Product Development Process

Product Development Process

- Is a set of activities beginning with the perception of a market opportunity and ending in the production, sale and delivery of a product

New-Product Development Strategy

A firm can obtain new products through:

- **Acquisition** refers to the buying of a whole company, a patent, or a license to produce someone else's product.

- **New product development** refers to original products, product improvements, product modifications, and new brands developed from the firm's own research and development.

Reasons for new product failure

- **Overestimation of market size**
- **Poor design**
- **Incorrect positioning**
- **Wrong timing**
- **Priced too high**
- **Ineffective promotion**
- **Management influence**
- **High development costs**
- **Competition**

Characteristics of Successful PD

- Product quality
  - Satisfy customer needs?
  - Robust and reliable?
  - Price to customer? Market share?
- Product cost
  - Manufacturing cost
  - Profit for a sales volume at particular sales price. Optimization problem.

Characteristics of Successful PD

- Development Time
  - How long the team takes to complete the development effort?
- Development costs
  - How much was spent to develop the product?
- Development Capability
  - Organizational learning ability
  - How the firm can develop products more effectively and economically in the future

Other performance measures

- High performance along these five dimensions should ultimately lead to success.
  - Discuss what other factors or performance measures that can impact on the product development process?

Survey of Industry measures

- Total cost of PDD project
- On-time delivery of development project
- Actual project cost compared to budget
- Actual vs targeted time for project completion
- Lead time to market
- Field trial prior to production
- Projected profitability analysis

- Product failure rates
- Supplier lead time
- Reasons for failures on the market
- Product prototype pass safety tests
- R and D budget as a % of turnover
- Time spent on each stage of product development
- Product met quality guidelines
- Actual to predicted profits on products.

Challenges of PD

- Trade-offs
  - Recognizing, understanding, and managing trade-offs in a way that ensures success.
  - For example weight, safety, durability etc.
- Details
  - Complexity?
  - Design choices?
  - Modular design?

Challenges of PD

- Dynamics
  - Catering for a changing environment?
  - Technology
  - Customer preferences
  - Competitors' changes or introduction of new products
  - Financial indicators
  - Product demand

Challenges of PD

- Time pressures
  - Quick decisions with incomplete information?
  - Time to get product to market ahead of competitor?
- Economics
  - ROI?
  - Customer appeal?
  - Prices?
  - Competitor's price?

Other - Challenges of PD

- Creation
  - Appeal?
  - Transform an idea to a salable product?
- Satisfaction of societal and Individual Needs
  - Can you meet the needs of the intended market segment?
  - Can you meet every customer requirement?

Other - Challenges of PD

- Team Diversity
    - Recruiting the different skills and talents required?
    - Coordinating the various activities and teams?
- Term Spirit
    - How to keep the team highly motivated and cooperative?
    - How to managed a co-located team or a distributed team?

Obstacles to PD Success

- Lack of empowerment of the team
- Functional allegiances transcending project goals
- Inadequate resources
- Lack of cross functional representation on the project teams.
- Any others? Discuss?

Research and Development

R → **T** → **D**
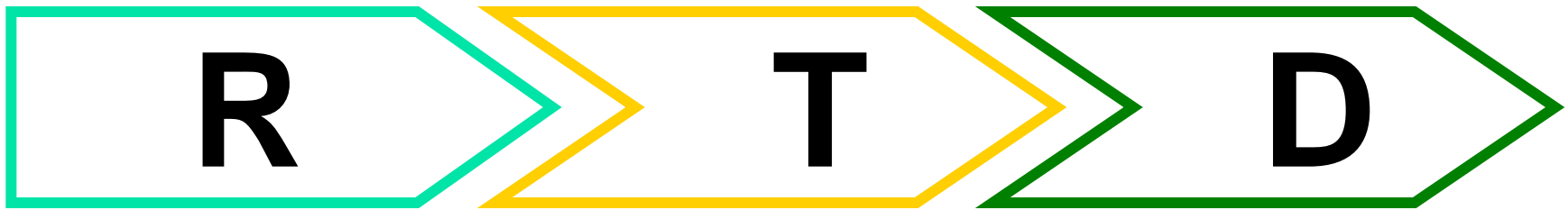
Basic Research	Technology Development	Product Development
• **Discovery process**	• **Loosely structured**	▪ Structured methods
• **No set timing**	• **Difficult to plan**	▪ Planned timing
• **Unpredictable returns**	• **Less predictable**	▪ Predictable outcome
• **Long term**	• **Medium term**	▪ Short term

Who Designs and Develops Products?

- PD is an interdisciplinary activity requiring contributions from all functions of the firm. Three are always central:
  - Marketing
  - Design
  - Manufacturing

Finance

Sales

Legal

Manufacturing
Engineer

Marketing
Professional

Purchasing
Specialist

TEAM
LEADER

Industrial
Designer

Electronics
Designer

Mechanical
Designer

Core
Team

Extended Team
(Including Suppliers)
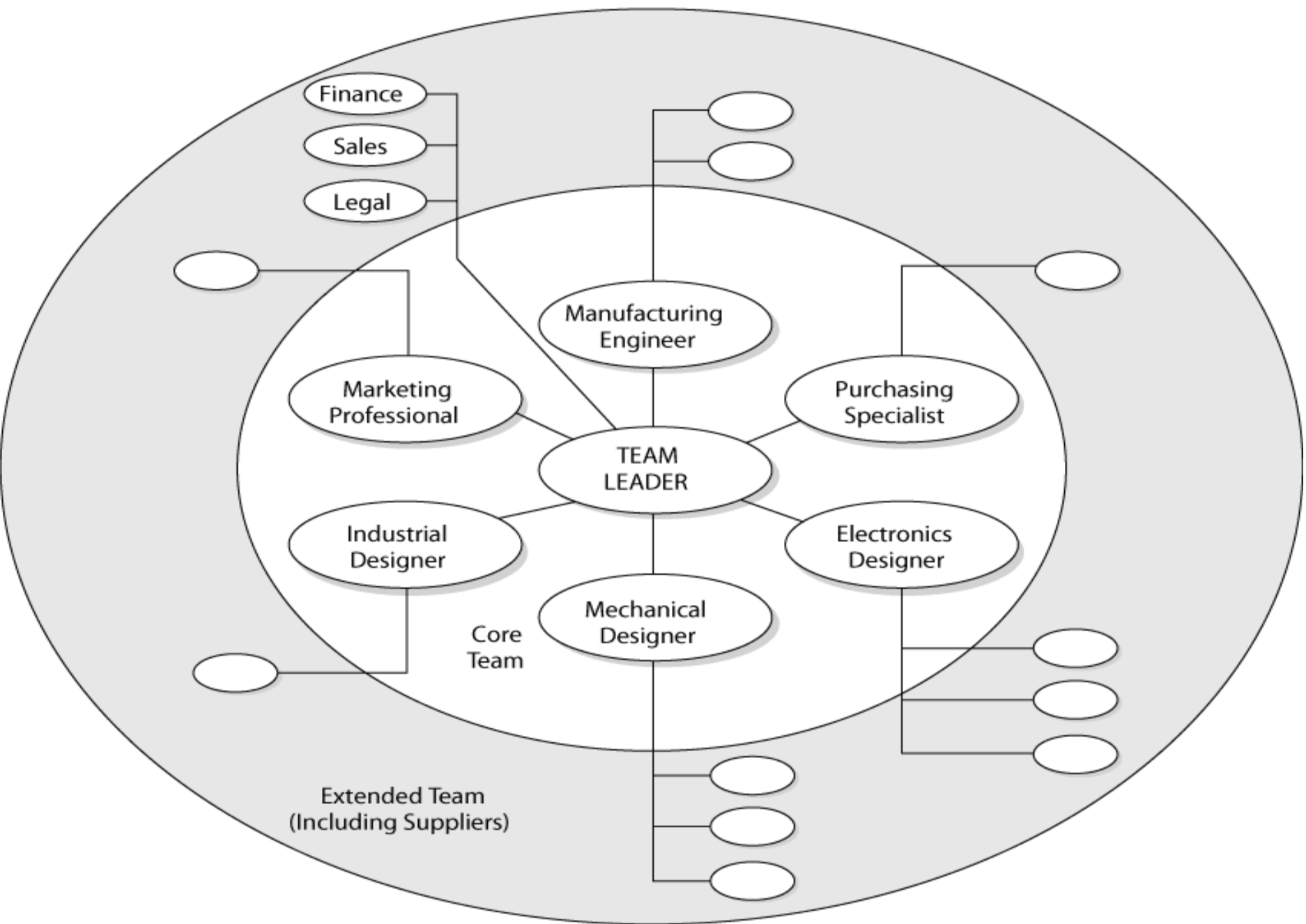
From *Product Design and Development* by Karl Ulrich and Steven Eppinger (McGraw-Hill/Irwin)

Product development team – core team

- Marketing professional
- Design professionals
  - ME
  - EE
  - Industrial Designer
- Manufacturing professionals
  - Manufacturing engineer (manufacturability)
  - Purchasing specialist (supply chain)

Product development team – extended team

- Legal, sales, finance professionals
- Consulting firms
- Government agencies
- Universities
- Environmental groups
- Professional regulatory groups (such as the ASME)

Benefits of integration

- The best practice is to involve a team of people representing the necessary disciplines and skills (a cross-functional team)
- Note:
  - Assemble your project team of multi-disciplinary backgrounds as required.

Managing New-Product Development

New-Product Development Strategies

1. Customer-centered new product development
2. Team-based new product development
3. Systematic new product development

Managing New-Product Development

New-Product Development Strategies

- **Customer-centered new-product development** focuses on finding new ways to solve customer problems and create more customer satisfying experiences

  - Begins and ends with solving customer problems

  - The most successful new products are ones that are differentiated

Managing New-Product Development

New-Product Development Strategies

- **Sequential new product development** is a development approach where company departments work *individually* to complete each stage of the process before passing along to the next department or stage: increased control in risky or complex projects; slow – **not good!**

- **Team-based new-product development** is a development approach where company departments work closely together in cross-functional teams, overlapping in the product-development process to save time and increase effectiveness.
  - increase tension and confusion
  - is faster and more flexible

# Managing New-Product Development

New-Product Development Strategies

- **Systematic new product development** is an innovative development approach that collects, reviews, evaluates, and manages new product ideas.
  - Creates an innovation-oriented culture
  - Yields a large number of new-product ideas

Product Life-Cycle Strategies

- **Product life-cycle (PLC)** is the course that a product's sales and profits take over its lifetime.
  - Product development
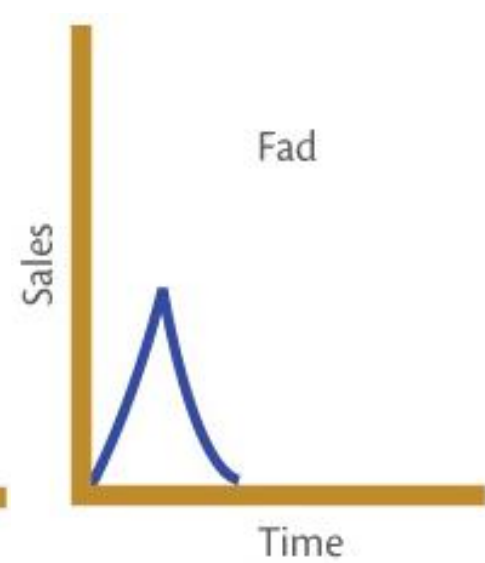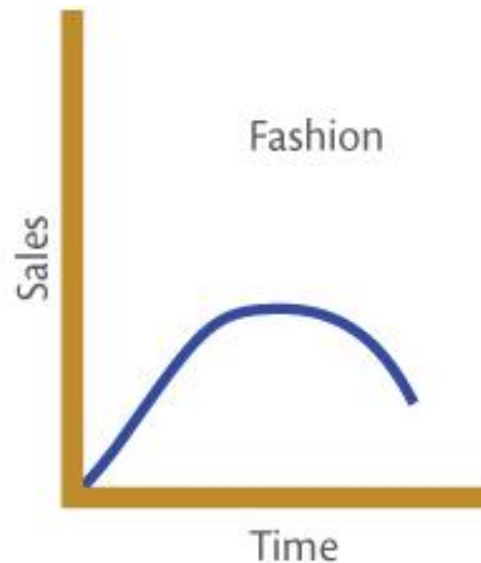 - Introduction
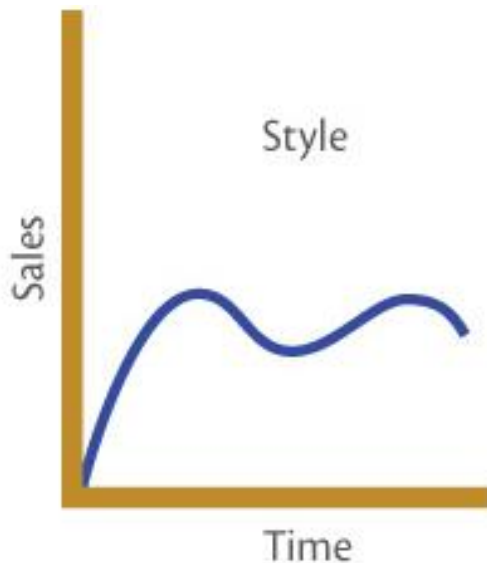 - Growth
  - Maturity
  - Decline
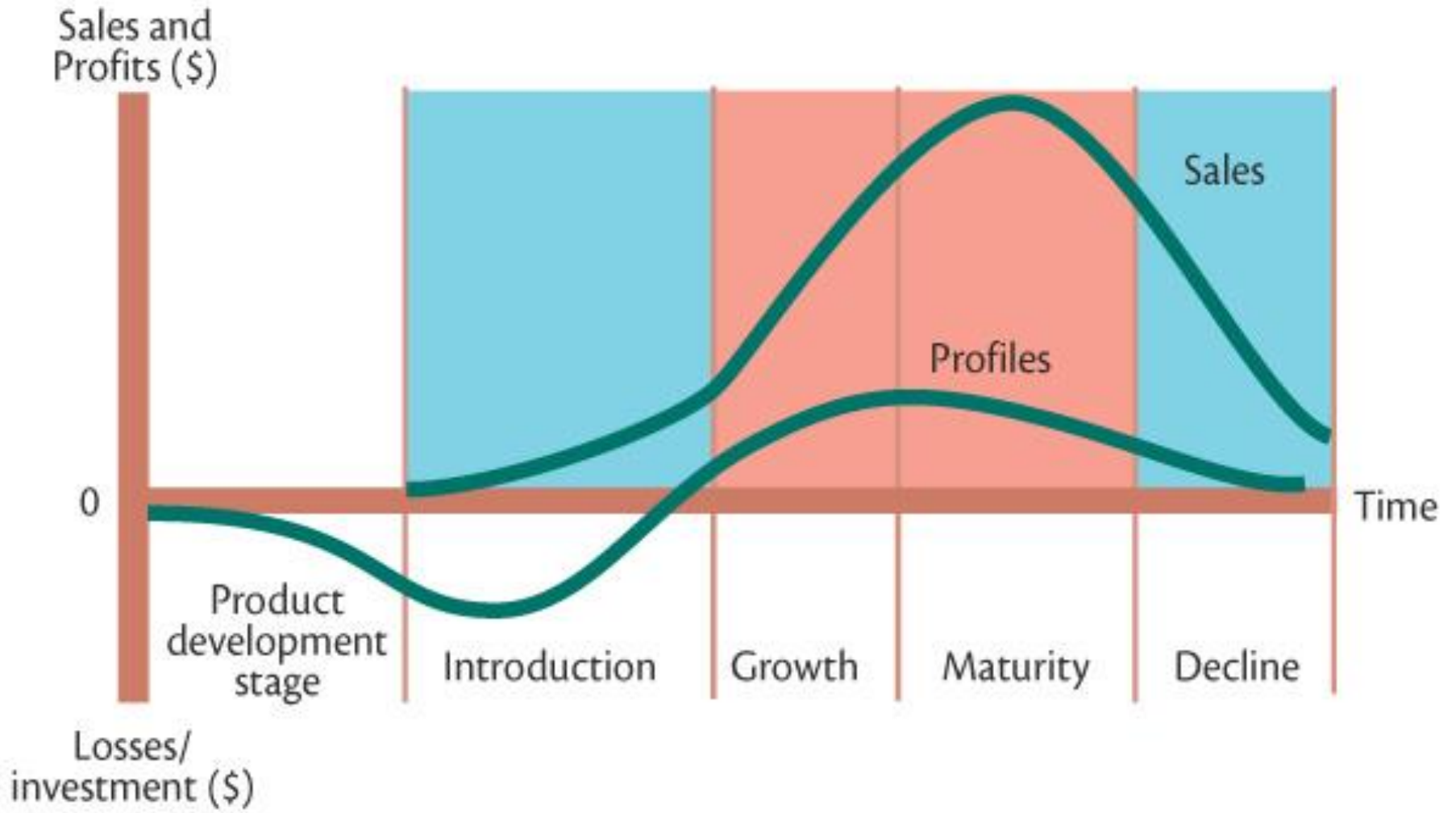
Sales and profits over the product's life from inception to decline

Product Life-Cycle Strategies

Product life-cycle (PLC) can also be applied to styles, fashions and fads

- **Style** is a basic and distinctive mode of expression.
- **Fashion** is a currently accepted popular style in a given field.
- **Fads** are temporary periods of unusually high sales driven by consumer enthusiasm and immediate product or brand

Product Life-Cycle Strategies

Introduction stage is when the new product is first launched.

- Takes time
- Slow sales growth
- Little or no profit
- High distribution and promotion expense

Product Life-Cycle Strategies

Growth stage is when the new product satisfies the market.

- Sales increase
- New competitors enter the market
- Price stability or decline to increase volume
- Consumer education
- Profits increase
- Promotion and manufacturing costs gain economies of scale
- Product quality increases
- New features
- New market segments and distribution channels are entered

Product Life-Cycle Strategies

Maturity stage is a long-lasting stage of a product that has gained consumer acceptance.

- Slowdown in sales
- Many suppliers
- Substitute products
- Overcapacity leads to competition
- Increased promotion and R&D to support sales and profits.

<u>Marketers consider modifying strategies at the maturity stage</u>

- Market modifying
- Product modifying
- Marketing mix modifying

Product Life-Cycle Strategies

- **Market modifying** is when a company tries to increase consumption of the current product (New users; Increase usage of existing users; New market segments)
- **Product modifying** is changing characteristics (quality, features, or style) to attract new users and to inspire more usage.
- **Marketing mix modifying** is when a company changes one or more of the marketing mix elements.
  - Price
  - Promotion
  - Distribution channels

Product Life-Cycle Strategies

- **Decline stage** is when sales decline or level off for an extended time, creating a weak product.

  - Maintain the product without change in the hope that competitors leave the industry

  - Reposition or reformulate the product in hopes of moving back into the growth stage

  - Harvest the product that means reducing various costs and hoping that sales hold up

  - Drop the product by selling it to another firm or simply liquidate it at salvage value

Additional Product and Service Considerations

Product Decisions and Social Responsibility

- Public policy and regulations regarding developing and dropping products, patent protection, product quality and safety, and product warranties.

International Product and Service Marketing

- Determining what products and services to introduce in which countries

- Standardization versus customization

- Packaging and labeling

- Customs, values, laws

The PDD Process

- The generic PD process
  - Planning
  - Concept Development
  - System-level Design
  - Detail design
  - Testing and refinement
  - Production ramp-up

Role of Key Functions

Concept Development	System-Level Design	Detail Design	Testing and Refinement	Production Ramp-up
Marketing ■Define market segment ■Identify lead users ■Identify competitive products	■Develop plan for product options and extended product family	■Develop marketing plans	■Develop promotion and launch material ■Facilitate field testing	■Place early production with key customers
Design ■Investigate feasibility of product concepts ■Develop industrial design concepts ■Build and test experimental prototypes	■Generate alternative product architecture ■Define major sub-systems and interfaces ■Refine industrial design	■Define part geometry ■Choose material ■Assign tolerances ■Complete industrial design control documentation	■Do reliability and life testing and performance testing ■Obtain regulatory approvals ■Implement design changes	■Evaluate early production output
Manufacturing ■Estimate manufacturing cost ■Assess production feasibility	■Identify suppliers for key components ■Perform make-buy analysis ■Define final assembly scheme	■Define piece-part production process ■Design tooling ■Define quality assurance processes ■Begin procurement of long-lead tooling	■Facilitate supplier ramp-up ■Refine fabrication and assembly processes ■Train work force ■Refine quality assurance processes	■Begin operation of entire production system