Product Planning & Development (21-423)
Advanced Manufacturing Laboratory
Department of Industrial Engineering
Sharif University of Technology

Session #4

Course Description

- **Instructor**
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- **Recommended prerequisite**
  - Manufacturing process I (21-418)

- **Class time**
  - Sunday-Tuesday 18:00-19:30

- **Course evaluation**
  - Mid-term (25%)
  - Final exam (40%)
  - Quiz (5%)
  - Exercise (Manufacturing Lab.) (30%)
Course Description (Continued...)

- **Mid-term session:**
  - **Wednesday:** 9th Ordibehesht 1394, 16:30 ~ 18:30
- **Final Exam:**
  - **Monday:** 1st Tir 1394, 09:00 ~ 11:30
- **Reference:**

Course Description (Continued...)

- **Contents:**
  - Product development in the changing Global world
  - Stages of Product Development
  - The Structure of the Product Design Process
  - Early design: Requirement definition and conceptual Design
  - Trade-off analyses: Optimization using cost and utility Metrics
  - Detailed design: Analysis and Modeling
  - Design Review: Designing to Ensure Quality
  - Production System: Strategies, planning, and methodologies
  - Production System Development
  - Planning and Preparation for Efficient Development
  - Supply chain: Logistics, packaging, supply chain, and the environment
The Structure of the Product Design Process

* Early Design:
  * Requirement definition and conceptual design

"A manager wants to find and fix software faults (i.e., bugs) more quickly. He offers an incentive plan: $20 for each bug the quality people find and $20 for each bug the programmers fix. These are the same programmers who created the bugs! As a result, an underground development in "bugs" sprung up instantly. The plan was rethought after one employee earned $1,700 in the first week"! (Wall Street Journal, 1995)

* The key is to design without mistakes, not to spend time and money correcting the mistakes.
The Structure of the Product Design Process

- Early Design:
  - Requirement definition and conceptual design

The keys to successful product development are to know the customer's current and future needs and to provide a product that meets these needs at a competitive cost.

- Customers needs, technology, economy and the competition are always evolving and changing

- Management's task is to provide a creative environment of adequate resources and leadership to make it happen. For long-term survival of a company this must be a continuous process.

- Early Design:
  - Requirement definition and conceptual design

- Requirement definition is an evolutionary process of identifying, defining, and documenting specific customer needs to develop product requirements for a new product, system, or process.

- It focuses on “what needs to be done” and is the first phase in product development

- It directs attention to critical customer, design, technology, manufacturing, vendor and support needs both within and outside the company.
The Structure of the Product Design Process

- **Early Design:**
  - Requirement definition and conceptual design
  - Conceptual design is a systematic analytical process used to
    - Identify several design approaches (i.e., alternatives) that could meet the defined product requirements,
    - Perform trade-off analyses to select the best design approach to be used, and
    - Transforms the product requirements into detailed lower level design requirements based on the selected approach.
  - It focuses on “how to get it done” and begins when a need for a new product is defined and continues until a detailed design approach has been selected that can successfully meet all requirements.

The Structure of the Product Design Process

- **Early Design:**
  - A systematic evolutionary requirement definition process
  - Customer needs analysis
  - Product use and user profiles
  - Technological capability forecasts
  - Benchmarking and company capability
  - Prototyping, virtual reality and House of Quality

- **Conceptual Design Process**
  - Collaborative multidisciplinary process
  - Identify all possible design alternatives
  - Extensive trade-off studies
  - Design Requirements
  - Documentations
The Structure of the Product Design Process

- Early Design:
  - Requirement definition
- Common pitfalls:
  - The first is that a specific solution (e.g., technology, resolution, bandwidth, or part types) is determined too early before conceptual design and trade-off studies have been performed
  - The second is that product requirement must be extremely innovative
  - The third is that requirements can be stated in general terms
  - The fourth is the common temptation to accept customer, marketing, or a consultant’s suggestions as the only and final input

- Early Design:
  - Requirement definition
- Common pitfalls:
  - The fifth pitfall may appear when the problem statement is continuously changing.
  - The sixth pitfall is when the product’s requirements become too complex and detailed
  - The seventh and final pitfall is trying to develop only one set of requirements for all customer
The Structure of the Product Design Process

- Early Design:
  - Requirement definition
  - Customer needs analysis
    - Need, want, desire or innovation are fundamental to all acquisitions or purchases.
    - Need is typically a specific deficiency or lack of something in a current product.
    - Deficiency is an opportunity for improving performance, cost, reliability, producibility, human factors, or a combination of these.
    - Desire is something someone wishes or longs for.
    - Innovation is something new that the customer never thought about before the product became available.

The Structure of the Product Design Process

- Early Design:
  - Requirement definition
  - Customer needs analysis
The Structure of the Product Design Process

- Early Design:
  - Requirement definition
  - Customer needs analysis