



19MCE401 - PROCESS PLANNING AND PRODUCT DEVELOPMENT
STUDY NOTES

UNIT 3 – PRODUCT DEVELOPMENT

TOPIC 1 – PRODUCT DEVELOPMENT PROCESS

Handled by:

Dr. T. Prakash M.E., Ph.D.,

Professor & Head,

Department of Mechatronics Engineering,

SNS College of Technology,

Coimbatore - 35.



Product Development Process:

We can define product development as “Entire set of activities required to bring a new concept to a state of market readiness”.



Figure 1: Source: outsourcing-vs-in-house-product-development-c312e1789975

Steps in product development activities:

- Inspiring new product vision
- Business case analysis activities
- Marketing efforts
- Technical Engineering design activities
- Development of manufacturing plans
- Validation

Inspiring new product vision:

"Inspiring new product vision" is a pivotal concept in product development that involves the creation of a compelling and forward-thinking concept or idea for a new product or feature. It is the process of envisioning a product that not only addresses current market needs but also anticipates future trends and customer desires.

To inspire a new product vision, teams must engage in creative thinking and market research to identify unmet needs or pain points. They should also consider emerging technologies, industry shifts, and changing consumer behaviours. The goal is to develop a vision that not only solves existing problems but also excites and captivates potential users.

An inspiring product vision serves as a guiding light for the product development process. It motivates teams, aligns stakeholders, and provides a clear direction for design, engineering,



and marketing efforts. It helps set the product apart from competitors by offering something unique and valuable.

Ultimately, an inspiring new product vision can lead to innovation and breakthroughs, driving product success and market leadership. It's a crucial first step in the journey of creating products that not only meet customer needs but also shape and define the future of the industry.

PRODUCT VISION



Figure 2. Source: <https://powerslides.com/powerpoint-marketing/analytics-templates/product-vision/>

Business case analysis activities:

"Business case analysis activities" in product development refer to a set of essential processes and tasks undertaken to evaluate the viability and potential success of a new product or initiative from a business perspective. These activities are critical in making informed decisions about whether to invest resources in a particular product development effort.

The key components of business case analysis activities typically include:

1. **Market Research:** Gathering data on market size, trends, competition, and customer needs to assess the demand and potential market share for the proposed product.
2. **Financial Projections:** Creating financial models to estimate the costs, revenue projections, and potential return on investment for the new product. This includes calculating factors like payback period, break-even analysis, and profitability.
3. **Risk Assessment:** Identifying potential risks and uncertainties associated with the product development project and devising mitigation strategies.



4. **Competitive Analysis:** Evaluating how the product stacks up against existing competitors and assessing its unique selling points.
5. **Resource Allocation:** Determining the necessary resources, including budget, personnel, and technology, required for successful product development.
6. **ROI Analysis:** Calculating the expected return on investment and comparing it with the organization's financial goals and benchmarks.
7. **Strategic Alignment:** Ensuring that the proposed product aligns with the company's overall business strategy and long-term objectives.

These activities help stakeholders make informed decisions about whether to proceed with a product development project, prioritize it within the organization, or explore alternative approaches. A well-executed business case analysis can significantly increase the chances of developing successful products that contribute to the company's growth and profitability.

Business Case Analysis in 3 Steps

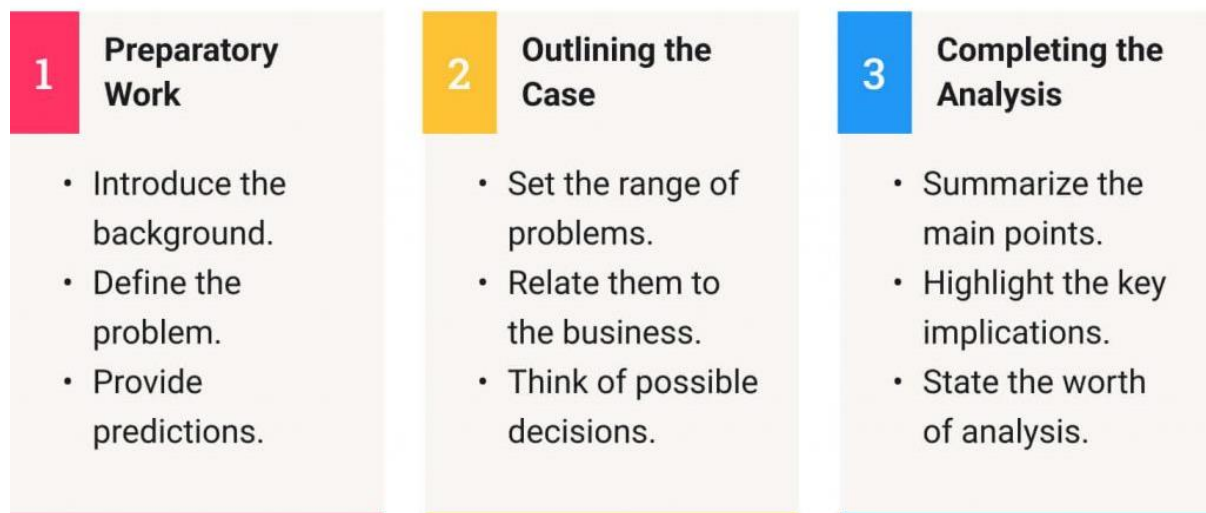


Figure 3. Source: <https://helpfulpapers.com/blog/how-to-write-a-case-study-tips-tricks-and-examples/>

Marketing efforts:

"Marketing efforts" in product development encompass all the strategies, activities, and initiatives undertaken to promote and sell a new product to the target audience. It's a crucial aspect of the product development process because even the most innovative and valuable products require effective marketing to reach their intended customers and generate demand.



Marketing efforts typically include:

1. **Market Research:** Conducting market research to understand the target audience, their needs, preferences, and pain points. This data helps in tailoring the product to meet customer expectations.
2. **Branding:** Creating a strong and compelling brand identity for the product, including logos, messaging, and positioning, to differentiate it in the market.
3. **Product Positioning:** Determining where the product fits in the market and how it compares to competitors.
4. **Pricing Strategy:** Setting the right price point based on cost, market demand, and perceived value.
5. **Promotion:** Developing marketing campaigns and strategies to raise awareness, generate interest, and drive sales. This includes advertising, social media marketing, content marketing, and public relations.
6. **Distribution Channels:** Identifying the most effective channels to distribute the product, whether through direct sales, retailers, e-commerce platforms, or partnerships.
7. **Sales Enablement:** Equipping the sales team with the necessary tools, training, and resources to effectively sell the product.
8. **Customer Feedback:** Continuously gathering feedback from customers to refine marketing strategies and improve the product.

Effective marketing efforts can significantly impact a product's success by creating awareness, driving demand, and fostering customer loyalty. It's a dynamic and evolving process that requires ongoing assessment and adaptation to align with changing market conditions and consumer preferences, ensuring the product's continued growth and profitability.



Figure 4. Source: <https://www.youtube.com/watch?app=desktop&v=PcNM1HBo1po>



Technical engineering design activities:

"Technical engineering design activities" in product development encompass the processes and tasks focused on translating a product concept or idea into a detailed and practical technical plan. These activities bridge the gap between conceptualization and actual product creation, ensuring that the product can be built effectively and efficiently.

Key aspects of technical engineering design activities include:

1. **Detailed Design:** Creating comprehensive blueprints, schematics, and specifications for the product's components, systems, and architecture. This involves specifying materials, dimensions, tolerances, and manufacturing processes.
2. **Prototyping:** Building physical or digital prototypes to test and validate design concepts, assess functionality, and identify potential issues early in the development process.
3. **Engineering Analysis:** Performing various analyses, such as structural, thermal, or fluid dynamics simulations, to ensure the product meets performance and safety standards.
4. **Manufacturability:** Ensuring that the design is suitable for mass production by considering factors like ease of assembly, cost-efficiency, and scalability.
5. **Materials Selection:** Identifying and sourcing the appropriate materials for construction, considering factors like durability, cost, and environmental impact.
6. **Testing and Quality Assurance:** Developing testing protocols and quality control measures to verify that the product meets the required specifications and standards.
7. **Regulatory Compliance:** Ensuring that the product design complies with relevant industry standards and regulatory requirements.
8. **Cost Estimation:** Estimating the production costs based on the design specifications and making necessary adjustments to meet budget constraints.

Effective technical engineering design activities are essential for a successful product development process, as they provide the detailed guidance needed for manufacturing and assembly. It also helps in minimizing risks, optimizing performance, and ensuring that the final product aligns with the initial concept and customer expectations.

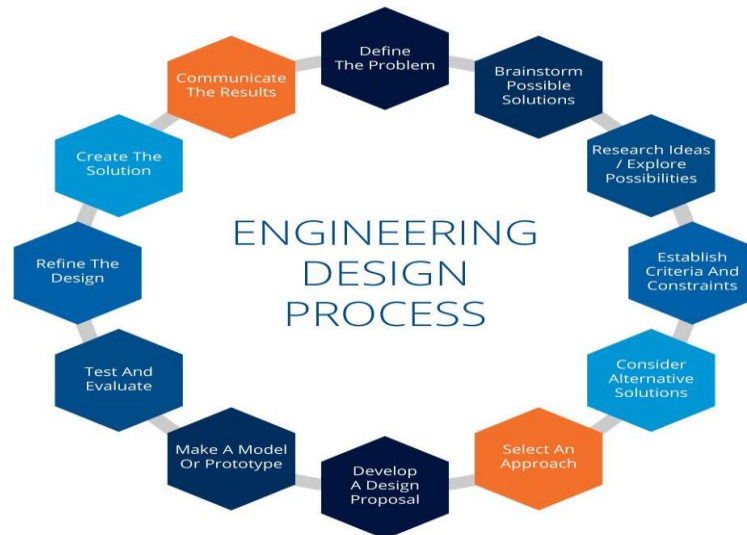


Figure 5. Source: <https://www.twi-global.com/technical-knowledge/faqs/engineering-design-process>

Development of manufacturing plans:

The "Development of manufacturing plans" in product development is a critical phase where the detailed strategies and procedures for producing a new product are created. This step is essential for transforming a product design from theory into a tangible, market-ready item. The development of manufacturing plans involves several key activities:

1. **Process Selection:** Identifying the most suitable manufacturing processes for each component of the product. This decision considers factors such as materials, cost, volume, and complexity.
2. **Workflows and Sequencing:** Determining the precise sequence of steps involved in assembling and producing the product, including any subcomponents or intermediate stages.
3. **Production Layout:** Designing the layout of the manufacturing facility or production line to optimize efficiency, minimize bottlenecks, and ensure worker safety.
4. **Materials Procurement:** Planning how and where to source the necessary raw materials, including establishing relationships with suppliers and considering lead times.
5. **Quality Control:** Establishing quality control measures and inspection points throughout the manufacturing process to ensure that each unit meets specifications and standards.
6. **Cost Estimation:** Estimating the manufacturing costs, which includes labour, materials, equipment, and overhead expenses, to determine pricing and profitability.



7. Capacity Planning: Assessing the production capacity and scalability to meet demand, and planning for potential production volume increases or decreases.
8. Resource Allocation: Allocating the required human resources, machinery, and equipment for manufacturing while ensuring efficient resource utilization.
9. Sustainability Considerations: Addressing environmental and sustainability concerns by incorporating eco-friendly practices and materials into the manufacturing process.

Effective development of manufacturing plans is crucial for delivering products on time, within budget, and at the desired quality level. It also facilitates smooth collaboration between design and production teams, ensures the feasibility of the product design, and paves the way for efficient, cost-effective, and sustainable production processes.

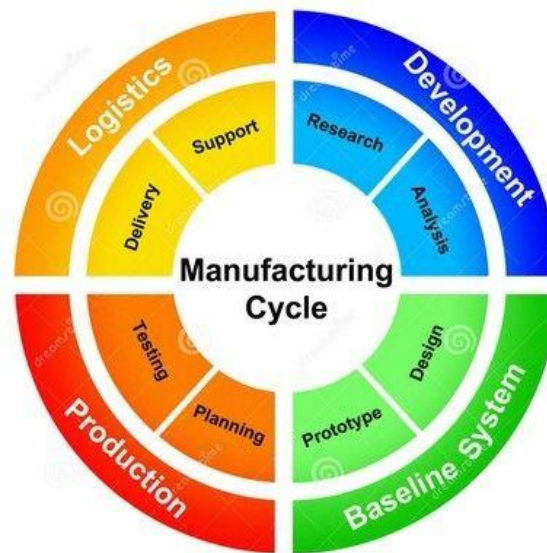


Figure 6. Source: <https://m.indiamart.com/proddetail/manufacturing-process-development-7092750891.html>

Validation:

"Validation" in product development refers to the systematic process of assessing whether a product, system, or process meets its intended goals and satisfies the needs and expectations of its users or stakeholders. It serves as a critical checkpoint to ensure that the product is on track and ready for market launch. Validation involves several key aspects:

1. Requirement Alignment: Validation begins by confirming that the product aligns with the initial design specifications and user requirements. It checks if the product does what it was intended to do.



2. Functional Testing: This involves rigorous testing of the product's features and functionalities to ensure they work as expected. It may involve simulation, modelling, or physical testing, depending on the nature of the product.
3. Usability Testing: For consumer-facing products, usability testing assesses how easily users can interact with and derive value from the product. It helps identify user experience issues and suggests improvements.
4. Compliance and Standards: Validation often includes checking whether the product complies with industry standards, safety regulations, and any applicable legal requirements.
5. Performance Evaluation: Assessing the product's performance under various conditions to ensure it operates reliably and efficiently. This might include stress testing, load testing, or endurance testing.
6. Prototyping: In some cases, creating prototypes for user testing can be part of the validation process, helping to identify design flaws and areas for improvement.
7. Feedback Incorporation: Validation also involves incorporating feedback from testing and evaluation into the product development process, making necessary adjustments or improvements.

Validation is a crucial step to minimize the risk of launching a product that doesn't meet customer expectations or regulatory requirements. It helps ensure that the product is robust, reliable, safe, and delivers the promised value, ultimately contributing to its success in the market.

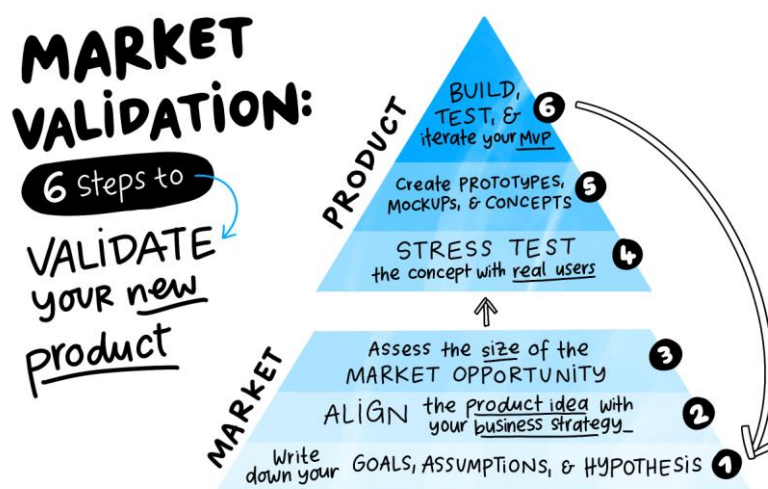


Figure 7. Source: <https://plan.io/blog/product-idea-validation/>