporation in an Enterprise Systems Engineering Body of Knowledge. Amongst others, the following scientific domains appear to be directly relevant.

- Major disciplines:
 - Anthropology
 - Cognitive science
 - Information Systems
 - Information Science
 - Epistemology (esp. K.R. Popper, M. Polanyi)

- Specialized fields
 - Cybernetics (N. Wiener, J. v. Neumann, W.R. Ashby, etc.)
 - System thermodynamics (I. Prigogine, H. Odum, etc.)
 - General systems theory (L. v. Bertalanffy, etc.)
 - Second order cybernetics (H v. Foerster, G. Bateson, etc.)
 - Living Systems Theory (J. G. Miller)
 - Viable Systems Model (S. Beer)

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- Autopoietic Systems (H. Maturana, F. Varela)
- Social Systems Theory (N. Luhmann)

This WG's scope is significant as it attempts to engage with issues from an emergent field of complex adaptive systems (social, technical and economic) focusing on the implementation of processes involved in this multi-disciplinary field. The skill set required is considerable due to an approach that includes social science, engineering, processes and management, practical and theoretical comprehension for an applied outcome. These are not commonly combined skills sets and no real formal training exists, yet the need for such combinations is known.

4 SKILLS AND EXPERTISE REQUIRED

Other than Systems Engineering, skills will be required from a variety of disciplines having some knowledge of the scientific disciplines listed above. Our existing members from within and outside of INCOSE are multidisciplinary in their own rights – having both theoretical and practical experience, and should be able to other knowledge required through their wide academic disciplinary connections.

5 MEMBERS, ROLES AND RESPONSIBILITIES

List the names of members and briefly describe their responsibilities.

- Lead: **Steven Else**
 - Responsibilities
 - (e.g. The lead shall be responsible for status reporting to the Assistant Director for Knowledge.)
- Co-Lead(s): (If applicable)
 - Susu Nousala
 - Responsibilities
 - (e.g. The co-lead shall be responsible to act in the absence of the lead.)
- Board Sponsor(s)/Champion(s): (If applicable) <name>
 - Responsibilities
 - (e.g. The Board sponsor shall be responsible for resource advocacy and status reporting to the INCOSE BOD and external stakeholders.)
- Members
 - William Hall
 - Amir Morris
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 - It is anticipated that many members of the Enterprise Solution Architecture Institute (http://www.eapincipals.com/Enterprise_and_Solution_Architecture_Institute_ESAI.htm) and the Kororoit Institute Proponents and Supporters Association, Inc. (<http://kororoit.org>) will be interested to participate in this WG.



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6 OUTCOMES (PRODUCTS/SERVICES)

See Scope (above)

7 APPROACH

8 MEASURES OF SUCCESS

Resource Requirements

9 DURATION

10 SIGNATURES

Enter the signature block of the submitter

Date

1st Level of Approval

A handwritten signature in black ink, appearing to read "Kaum", written over a horizontal line.

Technical Director, INCOSE

Date August 2011

2nd Level of Approval (Note this will be added by the INCOSE Technical Director when deemed appropriate.)

Chairman, INCOSE Board of Directors

Date



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Revision History

<u>Date</u>	<u>Revision</u>	<u>Description</u>	<u>Author</u>
	1.0	Initial Draft.	