

Rebuilding WTC

Design Process, Engineering Design Tools, Design Project 1

4013.315 Architectural Engineering System Design Mar. 11th, 2009



Moonseo Park
Associate Professor, PhD

395 433
Phone: 880-5848, Fax: 871-5518
E-mail: mspark@snu.ac.kr

Department of Architecture
College of Engineering
Seoul National University



What is Design

- Creation
- Synthesis *function + aesthetic + budget + needs
- No Unique Solution/Open Ended Problem
- Collaboration in a Team

4013.315 Architectural Engineering System Design Adopted from MIT Courseware 1.012, 2002

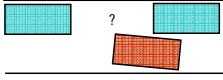
General Design Process

- Understand Problem
*Problem Formulation is as Important as Problem Solution
- Conceptual Design
- Embodiment Design
- Detail Design
- Prototype and Testing
- Completion (Implementation)

4013.315 Architectural Engineering System Design Adopted from MIT Courseware 1.012, 2002

Problem Identification

A parking problem



- The problem caused by
 - Road width?
 - Driving skill?
 - Driving mechanism?

4013.315 Architectural Engineering System Design Adopted from MIT Courseware 1.012, 2002

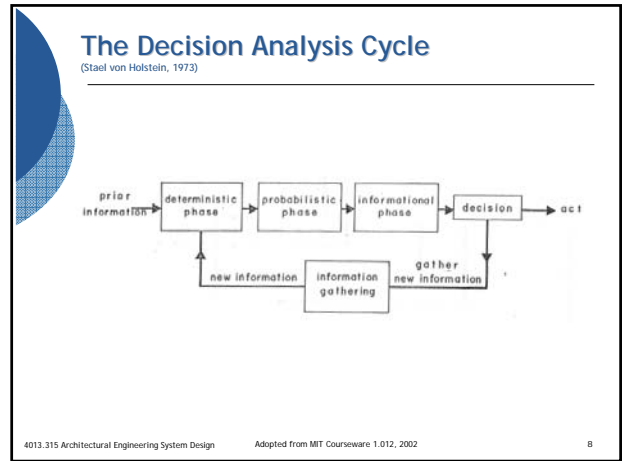
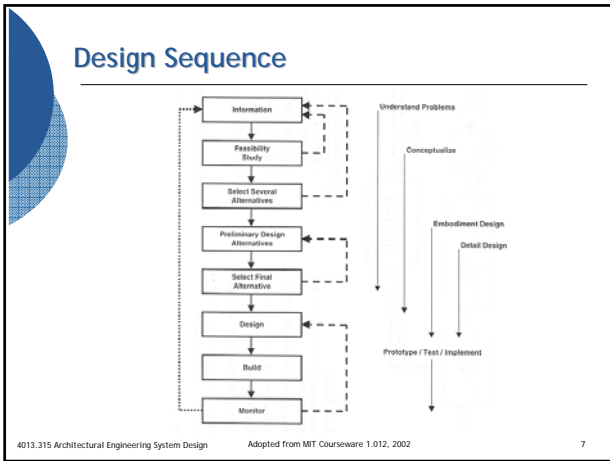
Parking Experts



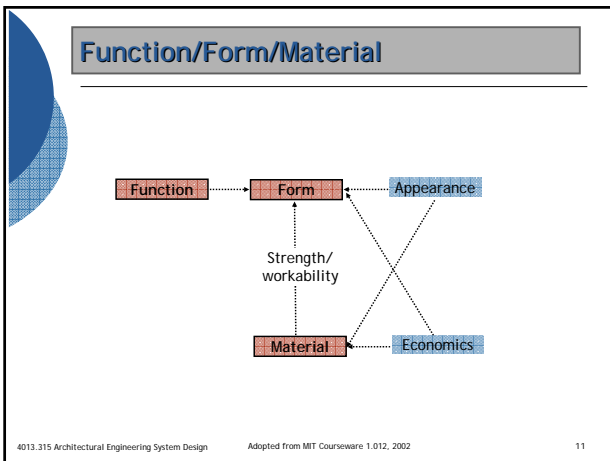
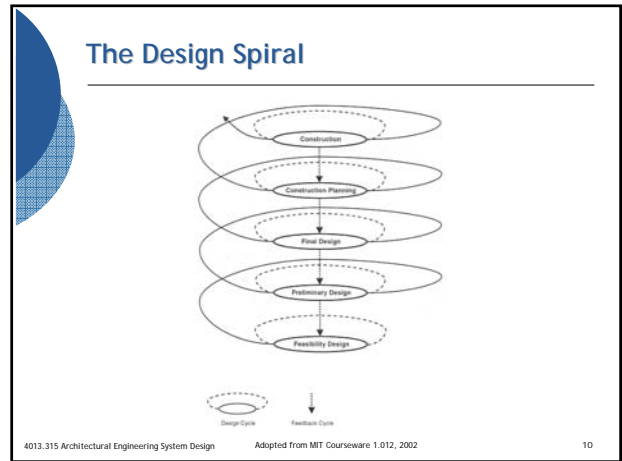
4013.315 Architectural Engineering System Design Adopted from MIT Courseware 1.012, 2002

Problem solving

4013.315 Architectural Engineering System Design Adopted from MIT Courseware 1.012, 2002



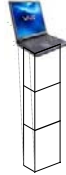
- ### The Decision Analysis Cycle
- (Stael von Holstein, 1973)
- | | |
|---|---|
| Deterministic Phase | Probabilistic Phase |
| 1. Define Problem and Limits of Investigation | 1. Express Uncertainty in Variables by Means of Probabilities |
| 2. Alternative Courses of Action | 2. Probabilistic Model |
| 3. Outcomes of Each Alternative | 3. Establish Relative Value of Probabilistic Outcomes |
| 4. Select Decision and State Variables | 4. Probabilistic Sensitivity Analysis |
| 5. Relate Outcomes and Variables | |
| 6. Time Preference | Information Phase |
| 7. Dominated Alternatives Eliminated | 1. Value of Perfect Information |
| 8. Sensitivity of Outcome to Variables | 2. Evaluate Various Information Collection Schemes |
- 4013.315 Architectural Engineering System Design Adopted from MIT Courseware 1.012, 2002 9



Task 1: Build as tall as possible!



Work performance criterion
Building height given the construction period, while satisfying the required stability (standing with your notebook computer on the top).



- Does the free form fulfill any function (which function)?
- Describe how you developed your building design.
- Say why you find the form attractive or not.
- Are form and function related in your design?
- What role do material properties play?
- If so, how?
- If you define a function first how does the form reflect it?
- Did the difference of materials play a role in your design regarding form, regarding function, regarding both?

Task 2: now work smart! Minimizing cost



Work performance criterion
Building height (should be stable) + Construction cost per floor

*Unit Cost

Wooden Chopstick	20 won
Plastic straw	10 won

Assignment (A1): Draw an influence diagram

Put yourself in the position of an AEC engineering system designer who wants to have a raw material (building blocks) that can be assembled in a variety of forms. This includes the contradictory requirements.

- Draw an *influence diagram* for your decision making process.

*An influence diagram shows the relation of different factors reflecting a process (manufacturing or construction) and is used as a basis for analyzing a process.

Due next week, PPT file.

References

- Avraham Shtub, Jonathan F. Bard, Shlomo Globerson, "Project management : engineering, technology, and implementation", Englewood Cliffs, NJ, Prentice Hall, 1994
- Frederick E. Gould, Nancy Joyce, Chapter 8, "Construction project management", Upper Saddle River, NJ, Prentice Hall, 1999
- James M. Lyneis, Kenneth G. Cooper, Sharon A. Els, "Strategic management of complex projects: a case study using system dynamics", System Dynamics Review, Vol. 17, No. 3, 2001
- Christopher M. Gordon, "Choosing appropriate construction contracting method", J. of Construction Engineering & Management, Vol. 120, No. 1, 1994
- Feniosky Pena-Mora, Jim Lyneis, "Project control and management", MIT 1.432J Lecture Material, 1998
- Barrie, D.S., and Paulson, B.C., "Professional Construction Management", McGraw Hill, 1992
- Halpin, D.W., "Financial and Cost concepts for construction management", John Wiley & Sons, 1995
- Yehiel Rosenfeld, "Project Management", MIT 1.401J Course Material, 2000
- Sarah Slaughter, "Innovation in construction", MIT 1.420 Course Material, 1999
- Gray and Hughes, "Building Design Management", .
- Murdoch and Hughes, "Construction Contracts: Law and Management", E&FN SPON, 1996
- Gray, Hughes and Bennett, "The Successful Management of Design", Reading, 1994