

## *CIM (21-548)*

*Advanced Manufacturing Laboratory  
Department of Industrial Engineering  
Sharif University of Technology*

*Session # 4*



## *Course Description*

- *Instructor*
  - *Omid Fatahi Valilai, Ph.D. Industrial Engineering Department, Sharif University of Technology*
  - *Email: [FValilai@sharif.edu](mailto:FValilai@sharif.edu), Tel: 6616-5706*
  - *Website: [Sharif.edu/~fvalilai](http://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: 16<sup>th</sup> Azar 1393, 09:00 ~ 10:30
- **Final Exam:**
  - Tuesday: 30<sup>th</sup> 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

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## 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)

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## *Course Description (Continued..)*

### ▪ *Contents:*

- *System Concepts*
- *Open System Concepts*
  
- *Application to the manufacturing systems*
  
- *Developing models of manufacturing systems*

*(3 sessions)*

## *System Concepts*

- *The Global manufacturing revolution*
  - *Manufacturing organizations are faced with the need to optimize the way in which they function in order to achieve the best possible performance within necessary constraints.*
  
  - *Many of the efforts in this direction are being carried forth under the banner of  
Computer-Integrated Manufacturing (CIM).*
  
  - *CIM is not a product that can be purchased and installed.*
    - *CIM is a way of thinking about and solving problems.*
    - *The emphasis is on understanding how to create effective manufacturing enterprises.*

## System Concepts

- *The CIM revolution*
  - *In most systems of interest, the system design will require an integrated information flow, which, in turn, depends on computer networks, thus giving rise to the CIM label.*
  - *However, these aspects of system design are typically a necessary but not sufficient contribution toward satisfying performance objectives.*
  - *There are many other important concerns.*
    - *The overall system must be rationalized, requiring that the work flow, organizational structure, and management methods must be redesigned to obtain performance objectives.*
    - *The entire meaning of product design must be assessed and modified as necessary to optimize system performance.*
    - *The most appropriate use of technology can then be selected within this context.*

## System Concepts

- *The CIM revolution*
  - *CIM is thus taken here to involve the design or redesign of an entire manufacturing enterprise in which all aspects of the system work together effectively.*
  - *In most cases of interest,*
    - *Integrated information flow,*
    - *The widespread application of computers, and*
    - *High levels of automation result from such design efforts.*

## System Concepts

- *The CIM revolution*
  - *The advantages of conversion to CIM-oriented operations for five companies were found as:*
    - *Reduction in engineering design cost* 25-30 percent
    - *Reduction in overall lead time* 30-60 percent
    - *Increase in product quality* 2-5 times
    - *Increase in capability of engineers* 3-35 times
    - *Increase in productivity of production operations* 40-70 percent
    - *Increase in productivity of capital equipment* 2-3 times
    - *Reduction in work-in-progress* 30-60 percent
    - *Reduction in personnel costs* 5-20 percent

## System Concepts

- *The CIM revolution*
  - *A typical manufacturing enterprise is a complex organization that depends on and interacts with a wide range of external organizations and activities.*
  - *Thus, managers of such enterprises are faced with difficult problem-solving situations as they attempt to optimize performance.*
  - *In order to solve a problem, it is necessary to develop a description or model of the features of the problem and to engage in activity that will produce a solution.*

## System Concepts

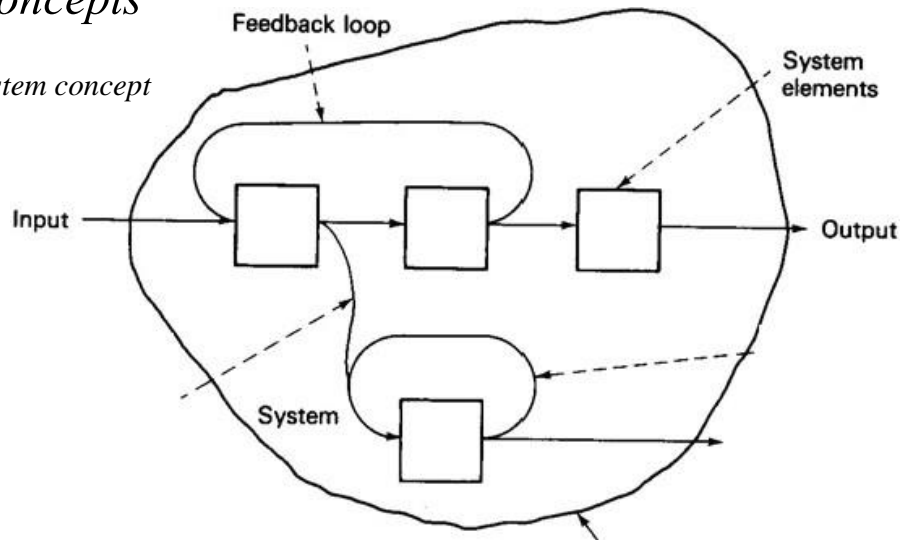
- *The open system concept*
  - *In order to frame the nature of the problems facing enterprise managers, it is useful to draw on open system concepts for insight into the problem at hand.*
  - *The open system approach to understanding can provide concepts and definitions that will be useful throughout the problem-solving effort.*
  - *The manufacturing enterprise of interest is considered to be an open system. The enterprise is assumed to function in an environment.*
  - *The manufacturing system and the environment interact together in many complex relationships.*

## System Concepts

- *The open system concept*
  - *Open system theory emphasizes the close relationships between a system and its supporting environment*
  - *A system is considered to consist of building-block elements or subsystems.*
  - *The elements can be described in terms of attributes or characteristics.*
  - *The elements are related to one another through these attributes.*
  - *The structure and function of the system depend on these relationships.*
  - *The system engages in purposeful activity. The goals and objectives of the system motivate system function .*
  - *The system takes in information to support decision making and provides information to the environment.*
  - *The relationships among elements typically involve feedback loops.*
  - *The system-environment interactions produce feedback loops in which the system acts on the environment, changing the ways in which the environment acts on the system.*

## System Concepts

- *The open system concept*



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## System Concepts

- *The open system concept*

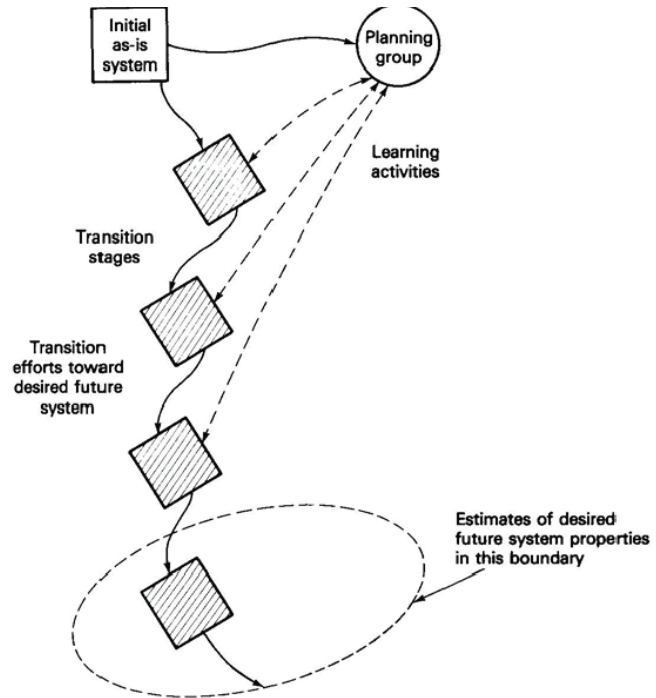
- *Based on the open system paradigm and on an understanding of realistic system modeling complexity, the following approach to problem solving can be developed:*
- *Study the system and environment to learn as much as possible.*
- *Use limited-scope modeling wherever helpful to understand the present system and environment.*
- *Estimate the future attribute boundaries that will likely be associated with competitive enterprises.*
- *Draw conclusions regarding the desirable characteristics of the specific enterprise.*
- *Plan a sequence of transition steps with learning activities.*
- *Conduct the transition steps with a cycle of try-evaluate-learn repeated over and over.*

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## System Concepts

- *The open system concept*



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## Exercise: CM:I:01

- *The open system concept*

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## Systems Theory Approach to Conducting Industrial Marketing Research

Earl Naumann  
Douglas J. Lincoln  
*Boise State University*

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