

13. Product Design and Development

Product Design and Development is the efficient and effective generation and development of ideas through a process that leads to new products. From an industrial engineering knowledge view, it is the processes and analysis employed supporting efficient decision-making during Product Design and Development.

13.1. Design Process

- 13.1.1. State of the art
- 13.1.2. Identify need
- 13.1.3. Conceptualization
- 13.1.4. Feasibility analysis
- 13.1.5. Production
- 13.1.6. Product life cycle

13.2. Design Process Steps

- 13.2.1. Business strategy
- 13.2.2. Identification of need
 - 13.2.2.1. Technology development
 - 13.2.2.2. Proposal
 - 13.2.2.3. Capture
- 13.2.3. Definition of a problem
 - 13.2.3.1. Statement of requirements
- 13.2.4. Gathering of information and data
- 13.2.5. Benchmarking
 - 13.2.5.1. Competitive intelligence
 - 13.2.5.2. Intellectual property
- 13.2.6. Conceptualization
- 13.2.7. Evaluation
 - 13.2.7.1. Analysis of design
 - 13.2.7.2. Decision making
 - 13.2.7.3. Trade studies
 - 13.2.7.3.1. Weighing and judging
 - 13.2.7.3.2. Quality function deployment (QFD)
- 13.2.8. Communication of the design

13.3. Design Project

- 13.3.1. Gating process
- 13.3.2. Feasibility study
- 13.3.3. Preliminary design
 - 13.3.3.1. Internal interfaces
 - 13.3.3.2. External interfaces
- 13.3.4. Detailed design
- 13.3.5. Verification and Test
 - 13.3.5.1. Demonstration builds

- 13.3.5.2. Systems test
- 13.3.5.3. Operational test
- 13.3.5.4. Audits
- 13.3.6. Planning for manufacture/production
 - 13.3.6.1. Factory planning
 - 13.3.6.2. Supply chain
- 13.3.7. Planning for distribution
- 13.3.8. Planning for use
- 13.3.9. Operations and support
- 13.3.10. Planning for retirement

- 13.4. Economic Decision-Making/Cost Evaluation**
 - 13.4.1. Life cycle analysis

- 13.5. Planning and Scheduling**
 - 13.5.1. Planning for manufacturing
 - 13.5.2. Project planning

- 13.6. Risk and Opportunity Management**

- 13.7. Metrics for Design and Development**

- 13.8. Program Leadership, Management, and Control**
 - 13.8.1. Project start-up
 - 13.8.2. Plans/schedules

- 13.9. Design for Manufacturability**
 - 13.9.1. How manufacturability can influence design
 - 13.9.2. Methods and procedures for production activity
 - 13.9.3. Work instruction/documentation for production
 - 13.9.4. Manufacturing process optimization

- 13.10. Design for Cost**

- 13.11. Design for Six Sigma**
 - 13.11.1. I2DOV process
 - 13.11.1.1. Invent
 - 13.11.1.2. Innovate
 - 13.11.1.3. Develop
 - 13.11.1.4. Optimize
 - 13.11.1.5. Verify
 - 13.11.2. CDOV process
 - 13.11.2.1. Concept design
 - 13.11.2.2. Design development
 - 13.11.2.3. Optimize
 - 13.11.2.4. Verify

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