UNIT II

PRODUCT DESIGN AND LIFE CYCLE MANAGEMENT-EARLY DESIGN

EARLY DESIGN

CONCEPTUAL DESIGN PROCESS

- The conceptual design process

(1) identifies all design approaches (i.e., alternatives) that could meet the defined requirements,

(2) performs trade-off analyses to select the best design approach to be used and

(3) transforms the product requirements into lower level design requirements based on the selected approach.

- It begins when a new product is defined in the requirement definition process and continues until the final design approach has been identified.
- Requirements are allocated down to the lowest levels needed and documented during this process.
- This is the phase where the size of the design team will grow.

(1) Identify all design approach and alternatives

- The first step is to start identifying potential design solutions to be used in trade-off analyses.
- Many people are involved in this collaborative effort to insure all possible options are considered. Creativity and innovation must be encouraged not only for design but also manufacturing, logistics and other areas.
- Identifying alternatives are often performed in "brainstorming" sessions.
- Design is about anticipation. The team anticipates new technologies and styling trends to envision how they might be translated into a good-looking, useful, easy-to-use and desired products. The team also anticipates styling and social changes and identities new customer need and desires as a result of those changes

(2) Extensive Trade-off Analyses

- The next step of conceptual design consists of evaluating each of the identified design approaches.
- Examine alternative design approaches and different parameters with the purpose of optimizing the overall performance of the system and reducing technical risk. This includes both innovative and Traditional approaches.
- A trade study is a formal decision-making method that can be used to solve many complex problems.
- Trade studies (also called trade off studies or analyses) are used to rank user needs in order of importance, develop cost models, and identify realistic configurations that meet mission needs. That information then helps highlight producible, testable and maintainable configurations with quality, cost, and reliability at the required levels.

- Trade-off studies are directed at finding a proper balance between the many demands on a design. The trade-off studies should include all-important parameters such as cost, schedule, technical risk, reliability, producibility, quality, and supportability.
- Utility metrics can be also used to quantify the different alternatives. The steps in trade-off studies are to:

1. Form a cross-functional team. The team may be completely independent group, with augmentation by functional experts.
2. Encourage customer involvement and innovation.
3. Define the objectives of the trade study alternatives.
4. Determine the approach and resources required.
5. Evaluate and select the preferred alternative.
6. Validate the study results through testing and/or simulation.
7. Iterate more detailed trade studies throughout the design process and Document the study and results.

(3) Developing and allocating Design Requirements

- Since these design requirements will provide the Performance baseline for each design team member they should be:

1. Easy to understand
2. Realistic
3. Detailed and measurable for the selected design approach.

- Important method of communication and provide the foundation for the design effort. It is used to develop program organization, funding, partnerships, and guidelines (including part selection, producibility, and reliability).
- Design goals and requirements should be sufficient in detail to:

- Communicate essential requirements to all the members of the design team including vendors.
- Permit complete technical control of the design process in all aspects of the program.
- Minimize loss of continuity resulting from personnel changes.
- Provide a quantified baseline for design trade-offs, design reviews and measurement of technical progress.
- Provide quantified testable requirements for test and evaluation.

➢ Design team must ensure that the stated requirements are reasonable and appropriate for the end user and within the limits of existing technology or that the technology could be developed.

IMPORTANT DEFINITIONS

TRADE-OFF STUDIES

- Design trade-off studies examine alternative design approaches and different parameters with the purpose of optimizing the overall performance of the system and reducing technical risk.

COST

- Cost is the most useful and popular measure for trade-off studies due to its universal nature and its flexibility as a measure. Cost is a flexible measure since almost any design parameter can be converted to a cost measure.

DESIGN TO COST (DTC)

- Design to Cost (DTC) is a cost analysis technique aimed at reducing or minimizing a product's price or cost, which results in increased sales volume.

IMPORTANT DEFINITIONS

LIFE CYCLE COST

- Life cycle cost (LCC) is a cost analysis discipline that develops a model of the total cost for development, operation, maintenance and disposal of a product over its full life to be used in design trade-off studies.

References

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Thank you