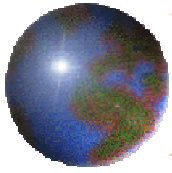


INCOSE 2007 Symposium
Observations and Insights

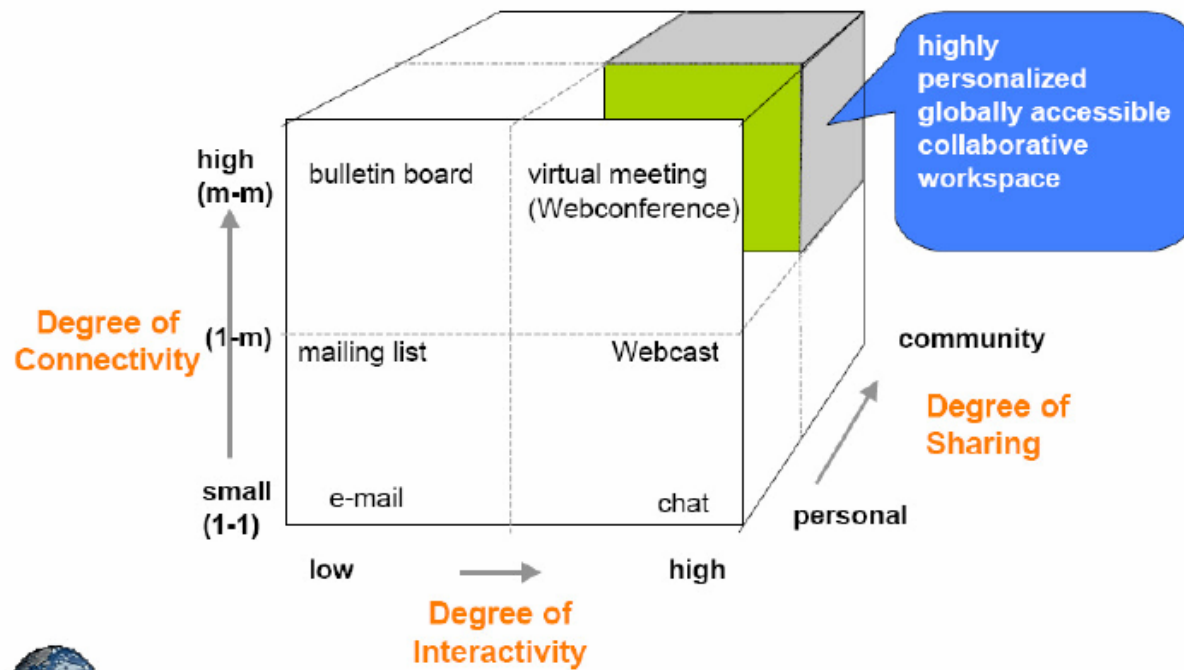
Replacing Mass Communication with Mass
Collaboration

Wisdom of the Masses Initiative



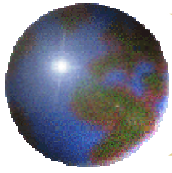
Mass Collaboration Eclipse of Mass Communications

3 Dimensions of Collaborative Behavior



When do we get here?

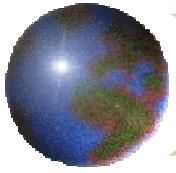




Enchantment Southern NM

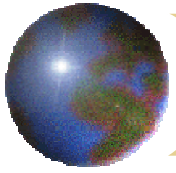
Mass Collaboration Solicitation

- ⊕ Evangelization – Members and Region SE Development
- ⊕ Mass Collaboration eclipsing Mass Communication
 - ▣ Peering
 - ▣ Sharing
 - ▣ Open Advantage
 - ▣ Global Action
- ⊕ Expanding Mass Collaboration for Southern NM Enchantment Expansion
 - ▣ Solving Time and Space Problem
 - ▣ Language Problem? Mexico Outreach?
 - ▣ WSMR SE Directorate Outreach
 - ▣ ITEA M&S Panel - MBSE December
- ⊕ Mass Collaboration Ideas
 - ▣ Virtual Meetings
 - ▣ BNSL partnership
 - ▣ Student Chapters – NMSU and/or UTEP
 - ▣ NMSU Initiative
 - ▣ Recruiting Meeting
- ⊕ Tri-state (NM, Texas, Mexico)
 - ▣ Border Initiatives
 - ▣ Sub-chapters
 - ▣ Sister Chapters



Edge of Chaos Insights

- ⊕ Multidiscipline Dialog Leads to Critical Insights
- ⊕ Facilitates Abstractions
- ⊕ Enables Marketplace of Ideas
- ⊕ Breadth First Search Tree Traversal versus Depth First Search Tree Traversal



SE is about the three P's

⊕ Systems Engineering

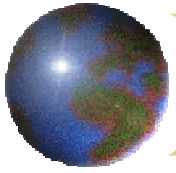
- ⊠ People
- ⊠ Process
- ⊠ Product

⊕ Is this Equivalent to

- ⊠ Will
- ⊠ Way
- ⊠ Means

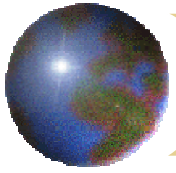
- Are we applying SE to each of our workgroups?
- Are we “eating our own dog food”?
- Are we giving equal weight to:
 - optimization and innovation?
 - deduction and induction?
 - certainty and adaptation?

Become a learning organization through relentless reflection (Hansei, 反省)
and continuous improvement (Kaizen) – Toyota Way



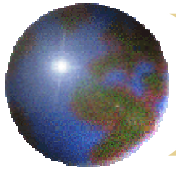
Will, Means, and Way

- ❖ INCOSE has a Means and Way Committee
- ❖ Where is the Will committee?
- ❖ $\text{Capability} = \text{Means} + \text{Way}^2 + \text{Will}^3$
meaning will has three times the effect of means
- ❖ Dynamics of insurgency, asymmetric warfare, and creative induction



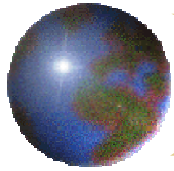
INCOSE is a Community of Interest

- ❖ Established as a counter movement to IEEE strict standards based social movement
- ❖ Society of Volunteers
- ❖ 7000 International members augmented by Face-to-Face Social model and Web 1.0 (bulletin board, email) model
- ❖ Increasing network connectivity limited by current means and way



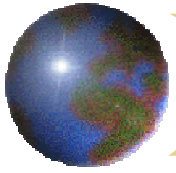
INCOSE as a Social Network

- ❖ Augmenting Social Networks
- ❖ Web 1.0 was about creating better bulletin board and mail system
- ❖ Web 2.0 is about creating mass collaboration
- ❖ Toyota Way reminds us the right process produces the right results
- ❖ Are we manifesting self-organizing innovation network dynamics?



INCOSE The Hyper-Network Community of Interest for Systems Engineering

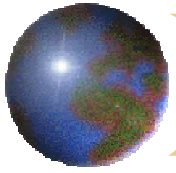
Level	Focus	Examples	Systems Perspective	Biology Perspective	Issues	Principles
4 Hyper-Networks	Federated activities toward common goals among multiple organizations that retain their separate identities and have no common hierarchy	B2B exchange, ecosystems (Amazon.com, iTunes, eBay, Wikipedia, blogs), consortia (W3C, IETF, OMG), hastily formed networks	Complex adaptive systems Systems of systems	Ecological communities	Information sharing, information overload, valued information at the right time (VIRT), shared models and semantics, cross-organization structure, collaborative commerce	Push, pull, search, filters, context-aware models, conditions of interest, distributed decision-making, need to share
3 Organizations and Communities	Coordinated activities within a single organization or community that has a single purpose	Businesses (Amazon.com, iTunes, eBay, Paypal), enterprises, supply chains, processes	Coordination systems Transactions Workflows	Life forms	Enterprise architecture, information assurance, information overload, organizational structure, command and control, process specification and management	Concurrency control, interaction rules, social network structure, channels for content types, need to know
2 Internet Service Providers and Customers	Accounts, access, and bit-flows managed by protocols and middleware	Protocols (email, datagram, file transfer, remote login, Web service, secure sockets, WiFi), middleware (name services, search engines, single sign-on, business VPN, packet telephony, audio and video streaming)	Information flow systems	Circulatory system Central nervous system	Protocol design, end to end error recovery, access control, firewalls, congestion, spam, virus, Trojan horse attacks, secret communications, most of network invisible to search engines	Protocol verification, domains of protection, bottleneck control, queuing, resource contention and prioritization
1 Signals and Telecommunications	Physical components, links, signals	Routers, fiber cables, leased lines, switches, Hamming codes, routing algorithms, network cards, local networks, wide area networks, IP addressing	Physical systems	Neurons and their connections	Connectivity, packet loss, link or router failure, error recovery, congestion, buffer overflow	Redundancy, dynamic routing, fundamental laws of throughput and response time, power laws of connectivity



The International in INCOSE

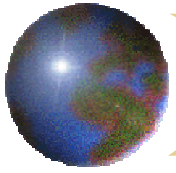
Acting Globally through Peering, Sharing and Openness

- ⊕ Augmenting a social network separated by time, space and language
- ⊕ Do we need more interaction tools that replicate face-to-face dialog?
- ⊕ Do we need interaction tools that transcend time, space, language?



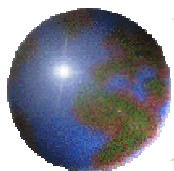
INCOSE Mass Collaboration 2.0

- Will continue to expand to establish self-organizing innovation networks
 - Collaborative Innovation Networks
 - Wikinomics (Being Open, Peering, Sharing, Acting Globally)
 - Web 2.0 expanding social networks
- Current means and way does not scale
 - Persistent Dialog Theme



Systems Engineering Workgroups

- ✚ Certified Systems Engineering Professional
- ✚ DoD Systems Engineering (DoDAF 2.0, System of Systems, Mark Schaeffer)
- ✚ Enterprise Architecture
- ✚ Complex Systems Engineering
- ✚ Lean Systems Engineering
- ✚ Network Centric Operations
- ✚ Intelligent Enterprise



DoD Network Centric Operations



Vision

Deliver the Power of Information

An agile enterprise empowered by access to and sharing of timely and trusted information

Mission

Enable Net-Centric Operations

Lead the Information Age transformation that enhances the Department of Defense's efficiency and effectiveness

Goals

Information on Demand

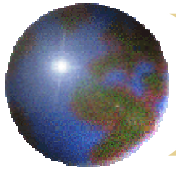
- Build the Net
- Populate the Net
- Operate the Net
- Protect the Net

Outcome

People, processes, and technology working together to enable timely and trusted:

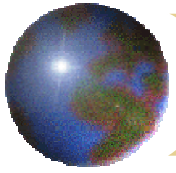
- Access to information
- Sharing of information
- Collaboration among those involved

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The Right Process Produces the Right Results

- Right System versus System Right (SE)
- Right Job & Job Right (LEAN SE)
- Web 1.0 vs. Web 2.0
- INCOSE vs. PMI
- Microsoft vs. Google
- Hierarchy (star chambers) and Networks
- Momento Pattern vs. Persistent Pattern
- Complex Systems Engineering States (Order, Chaos, Complexity)
- Intelligent Enterprise creates increasing Intelligence



Devil in the Details

It is my contention that simple shifts in process such as replacing INCOSE collaboration framework with mass collaboration framework would do more to create a marketplace of ideas than the current process.

SE says focus on people, process, and product.

Principles of Maneuverability (Boyd) say to focus on people, ideas, and hardware in that order.

Transformation requires will³ (people), way² (ideas), and means (hardware) - in that order.

INCOSE relies on email, face-to-face, and sharepoint while power instance actors like Google have established self organizing networks using mass collaboration applications (wikis digital libraries, virtual forums, peering, sharing, being open, and acting globally) based on network dynamics to expand the marketplace of ideas.

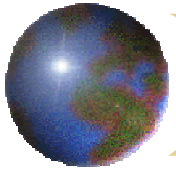
Complex Systems scientists observations of power laws and scale free networks must lead to action plans for expanding connectivity in a way that reflects how most representative power law manifesters or actors are doing it.

"**Simple** procedures (codes, programs), in nature as well as in computing, often **yield** the most **complex** results. Where does the complexity reside, if not in the simple program that created it? A minimal number of primitive interactions occur in a primordial soup and, presto, life. Was life somehow embedded in the primordial soup all along? Or in the interactions? Or in the combination of substrate and interactions?

Complex processes **yield simple** products (think about products of thinking such as a newspaper article, or a poem, or manufactured goods such as a sewing thread). What happened to the complexity? Was it somehow reduced, "absorbed, digested, or assimilated"? Is it a general rule that, given sufficient time and resources, the simple can become complex and the complex reduced to the simple? Is it only a matter of computation?

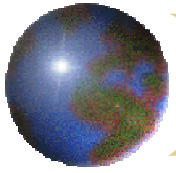
We can resolve these apparent contradictions by closely examining the categories we use.

Perhaps simplicity and complexity are categorical illusions, the outcomes of limitations inherent in our system of symbols (in our language). "



Adaptation - the Antidote to Uncertainty

- Complex Systems Theory and Complex Systems Engineering
- LEAN Systems Engineering
- Model Based Systems Engineering (facilitating abstraction and action while avoiding analysis paralysis and diminishing returns)
- Toyota Way – SE in action, the concrete instance of Deming abstractions
- Enterprise Software as scale-free network working model of Model Based Systems Engineering
- Object Oriented Enterprise Architecture
- Intelligent Enterprise Systems Engineering
- SE Fundamentals
- DoD Network Centric Warfare / Network Centric Operations
- Swarm Theory in Billion Man Swarm Era
- Hyper-networks (Complex Systems and System of Systems Ecosystems)
- John Boyd expansion of scientific method as it applies to the manifestation of action [http://en.wikipedia.org/wiki/John_Boyd_\(military_strategist\)](http://en.wikipedia.org/wiki/John_Boyd_(military_strategist))
- Google as a self-organizing social network (a collaborative innovation network in action)
- Democratic Republic 2.0 Digital Building Blocks Transcending Time and Space – Public Forums, Marketplace of Ideas, Libraries, Peering, Sharing, Open, Global



Principles of Complex Systems for Systems Engineering

To transition from doing SE to doing CxSE [Bar-Yam 2006]

a) Continually build on what already exists [It's a complex system after all; it must evolve]

Evolution from scratch is slow; start from something close to what you want

b) Focus on creating an environment and process rather than a product

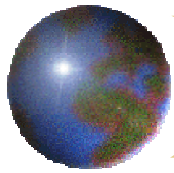
c) Individual components must be modifiable in situ

d) Operational systems include multiple versions of functional components

e) Utilize multiple parallel development processes

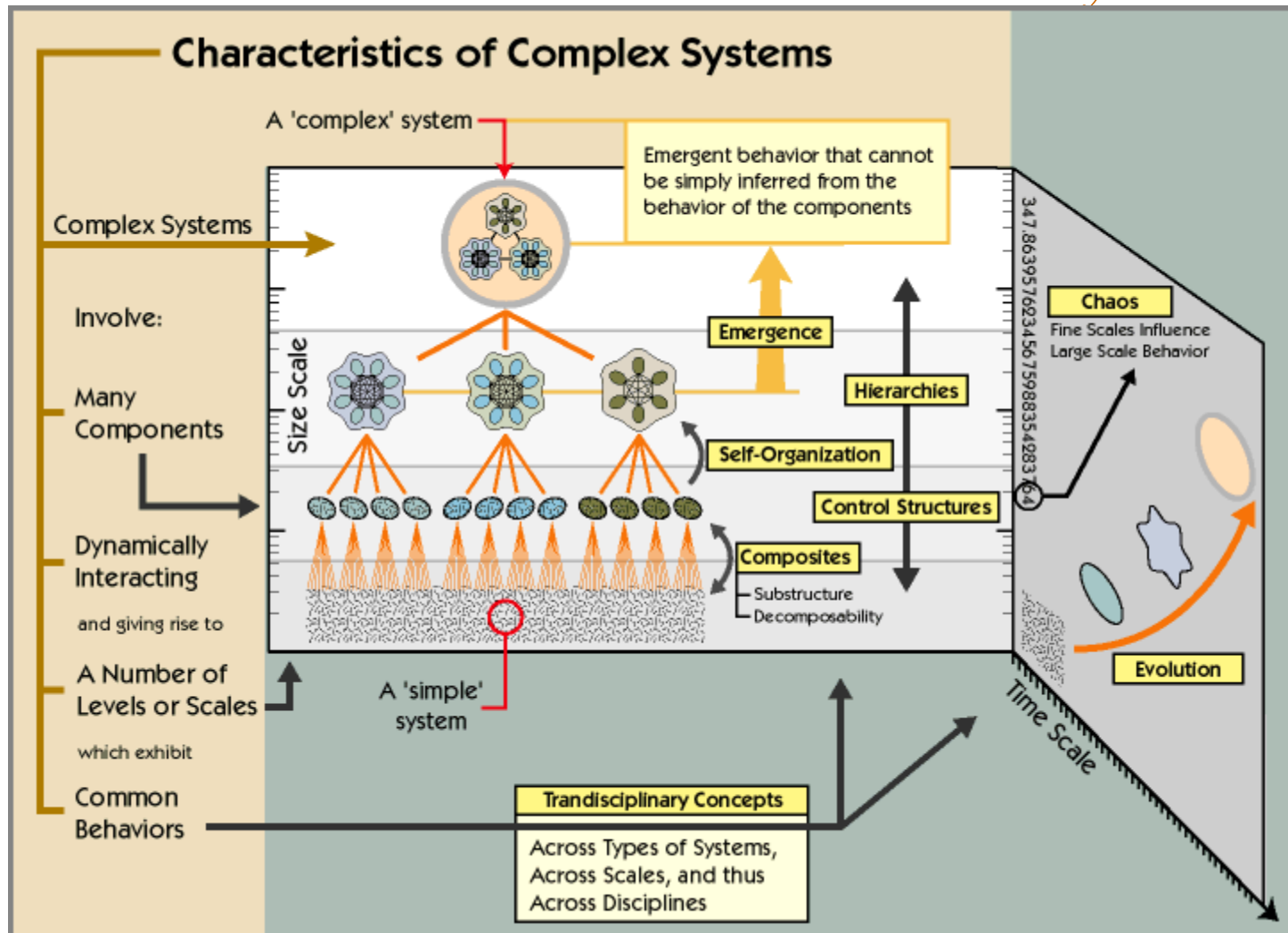
f) Evaluate experimentally in situ

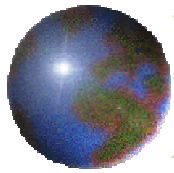
g) Gradually increase utilization of more effective components



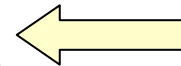
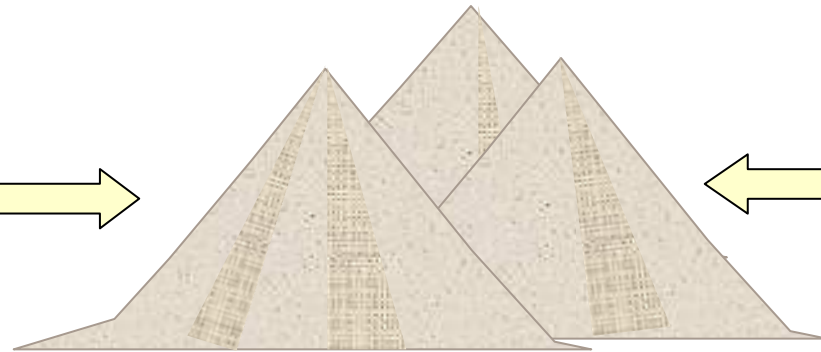
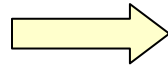
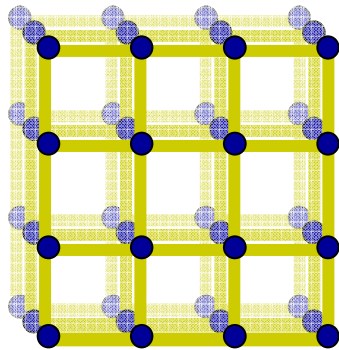
Complex Systems Engineering Adaptation Frameworks

Destructive Deduction to Creative Induction Cycle





Complex adaptive systems adapt toward the edge of chaos – Ever Unfolding State Changes



Order

Mechanical systems
Newtonian laws
Bell curves
Plans
Envt. stays same
Predictability
Control
High overhead
Little communication

Operational SE (OSE)

Complexity

Biological systems
Fractals
Power Laws
Priorities
Envt. evolves
Adaptation
Leverage
Agility
Critical Point

Complex SE (CxSE)

Chaos

Many domains
Laws of chaos
Strange Attractors
Reactions
Envt. unusable
Flexibility
Variety
Low overhead
Instability