Global Journal of Engineering, Design & Technology
ISSN: 2319-7293
OPEN ACCESS Freely available online
Commentary

Engineering Design Process and its Common Stages

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ABOUT THE STUDY

Engineers frequently follow a set of phases known as the engineering design process when developing useful goods and procedures. The procedure is highly repetitive; frequently, one step must be repeated several times before moving on to the next.

The basic sciences, mathematics, and engineering sciences are used in the decision-making process to convert resources in the best way possible to achieve a specified goal. The definition of objectives and criteria, synthesis, analysis, construction, testing, and assessment are some of the core components of the design process.

Common stages of the engineering design process

It's critical to realize that there are different ways to frame and express the engineering design process. Different terms used may overlap to varying degrees, which impacts whether processes are mentioned or classified as "high level" *versus* "subordinate" in any specific model. This obviously holds true for any specific sample steps or sequences provided here.

Research, conceptualization, determining design requirements, feasibility assessment, preliminary design, detailed design, production planning and tool design, and production are some examples of steps in the engineering design process.

Research: Finding information and conducting research might take a significant amount of time during different stages of the design process. The available relevant literature, issues and successes related to current solutions, costs, and market demands should all be taken into account.

Information should come from reliable sources. Reverse engineering is a useful strategy if there are already existing products on the market. Internet, local libraries, publicly accessible government records, private organizations, trade publications, vendor catalogues, and available individual specialists are other sources of knowledge.

Design requirements: One of the most crucial steps in the design process is defining the design requirements and conducting requirement analysis, which is also known as problem definition. This activity is frequently carried out concurrently with a feasibility analysis.

Throughout the engineering design process, the design requirements govern the design of the product or process being created. These comprise fundamental components such as the features, functions, and specifications chosen after considering user demands. Hardware and software specifications, maintainability, availability, and testability are a few design criteria.

Feasibility: In some instances, a feasibility study is completed before the development of the schedules, resource plans, and estimates for the following phase. A feasibility study is a review and analysis of a proposed project's potential to assist in the decision-making process. It describes and evaluates potential solutions or strategies for getting the intended result. The feasibility study aids in reducing the project's scope in order to pinpoint the ideal case. A feasibility report is produced, and then a post-feasibility review is carried out.

This can be applied to determine whether the engineer's proposal can move forward into the design phase using a feasibility assessment. This is based on two requirements, the project must be founded on a workable concept and it must stay below budgetary limits. For this part of the feasibility study, it is crucial to include experienced engineers with sound judgment.

Preliminary design: Preliminary designs, also known as high-level designs or FEEDs (Front End Engineering Design), frequently fill in the gap between conceptual designs and detailed designs, especially when the level of conceptualization attained during ideation is insufficient for a thorough review.

The characteristics of the part being developed will change during thorough design and optimization, but preliminary design concentrates on developing the overall framework to base the project on.

Detailed design: The Detailed Design process, which comes after FEED (Front End Engineering Design), could include material

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Received: 01-Mar-2022, Manuscript No. GJEDT-22-21488; **Editor assigned:** 04-Mar-2022, PreQC No. GJEDT-22-21488 (PQ); **Reviewed:** 21-Mar-2022, QC No. GJEDT-22-21488; **Revised:** 28-Mar-2022, Manuscript No. GJEDT-22-21488 (R); **Published:** 04-Apr-2022, DOI: 10.35248/2319-7293.22.11.146

Citation: Akinwande A (2022) Engineering Design Process and the Common Stages of Engineering Design Process. Global J Eng Des Technol. 11:146

procurement as well. In this phase, every part of the project or product is further described in detail using solid models, drawings, and specifications. The detailed design stage is now more productive thanks to computer-aided design software. For instance, a CAD programme can offer optimization to lower volume without compromising the quality of an item. The finite element method can also be used to calculate stress and displacement to determine stresses across the entire part.