Transportation Systems Design

CIV ENG 790

DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF WISCONSIN – MILWAUKEE

Spring 2018

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Let us know something about you.

- An interesting fact about yourself
- Any interesting research/projects that you may have been a part of in the past that you want to share
- What do you define “transportation”, “system”, and “design”? What do you define “transportation system design”?
- What do you think the future trend of “transportation system design”?
- One thing you need from this course before it is over

Course Syllabus

- Class Schedule: Tu 5:30PM – 8:10PM Kenwood InterdispRschCplx 1130
- Instructor: Dr. Jie Yu (yu22@uwm.edu)
- Office: NWQ 4428
- Office Hours: F 2PM – 3PM or by appointment

Course Syllabus

- Homework

1. Due at the beginning of the class in each week following the assignment

2. A 20% penalization is applied for late homework

3. Late homework will not be accepted once the graded homework set has been returned to the rest of the class

4. Electronic submissions are OK via D2L, but HARD COPIES are preferred

Course Syllabus

- Grading Policy

Final Grade will be based on:

• Homework	30%
• Term Paper	50%
• Class Participation/Communications	20%
Total	100%

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Grading Policy

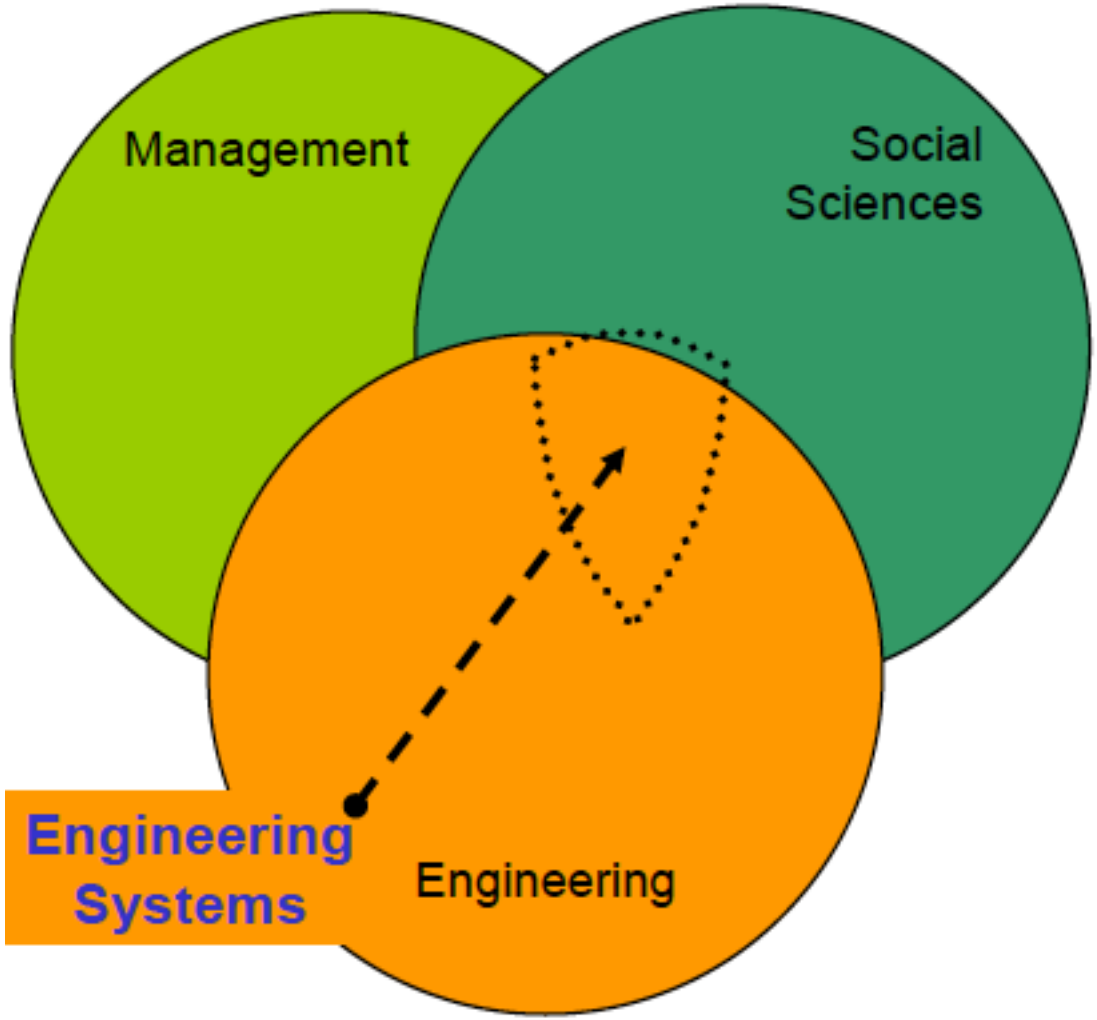
The grade of term paper will be based upon the following criteria:

• Objectives appropriate and clearly stated:	10%
• Methodology technically sound:	20%
• Data valid:	20%
• Conclusions valid and properly supported:	20%
• Study effort adequately described:	10%
• Report organization:	10%
• Well written and easily understood:	10%
	100%

01 Introduction

ENGINEERING SYSTEMS

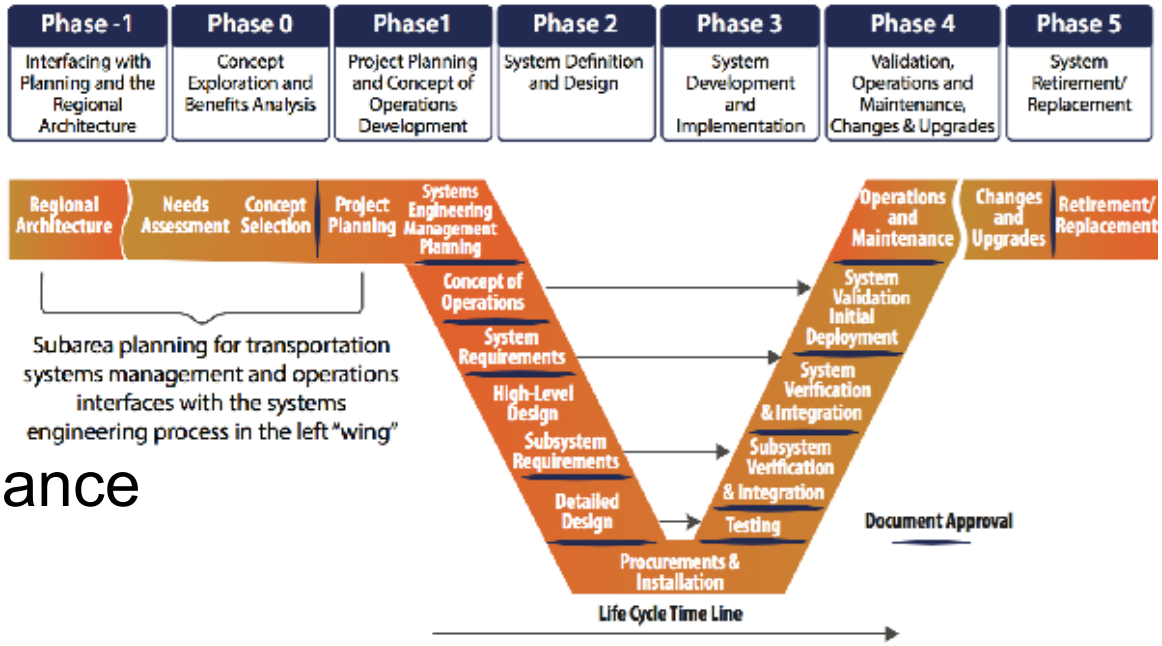
(at the interface of Engineering, Management, & Social Sciences)



Systems Engineering Process

TRANSPORTATION SYSTEM PHASES

- Conceptualization
- Planning
- Design
- Construction
- Operations/Maintenance
- Decommissioning



Corridor planning within the systems engineering "V" model.

Source: Federal Highway Administration and California Department of Transportation.

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Transportation System: CLIOS System

- Complex
- Large-scale
- Interconnected
- Open
- Socio-technical

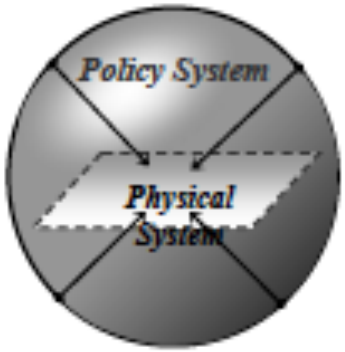
Transportation System: CLIOS System

- Complex
  - Structural complexity (e.g., network)
  - Behavioral complexity (e.g., travelers)
  - Evaluative complexity (e.g., decision makers)
  - Nested Complexity (e.g., physical domain vs. institutional sphere)

Transportation System: CLIOS System

- Complex

Nested Complexity



- Physical system "layer"
  - More quantitative principles
  - Engineering & economic models
- Policy system "sphere"
  - More qualitative in nature and often more participatory
  - Stakeholder evaluation and organizational analysis
- Different methodologies are required
  - within the physical system
  - between the policy system and the physical system
  - within the policy system

Transportation System: CLIOS System

- Large-scale
  - Geographic extent, and Impact

Transportation System: CLIOS System

- Interconnected
  - Environment
  - Energy
  - Economic
  - Global Climate Change
  - Telecommunications
  - …

Transportation System: CLIOS System

- Open
  - Social Factors (Risk)
  - Politic Factors (Geopolitics)
  - Economic Factors (Development)

Transportation System: CLIOS System

- Socio-technical
  - Complex Technology
  - Important Social Impacts

The Transportation as CLIOS System Era is Characterized by:

Advanced Tech and Math enabling …

- Operations focus
- Tailored customer service
- A rich info environment
- A higher and more effective level of intermodalism
- Large-scale optimization

The Transportation as CLIOS System Era is Characterized by:

Advanced Tech and Math enabling …

- Disaggregate demand analysis
- Real-time network control and provision of traveler info
- Vehicle automation and a crash-avoidance safety perspective
- Sophisticated pricing
  - Yield management
  - Pricing of externalities

The Transportation as CLIOS System Era is Characterized by:

Institutional change

- Public sector change − among and within levels of government
- Private sector change − with new business models & players
- Public Private Partnerships (PPP)

The Transportation as CLIOS System Era is Characterized by:

Macro-design performance considerations for the transportation enterprise

- Cost, LOS, price, travel time, service reliability, service frequency, safety
- In addition…
  - Flexibility, adaptability, robustness, resilience, …
- And, perhaps the most important “ility”
  - Sustainability (overarching pricinple of 3Es – Environment, Economics, Equity)

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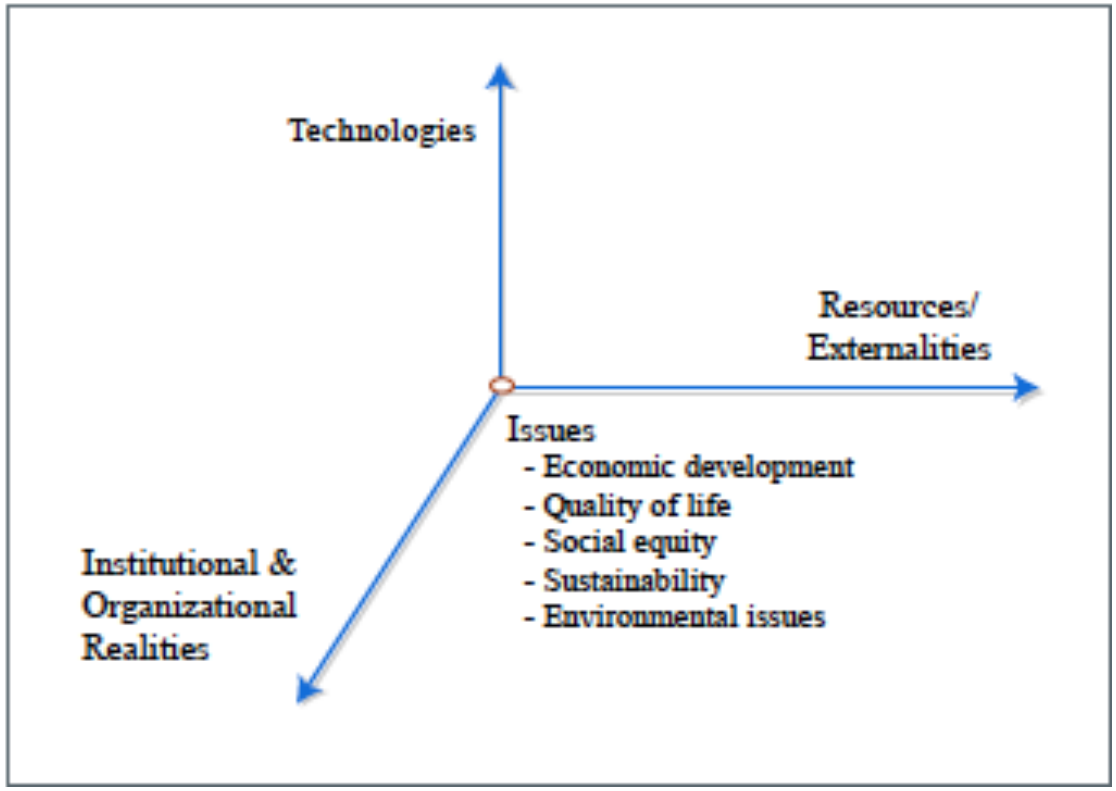
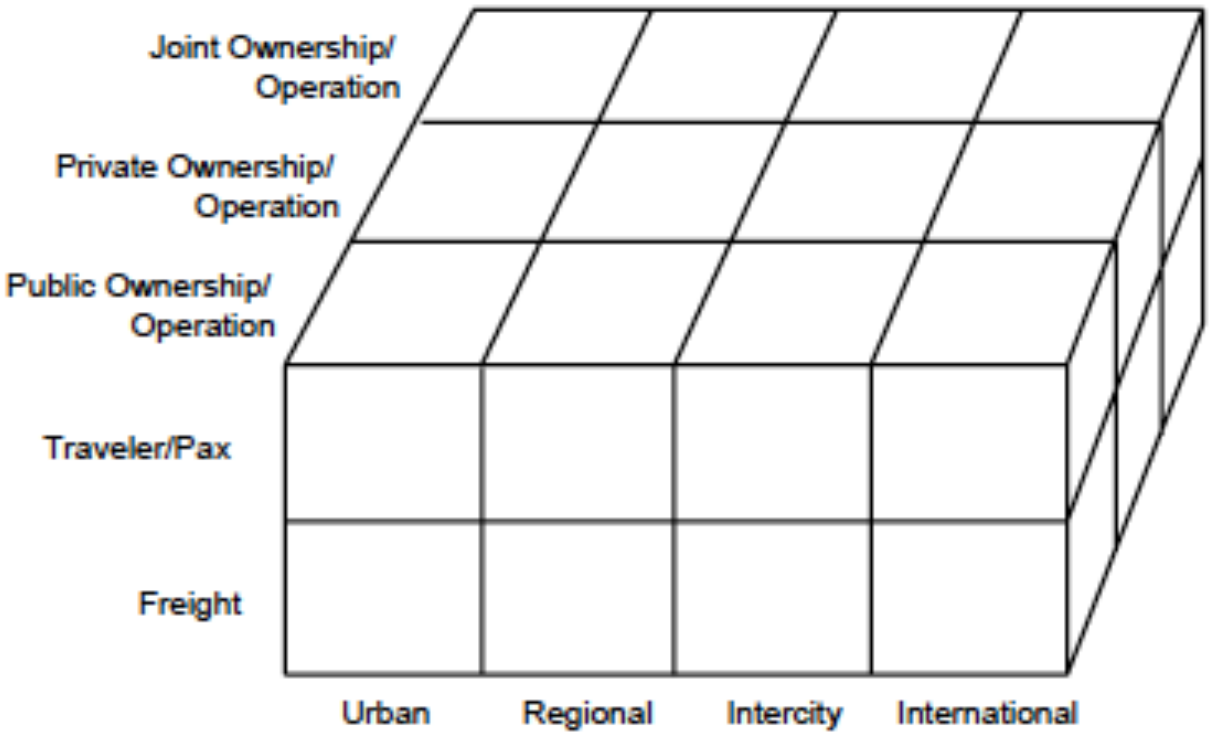
Driving Factors in Transportation Systems Design



Transportation Systems Characterization



HW1: paper review (see D2L)

- Review the paper entitled “Integrated Corridor Management for Urban Transport”
- Draw a systematic flowchart/diagram for planning, designing and implementing the Integrated Corridor Management project