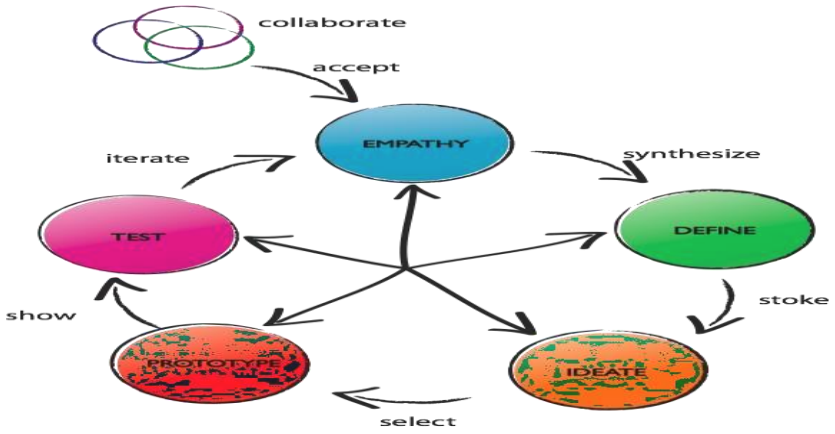
Introduction to Design Thinking Short notes

1 Introduction

Introduction to Design

Depending on the industry we are talking about, design can have many different definitions. Most generally, “design” is a process for deliberately creating a product to meet a set of needs. Mobile app development requires both engineering design and product design. Engineering design focuses on physics, such as speed, mass and other performance measures while product design also considers user and consumers by asking what the user wants in a product. Thus, Design is a realization of a concept or idea into a configuration, drawing or a product.



Characteristics of successful product development

A product is something sold by an enterprise to its customers or a product is a set of attributes offered to customers to fulfill their needs or requirements. It is obtained by conversion of raw material. The product is an entity for which clear idea of its design and development is known. The purpose of the product should be clearly visible.

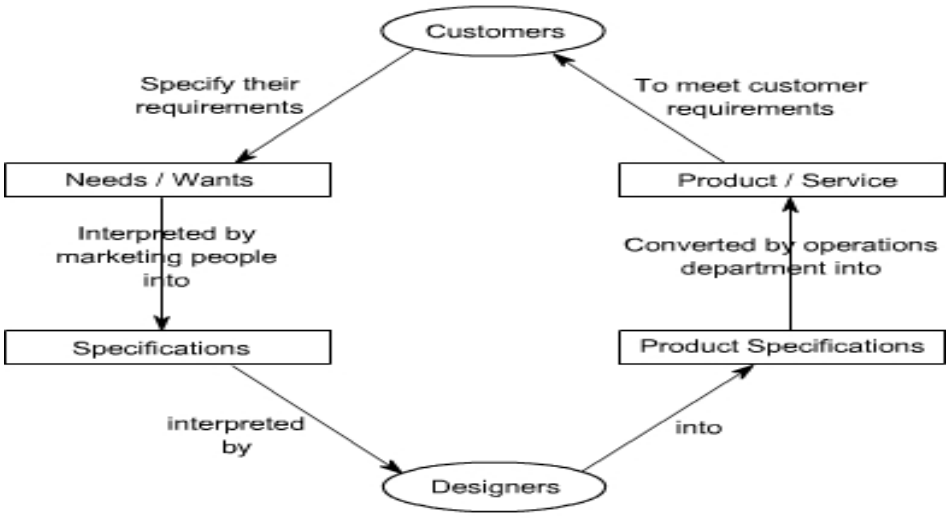
Product Design & Development (PDD)

- Basic need of every manufacturing company
- Consumers want and expect new and better products
- Not to innovate approach is becoming increasingly risky
- Innovating new product is expensive and risky

What is product development?

- Product Development is the set of activities, beginning with the perception of a market opportunity and ending in the production, sales and delivery of a product.
- The goal of the subject is to present a clear and detailed way a set of product development methods while focusing together the marketing, Design and manufacturing functions of the organization.

Product Development Process



Product development is an interdisciplinary activity requiring contribution from the following three functions.

Marketing

Design

Manufacturing

Marketing: The marketing function mediates the interactions between the firm and its customers. Marketing also typically arranges for communication between the firm and its customers, sets target prices and oversees the launch and promotion of the product.

Design: The design function plays the lead role in defining the physical form of the product to best meet customer needs. In this context, the design function includes engineering design (mechanical, electrical, software etc.) and industrial design (aesthetics, ergonomics, user interfaces).

Manufacturing: The manufacturing function is primarily responsible for designing and operating the production system in order to produce the product. Broadly defined, the manufacturing function also often includes purchasing, distribution and installation. This collection of activities is sometimes called the supply chain.

Elements of a Product Development Team

Project team

Few products are developed by a single individual. The collection of individuals developing a product forms the project team. This team usually has a single team leader who could be drawn from any of functions of the firm. The team can be thought of as consisting of a core team and an extended team.

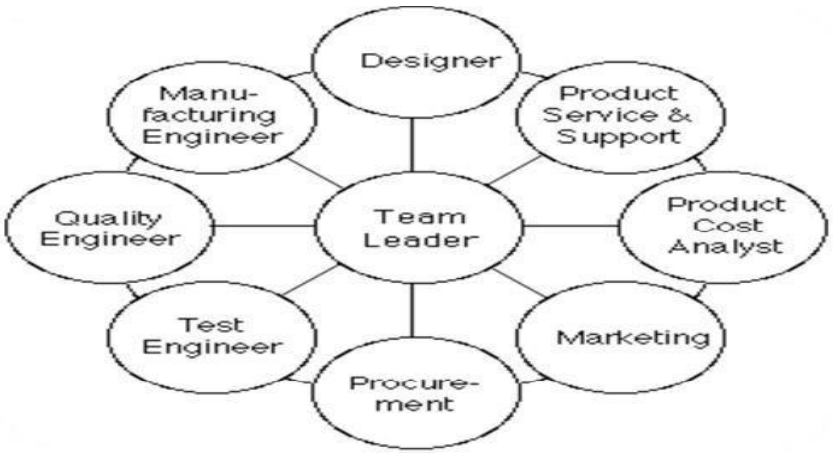
Core team

In order to work together effectively, the core team usually remains small enough to meet in a conference room.

Extended team

While the extended team may consist of dozens, hundreds or even thousands of other members.

Development Team



Reasons for expensive and risky:

- Most of the product ideas which go to product development stage never reach the market due to non availability of money, technology, manpower or due to change in demand.
- Many products that do reach the market are not successful mainly due to inferior quality, high product cost, poor functionality, poor marketing skills or change in demand.
- Successful products tend to have a shorter life due to change in demand, stiff competition or rapid technological changes.

Thus, management finds itself in a dilemma, it must development new product, yet the odds weight heavily against their success.

Product identification related factors:

- Gap in demand i.e. Demand > Supply
- Under-utilized resources-contract manufacturing– lending of facilities
- Diversification- limited customer base
- New product ideas- friends, co-workers, environment.

Product Analysis

- Performed before actual design starts
- It is based on the information collected about the customer's requirements and the level of competition.
- Its objective should be to satisfy as many functions as possible.
- Its objective should be to keep the product cost as low as possible.
- It is a trade off b/w product cost and functionality.
- It focuses on multiple product concepts

Why Product Analysis is So Imp.?

- Design modifications are more expensive at later stage of product life.

- Design modifications are unwelcomed, once the product is launched
- Design modifications at later stage also delay the launch of a new product.

Several aspects are considered for product analysis:

- Functionality aspect
- Operational aspect
- Quality aspect
- Reliability aspect
- Durability aspect
- Maintainability aspect
- Aesthetic aspect

Factors to study for PDD

- **Marketing related factors**
    - Prestige of the company
    - Technologically sound products
    - Customer's requirements
    - Market potential
    - Product life
    - Competition

Stages in Product life Cycle

- Introduction
- Growth
- Maturity
- Decline

Legal Factors

- Environment pollution

- Import restriction on capital goods
- Restriction on finance

Finance related factors

- Capital investment-manufacturing resources, plant and machinery
- Cash generation
    - Govt. support
    - Shares
    - Fixed Deposits

Manufacturing related factors

- Availability of technological know- how- its cost, related equipments
- Cost of Manufacturing facilities
- Quality of manufactured products – customer requirement
- Rate of production – market demand

Distribution related factors

- Availability of distributors- reputation, facilities and manpower
- Availability of ware houses- space requirement, cost and facilities
- After sale service- maintenance, repair, spares, cost
- Sales personnel – marketing skills, implementation of sale promotional schemes etc.

Organization related factors

- Skill requirement both workers and managers
- Availability of manager, labor etc.
- Salary and wages of workers – cost implications

Characteristics

Successful product development means “Development of a product that can be produced and sold profitably. (Very difficult to achieve quickly and directly).Generally

there are five specific dimensions used to measure the performance of product development effort.

1. Product Quality: Product quality is ultimately reflected in market share and the price that customers are willing to pay.

- How good is the product resulting from the development effort team.
- Does it satisfy customer needs?
- Is it robust and reliable?

2. Product Cost:

- Product cost determines how much profit accrues to the firm for a particular sales volume and a particular sales price.
- Capital equipment +Tooling + Incremental cost

3. Development Time:

- How quickly did the team complete the development effort .
- It determines how responsive the firm can be to competitive forces and to technological development

4. Development Cost:

- It is usually a fraction of investment required to achieve profit.

5. Development Capability:

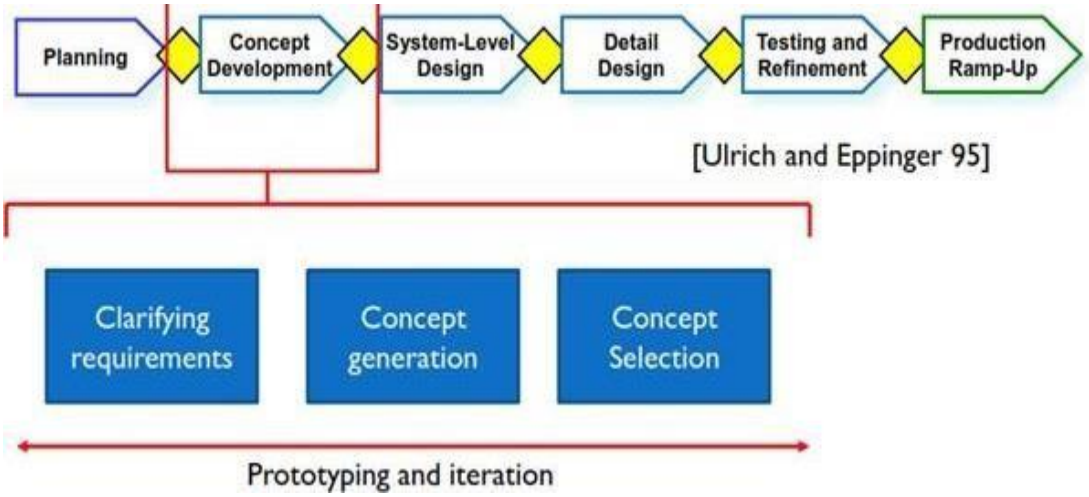
- Development capability is an asset the firm can use to develop products more effectively and economically in the future.
- Future Scope

3. Product development process

Product development is the process of creating a new product to be sold by a business or enterprise to its customers. Development refers collectively to the entire process of identifying a market opportunity, creating a product to appeal to the identified market, and finally, testing, modifying and refining the product until it is ready for production.

A development process can be understood as a risk management system .In the early phase of product development, various risks are identified. As the process progresses, risks are reduced as the key uncertainties are eliminated and the functions of the product are validated. When the process is completed, the team should have substantial confidence that the product will work correctly and be well received by the market.

The initial concept development process is important because a better design process leads to a better design outcome. Decisions made during the early stages of design tightly constrain future options. It is estimated that 70% cost of a product is determined in the first 30% of the design cycle.



Planning:

- This is also called as the "zero phase" since it precedes the project approval and launch of the actual product development process.
- The output of this phase is the project mission statement, which specifies the target market for the product, business goals, key assumptions, and constraints.

Concept development:

- Good concept development is crucial, during this stage the needs of the target market are identified, competitive products are reviewed, product specifications are defined, a product concept is elected, an economic analysis is done, and the development project is outlined.

- This stage provides the foundation for the development effort, and if poorly done can undermine the entire effort.

System level design:

- Includes the definition of the product architecture and the decomposition of the product into subsystem and components.
- The o/p of this phase usually includes a geometric layout of the product, a functional specification of each of the products subsystem and preliminary process flow diagram for final assembly process.

Detail design:

- Detail design, or design-for-manufacture, is the stage wherein the necessary engineering is done for every component of the product.
- During this phase, each part is identified and engineered. Tolerances, materials, and finishes and specification of standard parts to be purchased from suppliers are defined, and the design is documented with drawings or computer files.
- Process plan and tooling for each part is The output of this phase is the control documentation for the product.

Testing and refinement:

- During the testing and refinement stage, a number of prototypes are built and tested. Early alpha prototypes are built with prodn.
- Intent parts but not necessarily fabricated with actual processes. It is necessary to determine whether the performance of the product matches the specifications, and to uncover design shortfalls and gain in-the-field experience with the product in use.
- Later, beta prototypes are built from the first production components received from suppliers.

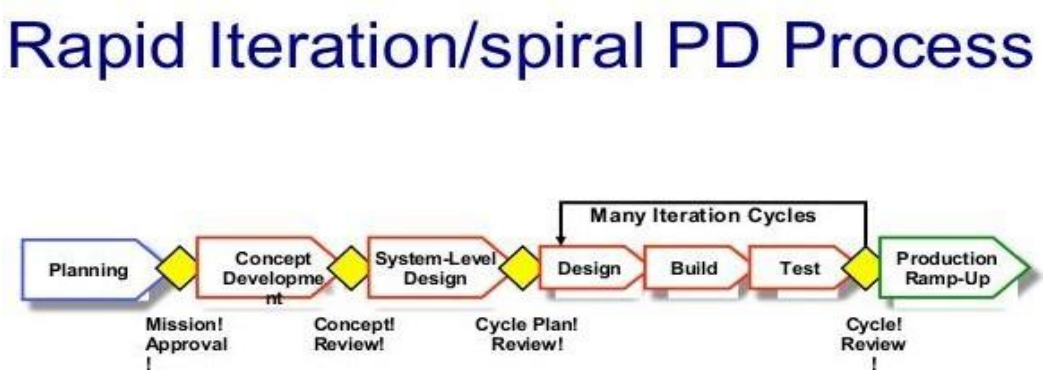
Production ramp-up:

- During production ramp-up, the work force is trained as the first products are being assembled.
- The comparatively slow product build provides time to work out any remaining

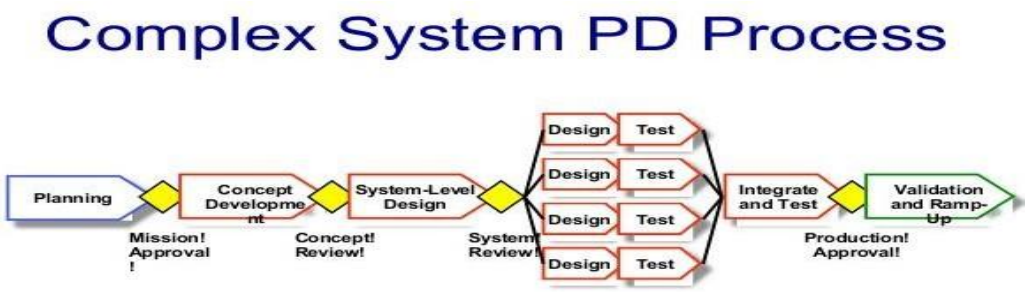
problems with supplier components, fabrication, and assembly procedures.

- The staff and supervisory team is organized, beginning with a core team, and line workers are trained by assembling production units.

ELOPMENT PROCESS PHASES A GENERIC DEV



A GENERIC DEVELOPMENT PROCESS PHASES



Identification of opportunities

Design Thinking is a design methodology that provides a solution-based approach to solving problems. It's extremely useful in tackling complex problems that are ill-defined or unknown, by understanding the human needs involved, by re- framing the problem in human-centric ways, by creating many ideas in brainstorming sessions, and by adopting a hands-on approach in prototyping and testing.

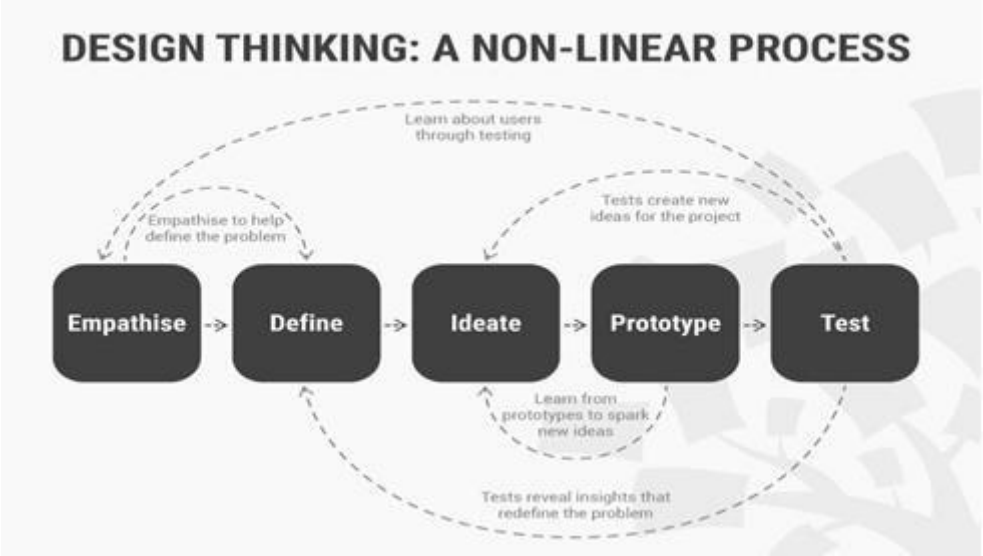
Empathizing: Understanding the human needs involved.

Defining: Re-framing and defining the problem in human-centric ways.

Ideating: Creating many ideas in ideation sessions.

Prototyping: Adopting a hands-on approach in prototyping.

Testing: Developing a prototype/ solution to the problem.



Empathizing:

The first stage of the Design Thinking process is to gain an empathic understanding of the problem you are trying to solve. This involves consulting experts to find out more about the area of concern through observing, engaging and empathizing with people to understand their experiences and motivations, as well as immersing yourself in the physical environment so you can gain a deeper personal understanding of the issues involved. Empathy is crucial to a human-centered design process such as Design Thinking, and empathy allows design thinkers to set aside their own assumptions about the world in order to gain insight into users and their needs.

Defining:

During the Define stage, you put together the information you have created and gathered during the Empathize stage. This is where you will analyze your observations and synthesize them in order to define the core problems that you and your team have identified up to this point. You should seek to define the problem as a problem statement in a human - centered manner.

Ideating:

During the third stage of the Design Thinking process, designers are ready to start generating ideas. You've grown to understand your users and their needs in the Empathize stage, and you've analyzed and synthesized your observations in the Define stage, and ended up with a human-centered problem statement. With this solid background, you and your team members can start to "think outside the box" to identify

new solutions to the problem statement you've created, and you can start to look for alternative ways of viewing the problem.

Prototyping:

- The design team will now produce a number of inexpensive, scaled down versions of the product or specific features found within the product, so they can investigate the problem solutions generated in the previous stage.
- Prototypes may be shared and tested within the team itself, in other departments, or on a small group of people outside the design team. This is an experimental phase, and the aim is to identify the best possible solution for each of the problems identified during the first three stages.
- The solutions are implemented within the prototypes, and, one by one, they are investigated and either accepted, improved and re-examined, or rejected on the basis of the users' experiences.

Testing:

Designers or evaluators rigorously test the complete product using the best solutions identified during the prototyping phase. This is the final stage of the 5 stage-model, but in an iterative process, the results generated during the testing phase are often used to redefine one or more problems and inform the understanding of the users, the conditions of use, how people think, behave, and feel, and to empathize.