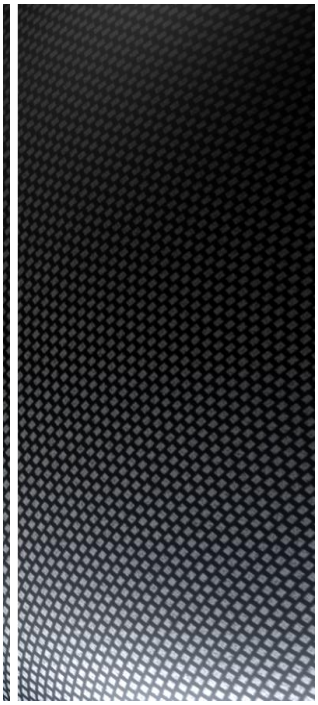


CIM (21-548)

Advanced Manufacturing Laboratory
Department of Industrial Engineering
Sharif University of Technology

Session # 6

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..)*

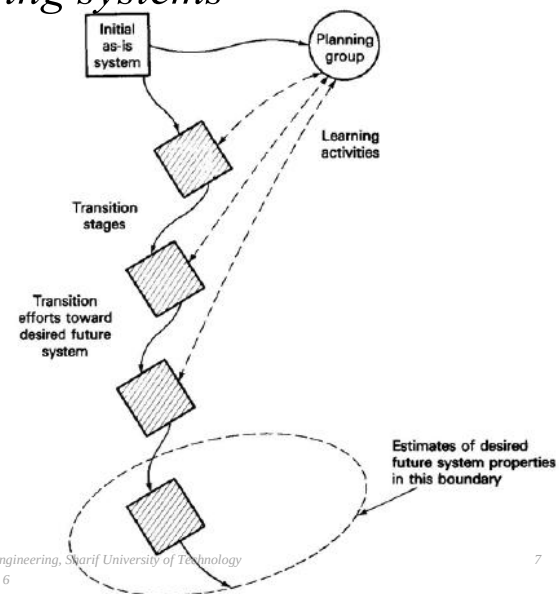
- *Contents:*
  - *Globalization and Manufacturing Paradigms* *(8 sessions)*
  - *System Concepts* *(3 sessions)*
  - *Evolution of Manufacturing systems* *(2 sessions)*
  - *Manufacturing System Design* *(4 sessions)*
  - *Manufacturing Equipment Design* *(3 sessions)*
  - *Information flow in Manufacturing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

Course Description *(Continued..)*

- *Contents:*
  - *System Concepts* *(3 sessions)*
    - *Open System Concepts*
    - *Application to the manufacturing systems*
    - *Developing models of manufacturing systems*

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.*



Developing models of manufacturing systems

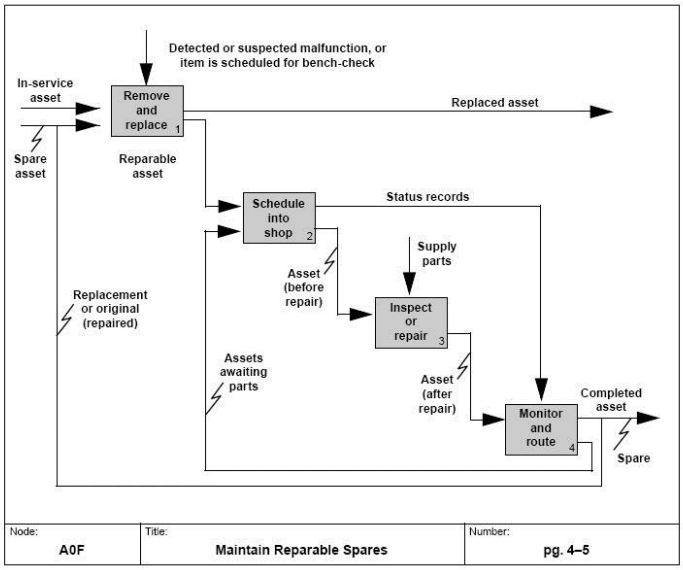
- *Application of a design IDEF model to a manufacturing system*
  - *A manufacturing system is described by IDEF in terms of functions (represented by boxes) and relationships (represented by arrows).*
  - *The top level of the model provides a general overview of the system, and the lower levels describe the subdivisions of the system.*
  - *A major advantage of this design tool is that inputs and outputs of higher layers are passed down as the IDEF model is extended in further detail.*

Developing models of manufacturing systems

- *Application of a design IDEF model to a manufacturing system*
  - *IDEF as a family of modeling languages, covers a wide range of uses, from functional modeling to data, simulation, object-oriented analysis/design and knowledge acquisition.*
  - *Eventually the IDEF methods have been defined up to IDEF14:*
    - *IDEF0 : Function modeling*
    - *IDEF1 : Information Modeling*
    - *IDEF1X : Data Modeling*
    - *IDEF2 : Simulation Model Design*
    - *IDEF3 : Process Description Capture*
    - *IDEF4 : Object-Oriented Design*
    - *IDEF5 : Ontology Description Capture*
    - *IDEF6 : Design Rationale Capture*
    - *IDEF7 : Information System Auditing*
    - *IDEF8 : User Interface Modeling*
    - *IDEF9 : Business Constraint Discovery*
    - *IDEF10 : Implementation Architecture Modeling*
    - *IDEF11 : Information Artifact Modeling*
    - *IDEF12 : Organization Modeling*
    - *IDEF13 : Three Schema Mapping Design*
    - *IDEF14 : Network Design*

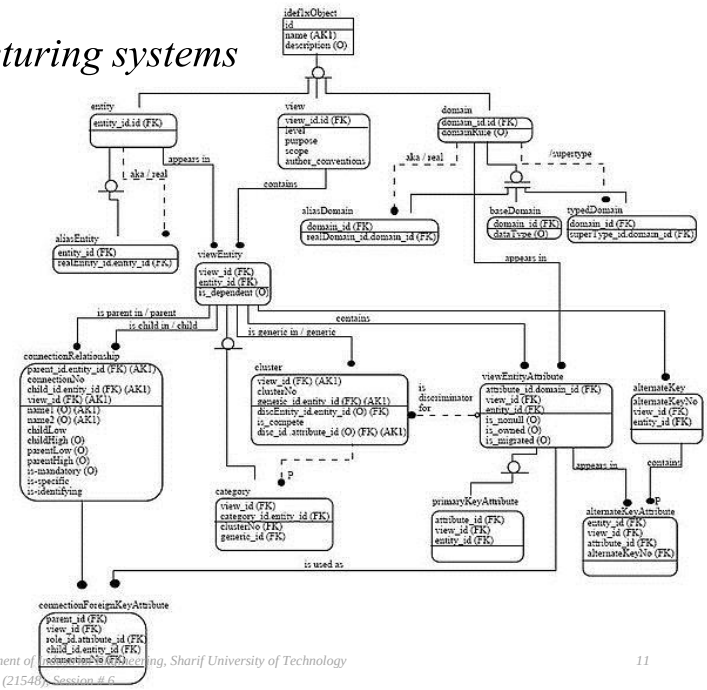
Developing models of manufacturing systems

- *Application of a design IDEF model to a manufacturing system*
  - *IDEF0 : Function modeling*



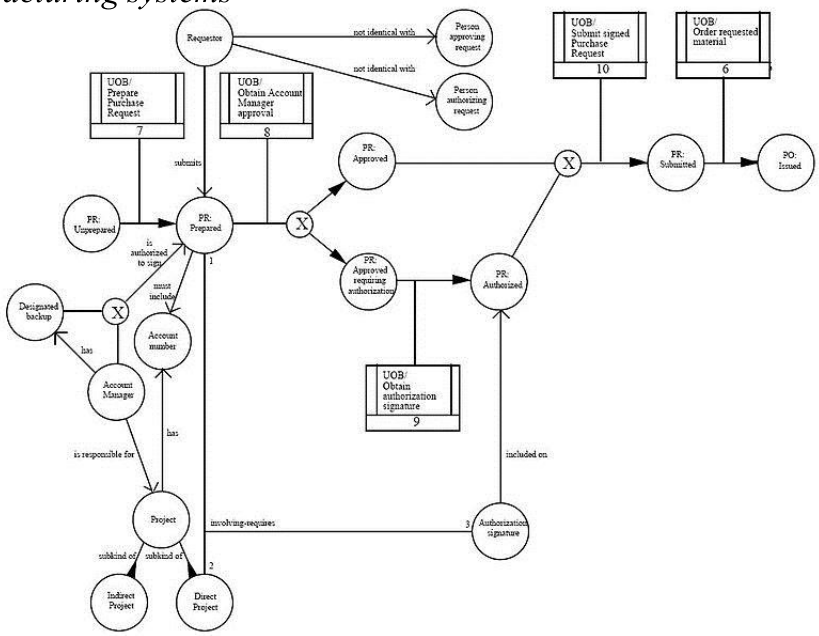
Developing models of manufacturing systems

- *Application of a design IDEF model to a manufacturing system*
  - *IDEF1 : Information Modeling*
  - *IDEF1X : Data Modeling*



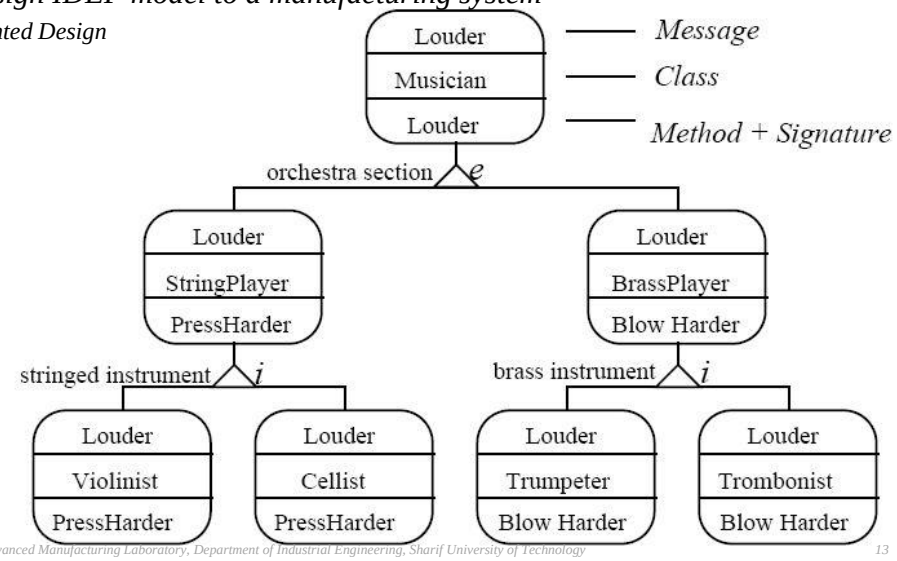
Developing models of manufacturing systems

- *Application of a design IDEF model to a manufacturing system*
  - *IDEF2 : Simulation Model Design*
  - *IDEF3 : Process Description Capture*



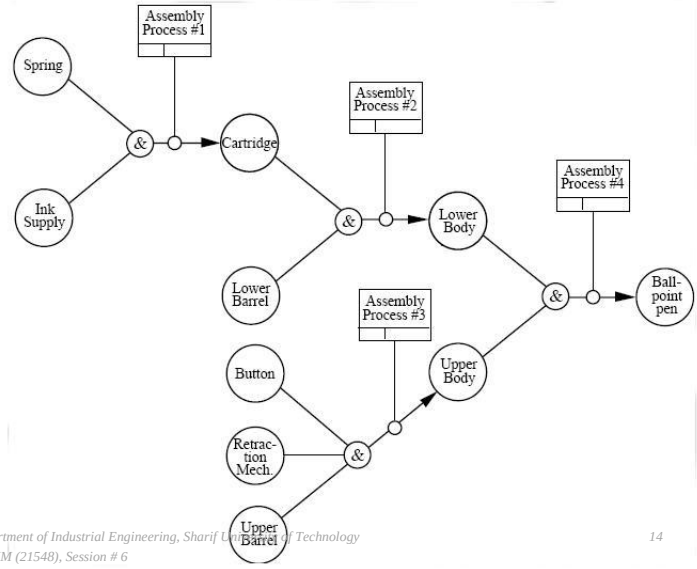
Developing models of manufacturing systems

- *Application of a design IDEF model to a manufacturing system*
  - *IDEF4 : Object-Oriented Design*



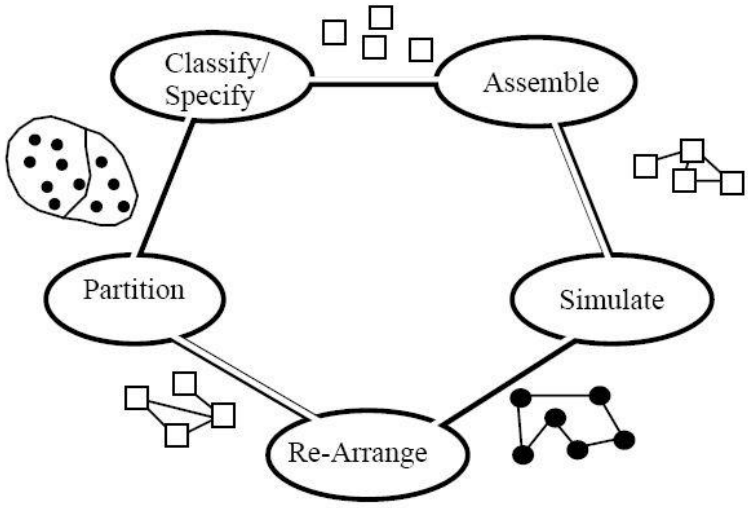
Developing models of manufacturing systems

- *Application of a design IDEF model to a manufacturing system*
  - *IDEF5 : Ontology Description Capture*



Developing models of manufacturing systems

- *Application of a design IDEF model to a manufacturing system*
  - *IDEF6 : Design Rationale Capture*



Exercise: CM:I:04

- *Developing Models of Manufacturing Systems*

Pergamon

Computers ind. Engng Vol. 29, No. 1–4, pp. 467–471, 1995

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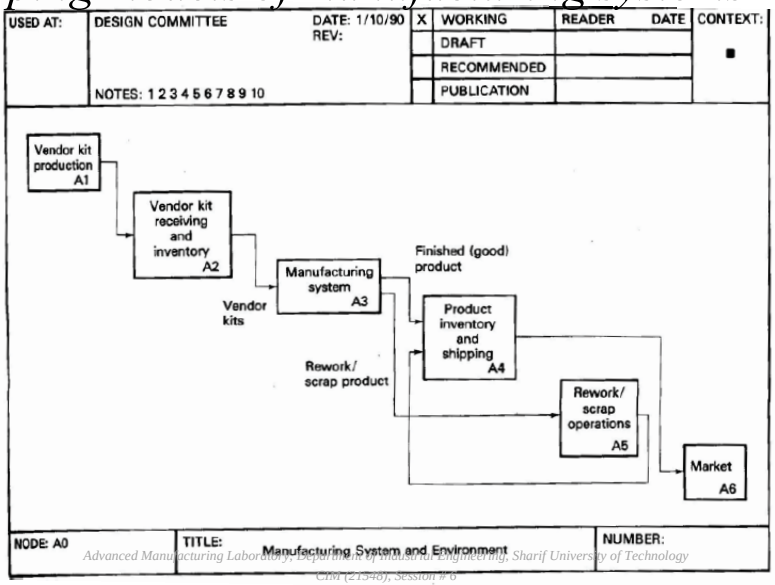
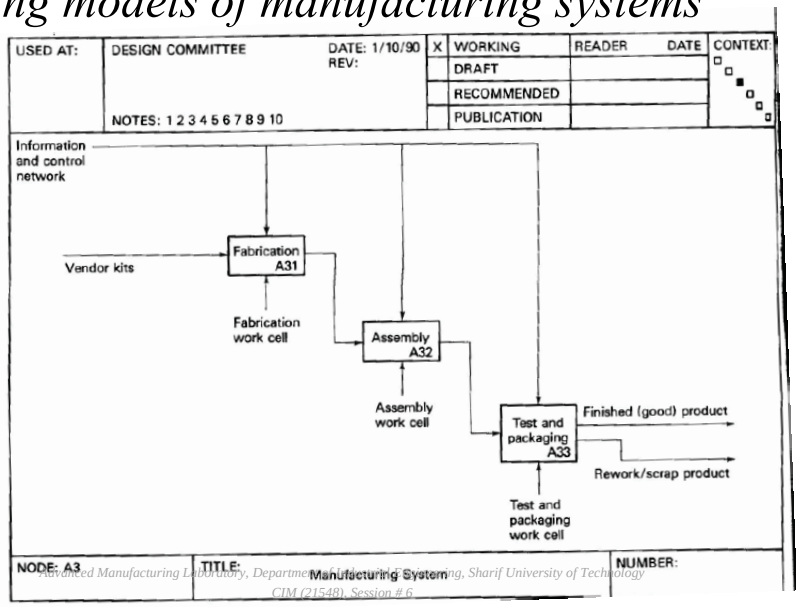
Implementing IDEF Techniques as Simulation Modelling Specifications

Antonie van Rensburg Nico Zwemstra

Developing models of manufacturing systems



Developing models of manufacturing systems



Exercise: CM:I:05

- *Developing Models of Manufacturing Systems*

Journal of Manufacturing Systems
Volume 11/No. 6

An Integrated Framework for Enterprise Modeling

Rajeev Malhotra and **Sundaresan Jayaraman**, Georgia Institute of Technology, Atlanta, GA

Abstract

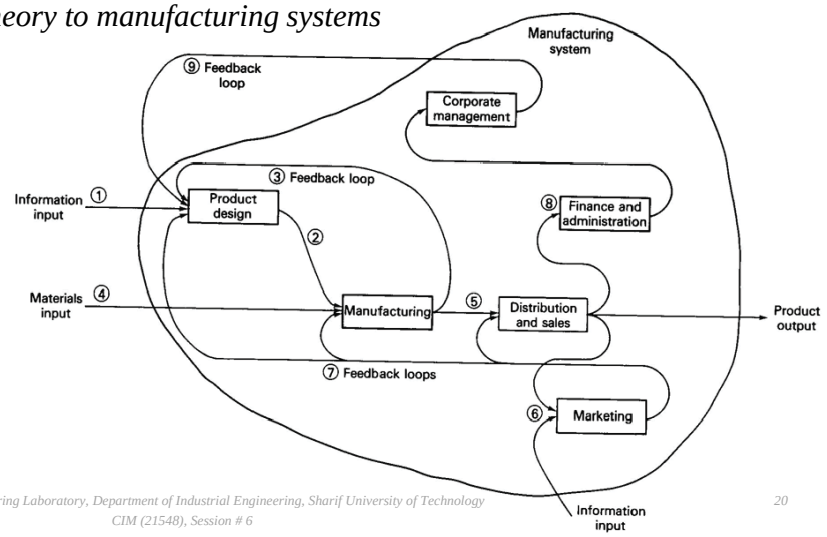
The IDEF modeling methodology of the US Air Force's integrated computer aided manufacturing (ICAM) program is a powerful tool for analysis, specification and design of integrated manufacturing systems. IDEF consists of methods for modeling the function structure, the data needed to support the functions, and the dynamic behavior of functions of a manufacturing enterprise. The resulting function, information, and dynamics models provide three distinct but complementary views of the system being modeled. A major deficiency of IDEF is the lack of cohesion between the three views whereby a single consistent description of the system is difficult to obtain, especially when the modeled domain is large and complex. Among its other limitations are difficulty in capturing the semantics of real-world systems in the information model, and a dynamics-modeling language unsuitable for modeling flexible manufacturing systems.

In this paper, we propose an integrated framework for enterprise modeling (IFEM) that extends the IDEF methodology to include methods that overcome the above-mentioned shortcomings of IDEF. The use of IFEM and its advantages over IDEF are illustrated using examples from a reference architecture developed for a computer-integrated apparel manufacturing enterprise.

Keywords: *Enterprise Modeling, Function Modeling, Data Modeling, IDEF Methodology, Computer-integrated Manufacturing (CIM), Relational Data Model*

Developing models of manufacturing systems

- *Applying Open system theory to manufacturing systems*



Exercise: CM:I:06

- *Developing Models of Manufacturing Systems*

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An integrated modelling framework to support manufacturing system diagnosis for continuous improvement

J.C. Hernandez-Matias*, A. Vizan, J. Perez-Garcia, J. Rios

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