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Can Systems Engineering support the integration of CSR in global production systems?

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Globalization – the context

- Globalization has set in motion a process of growing interdependence in economic relations (trade, investment and global production) and in social and political interactions among organisations and individuals across the world.
- Despite the potential benefits, it is recognised that the current processes are generating unbalanced outcomes both between and within countries.

The United Nations Commission on International Trade Law (UNCITRAL)

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Lecture points

- Overview of concepts
  - Global production systems
  - Corporate Social Responsibility
  - Systems Engineering
- An example
- Related concepts
- Addressing the question

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Global production systems

- Geographically and organizationally distributed production networks
- Systems that span several organizations, industry sectors and even national boundaries
- Interactions within these systems may be subject to conflicts between corporate interests (financial, competitiveness) and governmental interests (culture, democracy, work places, political relations)

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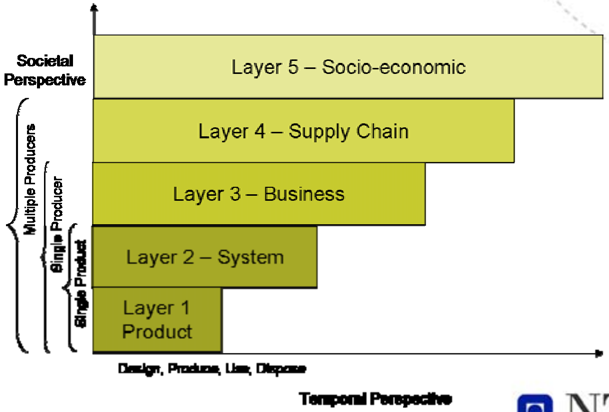
Hitchins 5-layer model



Hitchins (2007)

Corporate Social Responsibility

- A concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis – definition of the Commission of the European Communities, 2001 (Dahlsrud 2008)
- Term is ‘appraisive’ (Moon 2007) – no one deliberately seeks to be assessed as irresponsible

Elkington

- Coined phrase “triple bottom line” to illustrate that the CSR agenda focuses attention not only on the economic value added by corporations, but also the contributions that they add to (or detract from) societal and environmental values
- Some observed paradigm shifts
  - Markets moving from Compliance to Competition
  - Life-cycle technology moving from Product to Whole-life
  - Partnerships moving from Subversion to Symbiosis
  - Corporate governance moving from Exclusive to Inclusive

Implications of CSR for GPS

- Align the values of the extended corporation with the values of society – implying corporate citizenship
- Integrate the priorities of all stakeholders into the strategic and tactical decisions taken by the firm
- Embrace need for accountability and transparency
  - Communicate about policies and decision-making
  - Disclose the impacts of actions taken
- Tightly linked to business ethics for all decisions

CSR in global production systems

- Must be conceptualized to span multiple organizations, industry sectors and even national boundaries
- Consider implementation through a series of contractual and market relationships
- Insights from systems theory may help uncover the influence of diverse actors in the network on the overall performance

Paraphrased from CSR-Norway

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Systems Engineering

- Per Peter Checkland
  - A systems-based methodology for tackling real-world problems for which an objective or end-to-be-achieved can be taken as given, and the system engineered to achieve the stated objective.
- Per Derek Hitchins
  - The Art and Science of creating optimal solution systems for complex issues and problems
- Per INCOSE
  - is an interdisciplinary approach and means to enable the realization of successful systems

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Empirical applications of systems approaches

- Banathy – designing social systems
- Checkland – soft systems methodology
- Fet – environmental impacts in the marine sector
- Hale – INCOSE contributions to GEOSS
- Haskins – industrial parks
- Ramo – cure for chaos
- Robèrt – strategic sustainable development
- Senge – learning organizations, 5th discipline
- Warfield – social systems science

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Essential attributes of SE

- Systematic
  - Disciplined approach to solving problems, creating solutions, making decisions
  - Scope of the approach must encompass the entire problem space
- Systemic
  - Looks at wholes – the *problem* within a context and the interactions between the parts that lead to emergent behaviors of the solution
  - Mitigate unintended consequences
- Sustainable
  - Full life cycle considerations
  - Consider both the useful life of a system and its disposition after useful life

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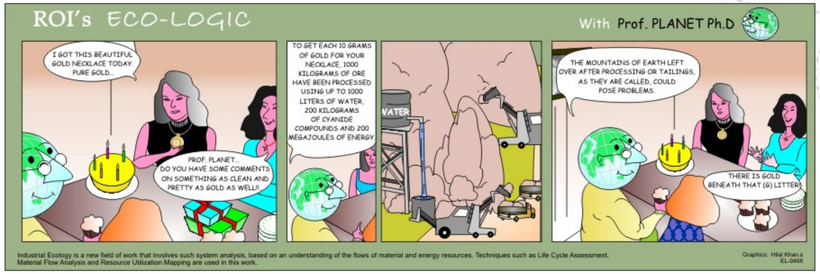
Unintended consequences



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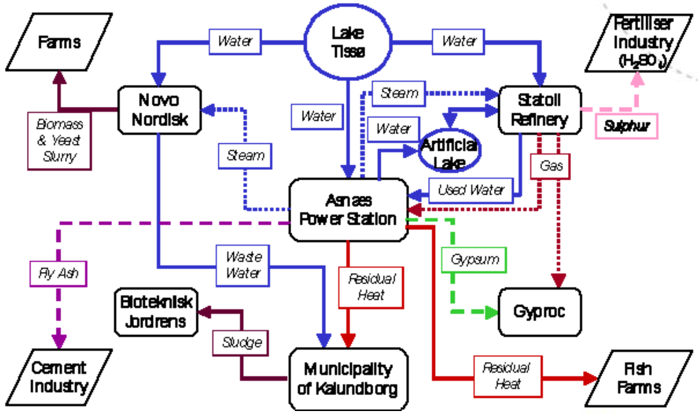
An eco-park example



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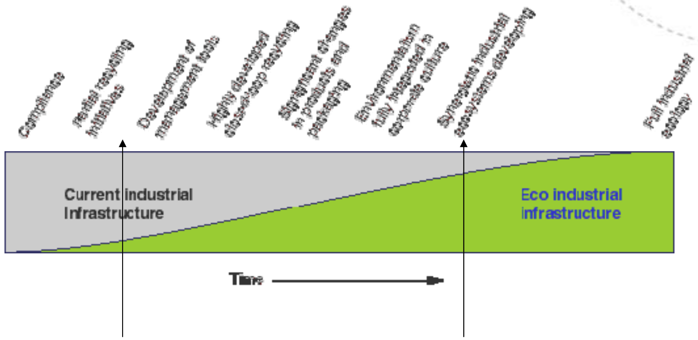
An Industrial Ecology view



Little, 1991

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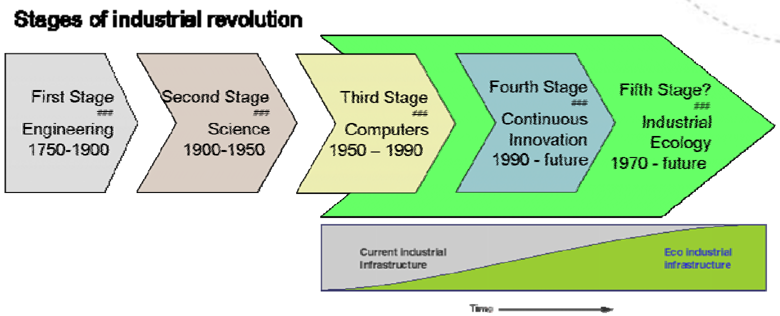
Production systems over time



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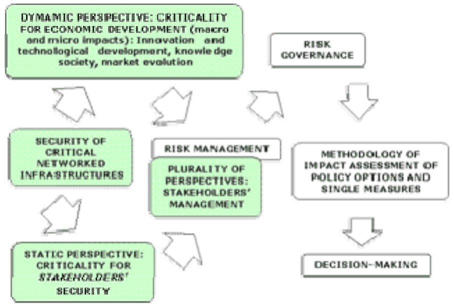
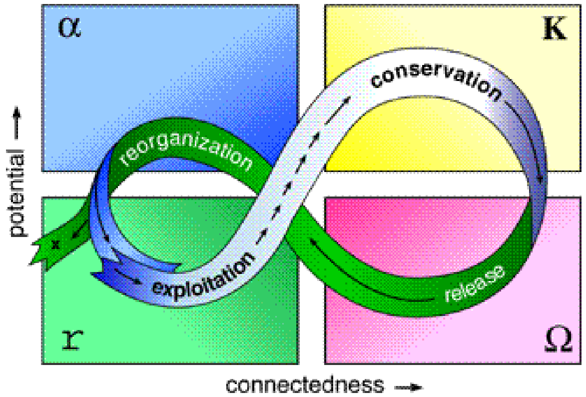
Risk governance view



Sajeva, *Security of Critical Networked Infrastructure*

Resilience



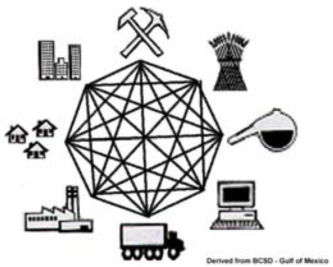
Holling and Gunderson 2002

A system of systems

- Autonomy
- Belonging
- Connectivity
- Diversity
- Emergence

Boardman Sauser 2008

Stakeholders of
Global Production Systems



Tools used by systems engineers

- Checkland's SSM
- Concept maps
- Systemigrams
- Modeling and simulation
- System dynamics (archetypes)
- Backcasting
- Interactive management
- Specialized trade studies
- TQM, House of Quality, 6 σ
- Scenario building
- Project management
- Cost estimating techniques
- Requirements management
- Risk management
- Human Factors analysis
- RMA – ilities
- Environmental impact analysis
- Decision-making under uncertainty (AHP, trees)
- … to name a few

Limitations of systems engineering

- Eventually a problem statement must be formulated – the quality of this statement is highly dependent on the ability of the stakeholders to communicate real needs
- The quality of the end result is highly dependent on the competence of the people involved – their ability to understand the problem and their ability to apply domain knowledge to the solution
- These limitations are shared with all human endeavors

Systems engineering can help .1

- Systematic approach
  - Following a process when coping with complicated and complex problems provides a framework for guiding the resolution
  - A framework provides an element of stability in an uncertain evolution
    - Support for open dialogue and consensus building among stakeholders
    - Generate a shared vision of the preferred future
    - Support for continuity – a 'memory' of what has been accomplished and what remains to be done
    - Support for 'course corrections' when needed
    - Disciplined decision-making and follow-through

Systems engineering can help .2

- Systemic approaches
  - Embrace the seemingly conflicting points of view held by the stakeholders; the paradoxes
  - See the systems that contribute to the understanding of the domain
    - The social systems – people interacting with people and technology
    - The production systems – creating the goods associated with quality of life
    - The technical infrastructure systems – providing underlying support
    - The value / belief systems – motivating people to act in certain ways
    - The management systems – intra- and inter-organizational cooperation
    - The governance systems – stimulate and manage change
    - The economic systems – often given higher priority than other considerations
    - The planet support systems – often given lower priority than they deserve

Systems engineering can help .3

- Sustainable solutions
  - Avoid quick fixes and point solutions with negative unintended consequences
  - Express performance as the mutual optimization of the triad of people, planet and product
  - Address the ways we involve stakeholders in the definition and implementation of changes
  - Increased stakeholder involvement will demand transparency and accountability of corporations, governments, all leaders (e.g. SE)

Systems engineering of the future

- To remain relevant in the future systems engineers
  - Need to tackle questions such as that posed for this lecture
  - Need to expand their tool kit, adding for example participatory management techniques
  - Need to be educated as ‘generalists’ with an expanded vocabulary that includes
    - Economics
    - Ethics
    - Environmental stewardship
    - Governance
    - Psychology
  - Need to prepare to lead the multi-disciplinary teams that will create the solutions to the problems facing us today

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Thank you for your attention