
Engineering Systems Doctoral Seminar ESD.83-- Fall 2011

Class 7

Faculty: Chris Magee and Joe Sussman

TA: Rebecca Saari

Guest: Professor Chris Zegras (DUSP & ESD)

Class 7 Overview

- ❑ Welcome, Overview and Introductions (5 min.)
- ❑ Dialogue with Professor Zegras (55min)--Redaction provided by David Gerstle
- ❑ Break (10 minutes)
- ❑ Discussion of ESD.83 faculty-provided theme-related papers led by Xin Zhang (approximately 40 minutes)
- ❑ Discussion of *Triumph of the City* by Glaeser, facilitated by Chris Magee (approximately 30 minutes)
- ❑ Theme and topic integration: Report from the front; Words; Quotes; Teaching and Learning Time-- Cities as complex systems-- (Sussman)
- ❑ Next Steps -preparation for Class 8 - (5 minutes) Magee

Discussion of *Triumph of the City*

- Colleague's ***additional insight*** to note
- Strengths of book
- Weaknesses

Discussion of *Triumph of the City* II

- Colleague's additional insights to note
- Strengths of book-
 - geographic, temporal and subject diversity;
 - Concepts (idea density) and nice stories;
 - raising our awareness of importance of human interaction at center of success
- Weaknesses-
 - Economics thinking only; parochial green definition; broad but shallow systems view;
 - Generalization from selected cases;
 - "Honesty" about firmness of conclusions (for example, proximity goodness

Discussion of *Triumph of the City* III

- Colleague's additional insights to note
- Strengths of book
- Weaknesses
- Looking forward, what does the thesis of the book suggest for living patterns, etc.)?
- How does the book connect to the rest of today's session?
 - Zegras article
 - Innes & Booher (development complexity, CAS)
 - Cascetta (urban transport governance complexity)

Theme and topic integration: Class 7

- Report from the front; _____
- Words
- Quotes
- “Teaching and Learning Time”
- Class 8 Plan (Magee)

Words

- Modularity
- Scalability

Quote I

- Sets of simultaneous equations as a way to “model” or define a system are, if linear, tiresome to solve even in the case of a few variables; if nonlinear, they are unsolvable except in special cases.
 - Ludwig von Bertalanffy, *General Systems Theory*

Quote II

- Trust is an important lubricant of a social system. It is extremely efficient; it saves a lot of trouble to have a fair degree of reliance on other peoples' word. Unfortunately this is not a commodity which can be bought very easily... Trust and loyalty... are not commodities for which trade on an open market is technically possible or even meaningful.
 - Kenneth Arrow, *The Limit of Organization*

Book I

- *Coordination without Hierarchy: Informal Structures in Multiorganizational Systems* by Donald Chisholm

Urban Transportation Organizations in the Bay Area

- AC Transit
- Golden Gate
- Muni
- Samtrans
- Santa Clara
- BART
 - Highly interdependent operationally but organizationally independent-- System of Systems.....?

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- ❑ Under conditions of stress, coordination is essential
 - ❑ “The depth of interdependence ...is never more evident than when through catastrophe or labor-management dispute, one operator is unable to provide its regular service”
 - ❑ Informal ties become essential....

Networks

- ❑ The urban transportation network, or collectively a set of networks
- ❑ The formal organizational networks of various players: BART, AC, etc, likely connected only at the CEO level
- ❑ The informal organizational networks with lateral connections within and among organizations
- ❑ Think about the role of technology here

Other Examples

- Military Organizations
- MIT

Book II

- *The Metropolitan Problem and American Ideas: Lectures Delivered on the William W. Cook Foundation of the University of Michigan* by Luther Halsey Gulick, 1961

Some ideas from the book circa 1961

- “New” problems
- Boundaries
- The principle of “exception”
- The principle of “integration”

Framing questions for ESD.83 I

- What is a complex system?
- What are our ways of thinking about these complex systems?
- What kinds of research questions do we want to **ask** in the field of Engineering Systems and how do we **answer** them?

Framing questions for ESD.83 II

- What are the historical roots of the field of Engineering Systems and what is their relevance to contemporary engineering systems issues and concepts?

- What does “practicing” Engineering Systems mean?

Framing questions for ESD.83 III

- ❑ What are the **design** principles of Engineering Systems?
- ❑ What does it mean to advance the field of Engineering Systems and how do we accomplish it?
- ❑ How do we integrate engineering, management and social science in Engineering Systems?

Learning Objectives

- ❑ **Basic Literacy:** Understanding of core concepts and principles - base level of literacy on the various aspects of engineering systems
- ❑ **Interdisciplinary capability:** The capability to reach out to adjacent fields in a respectful and knowledgeable way and the ability to engage with other ES scholars in assessing the importance to ES of new findings in related fields

Learning Objectives

- ❑ **Critical Analysis:** Ability to critically assess research and scholarship aimed at furthering knowledge in engineering systems; development of defensible point of view of important contributing disciplines in Engineering Systems Field

- ❑ **Links Across Domains and Methods:** Ability to identify links/connections across different fundamental domains and methods relevant to engineering systems

Learning Objectives

□ **Scholarly Skills**

- 1) The ability to write a professional-level critical book review;
- 2) A beginning level ability to develop and write a research proposal in the ES field;
- 3) The ability to present and lecture on critical analysis of material that one is not previously familiar with;
- 4) Developing wider reading skills and habits

THE END



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Engineering Systems Division



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