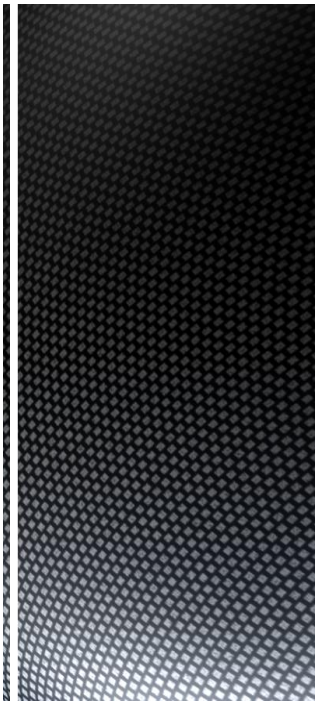


CIM (21-548)

Advanced Manufacturing Laboratory
Department of Industrial Engineering
Sharif University of Technology

Session # 7

Course Description

- *Instructor*
  - *Omid Fatahi Valilai, Ph.D. Industrial Engineering Department, Sharif University of Technology*
  - *Email: FValilai@sharif.edu , Tel: 6616-5706*
  - *Website: Sharif.edu/~fvalilai*
- *Class time*
  - *Sunday-Tuesday* *09:00-10:30*
- *Course evaluation*
  - *Mid-term* *(30%)*
  - *Final exam* *(50%)*
  - *Quiz* *(5%)*
  - *Exercise* *(15%)*

Course Description *(Continued ...)*

- *Mid-term session:*
  - *Sunday: 16th Azar 1393, 09:00 ~ 10:30*
- *Final Exam:*
  - *Tuesday: 30th Dey 1393, 15:00 ~ 17:30*
- *Reference:*
  - *Schaefer, D., Cloud-based Design and Manufacturing (CBDM): A Service-Oriented Product Development Paradigm for the 21st Century, . London: Springer, 2014*
  - *Koren, Y., "The Global Manufacturing Revolution", Wiley, 2010*
  - *Nasr, A., "Computer-Based Design and Manufacturing An Information-Based Approach",Springer, 2007*
  - *Mitchell, F.H., "CIM Systems: An Introduction to Computer-Integrated Manufacturing", Prentice Hall College Div; 1St Edition edition (January 1991), ISBN: 978-0131332997*

Course Description *(Continued..)*

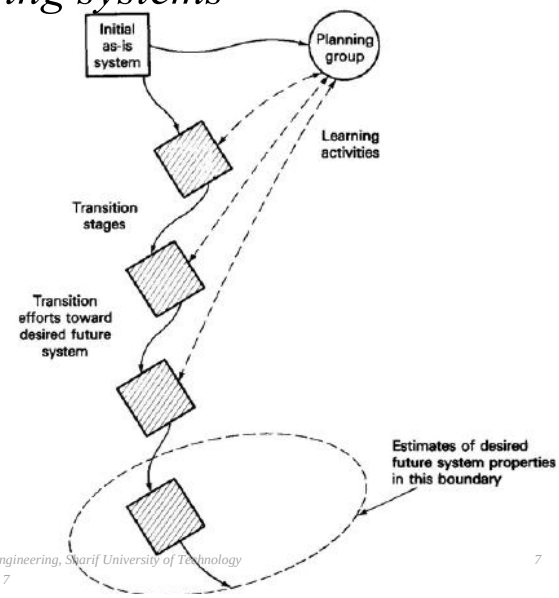
- *Contents:*
  - *Globalization and Manufacturing Paradigms* *(8 sessions)*
  - *System Concepts* *(3 sessions)*
  - *Evolution of Manufacturing systems* *(2 sessions)*
  - *Manufacturing System Design* *(4 sessions)*
  - *Manufacturing Equipment Design* *(3 sessions)*
  - *Information flow in Manufacturing Systems* *(4 sessions)*
  - *Product design and Manufacturing System* *(3 sessions)*
  - *Manufacturing System Implementation* *(5 sessions)*

Course Description *(Continued..)*

- *Contents:*
  - *Manufacturing System Design* *(4 sessions)*
    - *Problem definition*
    - *Computer Integrated Manufacturing*
    - *Design principles*
    - *A multi-layer model for study of design principles*
    - *Implementing system design concept*

Application to the manufacturing systems

- *Developing Models of Manufacturing Systems*
  - *Modeling based on heuristic basis:*
    - *It is often helpful to develop simple, intuitive models that describe the subsystem elements and the relationships among the elements.*
    - *This approach to visualizing problems has become a commonly applied method for gaining an understanding of complex systems.*
    - *A heuristic understanding "sets the stage" for exploration of the system to discover further information and insights.*

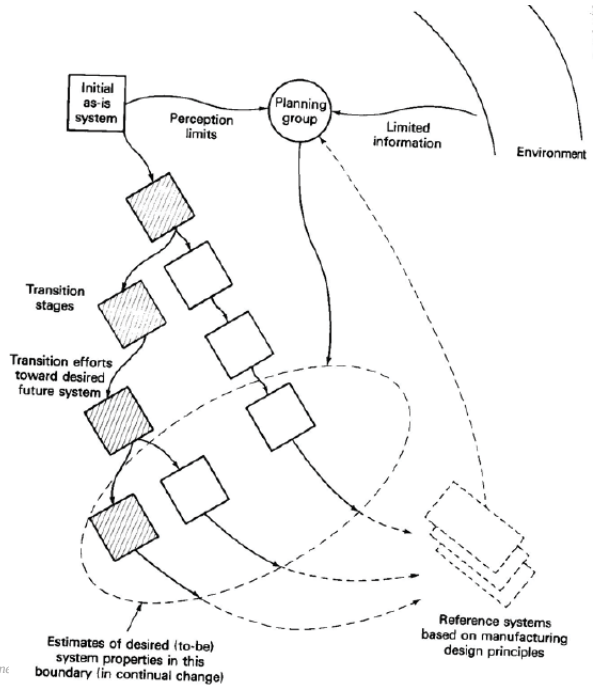


Manufacturing System Design

- *Problem definition and system approach*
  - *In order to achieve directed change within an organizational framework, the design or redesign of a manufacturing system requires the establishment of a planning group.*
  - *This planning group must act to collect information, evaluate alternatives, and make decisions with respect to the perceived choices.*
  - *To be effective, the group must be endorsed by the organizational leadership.*

Manufacturing System Design

- *Problem definition and system approach*



Manufacturing System Design

- *Problem definition and system approach*
  - *Using a heuristic visual model:*
  - *The planning group receives limited information regarding the present environment and even more limited estimates of probable future environments.*
  - *The environment is in constant change and can only be partly known.*
  - *The planning group also must develop a detailed understanding of the present (as-is) manufacturing system.*
    - *This understanding is limited by available information and the perception limits of the group's members.*

Manufacturing System Design

- *Problem definition and system approach*
  - *The planning group is assumed to have access to a set of manufacturing design principles that provide general guidance into the types of to-be system designs that have a reasonable likelihood of providing a competitive manufacturing system.*
  - *These principles may be used to produce idealized "reference system" configurations.*
    - *The reference systems typically do not reflect the many subtleties and dimensions of the "to-be" systems, nor the many trade-offs involved in system design, but they do represent limiting cases for selected features of a CIM-oriented system*

Manufacturing System Design

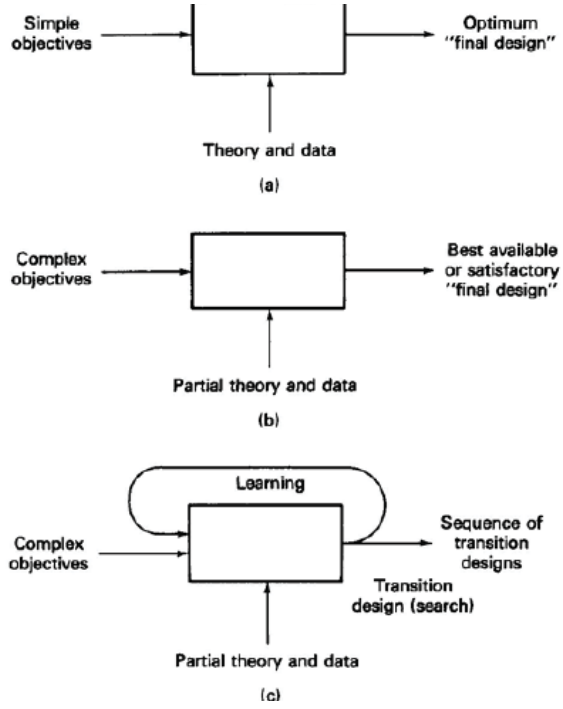
- *Problem definition and system approach*
  - *Since the environment and reference systems are consistently changing (due to new information and insights), and the as-is system is continually evolving, the preferred to-be system concepts will also change with time.*
  - *The desired future state for the system will not be fixed but will evolve in time. Thus it is reasonable to conclude that in many cases, the to-be system must be regarded as a temporary concept that will never be achieved.*
  - *Rather, the to-be system provides a direction for change and serves to specify or constrain the near-term transition stages.*

Manufacturing System Design

- *Problem definition and system approach*
  - *The resultant evolutionary pathway is likely to be a series of transition stages that become the bases for new evolutionary paths.*
  - *The definition of flexible, robust transition stages thus becomes a key element of the design process.*
    - *Each transition stage must be a stand alone, viable configuration that does not excessively limit future to-be system concepts.*
    - *It may often be necessary to use a transition stage as a starting point toward a revised final configuration that was not originally anticipated.*
  - *Major difficulties are thus encountered, since the planning group is working with a moving target.*

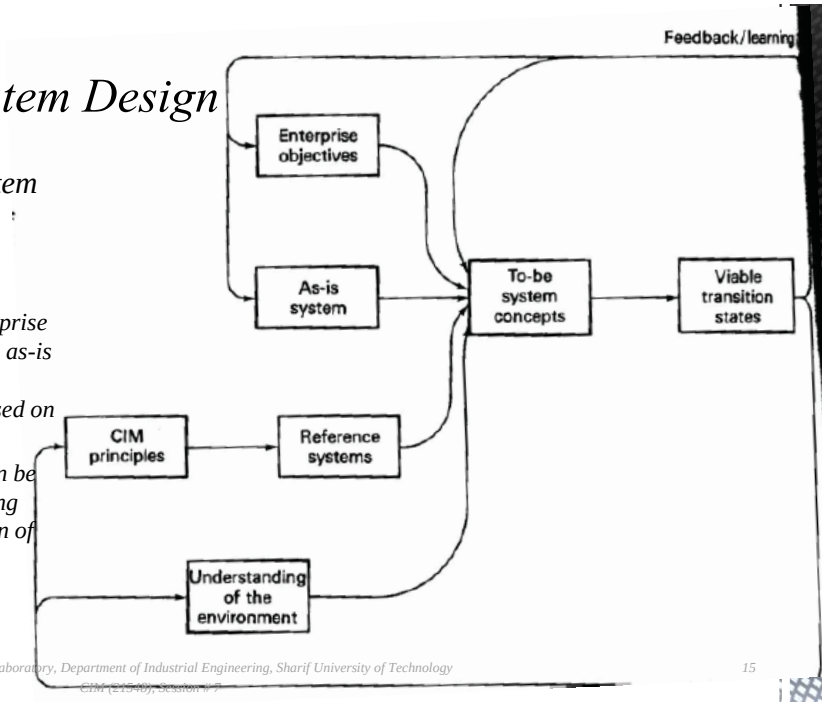
Manufacturing System Design

- *Problem definition and system approach*



Manufacturing System Design

- *Problem definition and system approach*
  - *Evolutionary growth cycle for a manufacturing system.*
  - *Information regarding the enterprise objectives and knowledge of the as-is system is merged with insights regarding reference systems based on CIM principles*
  - *Viable transition states may then be developed, and feedback/learning will take place to drive evolution of the transition states.*



Manufacturing System Design

- *Problem definition and system approach*
  - *Manufacturing system design thus cannot be approached as a static, linear endeavor with a unique, fixed, optimum solution.*
  - *Rather, due to constant change and adaptation, the system follows a sequence of trial solutions.*
  - *System design must be approached as an evolutionary learning process that enables continuous adaptation to a changing environment.*
  - *The design objective must be a gradual system evolution using robust, flexible transition stages*