UNIT II

PRODUCT DESIGN AND LIFE CYCLE MANAGEMENT-EARLY DESIGN

EARLY DESIGN

IMPORTANT DEFINITIONS

REQUIREMENT DEFINITION

- 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 but sometimes requires updating as changes occur in the market and technology.
- This activity focuses on "what is needed" to be successful not on "how to" design the product.

CONCEPTUAL DESIGN

- A systematic analytical process used to

1)identify several design approaches (i.e., alternatives) that could meet the defined product requirements,

2) perform trade-off analyses to select the best design approach to be used, and

3) 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.
- In addition, it determines detailed design goals and requirements, allocates them to the lowest levels needed and then finalizes them during this phase.

BEST PRACTICES FOR EARLY DESIGN

REQUIREMENT DEFINITION PROCESS

(i) Customer needs analysis
(ii) Product use and user profiles
(iii) Technological capability forecasts
(iv) Benchmarking and company compatibility
(v) Prototyping, virtual reality and house of quality

CONCEPTUAL DESIGN PROCESS

(i) Collaborative multidisciplinary process
(ii) Identify all possible design alternatives
(iii) Extensive trade-off studies
(iv) Design requirements
(v) Documentation

CUSTOMER NEEDS ANALYSIS

- Interviews of customers
- Design partnerships or alliances
- Computer databases and data mining
- Consultants or experts
- Brainstorming sessions
- Personal and company experience
- Published information
- Market and competitor benchmark analysis
- Prototyping and virtual reality
- House of quality or Quality Function Deployment

PRODUCT USE AND USER PROFILES

- **Product use and user profiles document on a time scale, all the functions that a product and the user must perform, including the various environments that the system will encounter.**
- **Profiles provide the operational, maintenance, and environmental baseline for the definition of design requirements.**
- **Profile methods include:**

1. Scenarios and use cases: step-by-step descriptions of how the product will be used for a particular application or task.

2. Task analysis and user profile - design technique that evaluates specific task requirements for an operator with respect to an operator's capabilities. Breaks down major tasks into detailed descriptions. The level of details and requirements for each task will progressively become more detailed as the design process progresses.

3. Network diagrams-used to graphically show the interrelationships and sequential flow of how the product will be used and supported. Traditional structured analyses may also be used to identify process flows, events and conditions, and entities in legacy system documentation.

4. Product use, mission or environmental profiles - These profiles should include both environmental and functional conditions.

An environmental profile shows on a time scale the significant environmental parameters, including their levels and duration that are expected to occur during the life of the product.

It defines the total envelope of environments in which the product must perform, including conditions of storage, handling, transportation, and operational use.

References

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3. Thomas A. Sabomone, (1995), What every engineer should know about concurrent engineering, Marcel Dekker Publications, ISBN- 978-0-824-79578-8.

Thank you