

Part I

Product innovation and strategic logic

Innovation involves changes and improvements to technologies, products, processes, and services that result in positive contributions for customers and other constituents of business organizations. An innovation is a creative new solution to the prevailing conditions and trends, and fulfills the expressed and latent needs and wants of customers and stakeholders.

Innovation management involves the means, mechanisms, and methods for leading change through developing new technologies, products, and processes. It includes changes in business models and organizational structure. Innovation management is imperative for improving product portfolios, enhancing and developing new products, and achieving customer and stakeholder satisfaction in the fast-paced world of globalization, technological change, and pressures from the business environment.

Innovation is pivotal for sustaining the prosperity of most organizations. If cash flow is the life-blood of a business enterprise, then innovation is the prescription for reinvigorating the organization to compete more successfully in a demanding world.

Product innovation concentrates on improving the strategic position and product-delivery capabilities of the organization through creativity and leadership. Product innovation includes several essential aspects.

- (1) Examining the needs for new products, processes, and services.¹
- (2) Determining the proper direction and fit for new products.
- (3) Establishing the appropriate game plan of the entire management system for developing and commercializing new products.
- (4) Selecting new-product opportunities for investment.
- (5) Enhancing the organizational capabilities to create successful new products.
- (6) Creating the new product and executing the new-product development (NPD) program.

Product innovation is a dynamic construct requiring managerial and organizational leadership and skills; it is a far-reaching term. It involves taking the initiative to make incremental or even dramatic improvements to the existing product portfolios, replacing

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some of the current products with new ones, or developing new-to-the world products for the benefit of existing or new customers.

In this book, product innovation focuses on process-management methodologies for evolutionary changes to create new or improved products rather than revolutionary changes via technological innovation. Product innovation is a means of managing the destiny of the organization instead of reacting to the pressures of the markets and business environment. *Leading change through integrated product development* (IPD)² is the most important perspective. IPD provides the organization with the ability to improve its positions in the served markets as well as in new markets by creating new solutions. It presents opportunities to enhance the business environment in a favorable way.

The twentieth century witnessed many spectacular innovations, from the airplane to microprocessors and the Internet. Based on the successes of their new products and technologies, companies like Boeing, Intel, Microsoft, General Electric, Toyota, Siemens, Nestlé, Proctor & Gamble, and many others improved their methodologies and capabilities to develop new products using sophisticated NPD processes. The emphasis has shifted from thinking about the features of the new product to managing the process within a management system to ensure that the core needs and requirements of customers and stakeholders are fulfilled to the greatest extent possible and to ensure that everything within the process occurs as synchronously as possible.

The twenty-first century is in its infancy. Technologies, products, and processes are becoming more sophisticated. Customers want even better quality and more value. Product life cycles are shrinking. Speed is becoming the overarching metric. Leading change through innovation is about creating a better world with products and technologies that people can trust and that have positive impacts on the business environment. Customers, stakeholders, and society expect improved solutions with overwhelming benefits as well as significantly reduced negative consequences and impacts. The general solution includes better products, more-effective processes, and more-capable and more-creative people.

IPD is the mainstream approach for developing new products. Its origins were established in the aircraft industry and automobile industry during the late 1980s and early 1990s.

Part I provides an introduction and overview of product innovation. It describes and discusses the driving forces in the business environment that induce changes, and the strategic direction of the company for compelling new-product development. The most important discussions focus on the standardized NPD process. Part I includes the following chapters:

- **Chapter 1** **Introduction to product innovation and new-product development**
- **Chapter 2** **Strategic logic of product innovation**
- **Chapter 3** **The new-product development process and organizational aspects**

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Part I lays the foundation for the main premises discussed through the book. It introduces the enterprise-management model, which serves as a basis for formulating, analyzing, and implementing strategies for new-product development. The book presents an integrated perspective for developing new products using a stakeholder-based approach.

Notes

1. The book covers the development of products and services. For the sake of simplicity, the term product(s) means products and services.
2. IPD incorporates all of the internal (technical, marketing, product, financial, and management) dimensions and the external (market, stakeholders, supply networks, related industries, and infrastructure) dimensions into a comprehensive framework that focuses on the concurrent development of all of the dimensions and elements of the NPD process. IPD is discussed in more detail in Chapter 1.

1 Introduction to product innovation and new-product development

Introduction

Overview

Product innovation is the overarching management framework for making incremental changes and improvements to products, services, and processes.¹ It includes the conceptualization, design, development, validation, and commercialization of new products for customers and markets in concert with the prevailing conditions and trends.² Product innovation involves the creative responses and solutions for meeting the needs and expectations of customers and market(s), the driving forces in the business environment, and the strategic requirements of the organization. Product innovation runs the gamut from improving existing products to discovering entirely new ways of satisfying customers and stakeholders. From an internal perspective, product innovation depends on the knowledge, experience, capabilities, resources, and the prevailing technologies of the organization. From an external perspective, product innovation focuses on customer and stakeholder needs, wants, and expectations. Customers desire excellent products and services with exceptional value, outstanding benefits, high quality, and assured reliability. Meeting such specifications is the exciting challenge of product innovation.

Product innovation is challenging because of the complexities of the business environment, the changing needs of customers and markets, the effects of competition, and the difficulties associated with understanding the present and forecasting the future. However, the complexities of product innovation are simplified in most organizations because there are common pathways to define and describe the processes and methods used for developing new products, and the organization has an information system to support the required analysis and decision making. Product innovation requires contributions from strategic management, engineering, marketing, finance, production and operations, supply networks, distribution channels, and customers on a concurrent basis to ensure that the process encompasses the essential requirements for achieving successful outcomes. A diversity of knowledge, skills, creativity, and insights is an essential precursor for success.

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Integrated product development (IPD) is the most widely adapted product-innovation methodology used to link systematically the external business environment – and its opportunities, challenges, and concerns – with the internal dimensions³ of the organization – and its capabilities and resources – to create innovative solutions based on improved products and services. IPD is the concurrent development of new products using cross-functional teams that are strategically and tactically aligned so that every participant is involved in the process from inception to commercialization. IPD is the new-product development (NPD) construct (process) used by most leading corporations to manage their NPD programs.⁴ There are many case studies and much empirical data to suggest that IPD is the most effective product-innovation methodology.⁵

IPD employs process-management techniques that integrate capabilities and requirements into seamless flows of activities for ensuring creativity, quality, thoroughness, and speed. Successful outcomes (new products) are realized through an effective NPD process that facilitates the flow of activities and outcomes from inception to commercialization using the knowledge gained from previous NPD programs and the skills and capabilities of the participants.⁶

IPD depends on the entire enterprise to achieve success. The enterprise consists of all of the internal participants, and the suppliers, the distribution channel, the customers, the stakeholders, related industries, and strategic partners. These dimensions⁷ are discussed in detail in the first three chapters since they are central to the fundamental premises of IPD. Indeed, the strategic alignment of all participants during the planning and implementation of the NPD process is the very essence of IPD. It is the concurrent planning, development, and implementation of the NPD program, the process, and its elements that defines and distinguishes IPD. Furthermore, it is the ongoing evaluation of the activities, outcomes, and prospects for success that provides the wherewithal to discern the merits of proceeding, adjusting, or terminating NPD programs or new product opportunities and gives IPD its most crucial characteristics. Using the principles and methods of IPD, management and participants have a reliable sense of the prospects of success. An effective NPD process gives the decision makers the confidence that they are exploiting the best opportunities and developing sound solutions.

The prime objective of IPD is to produce cost-effective designs for both products and processes which meet or exceed customer and stakeholder needs and expectations, providing exceptional value for all constituents. The organizational goal is to maximize the performance of the people and the management system and to minimize the negative impacts of new products on the external business environment. IPD is a structured framework that provides management and practitioners with a clear understanding of the interrelationships between product development elements and their impact on the product creation process, and the realities associated with the supply networks, external stakeholders, customers and markets, and competition. The intent of IPD is to reduce dramatically the time and resources required for successfully introducing products to the market(s).

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The concept of product innovation includes NPD programs involving improvements to existing products and the product development process of research and development (R&D) programs that create new-to-the-world products based on new technologies. The technology-development side of R&D often involves technological innovation used to discover and create the underlying technologies. The theories and methods involving technological innovation are beyond the scope of those pertaining to product innovation.⁸ The greater the departure from the prevailing technologies and market conditions the more likely it is that the type of innovation management process changes from product to technological, and from incremental to radical. The strategic process of selecting between product and technological innovation is a complex topic, and is discussed in Chapter 7.

The main premises of the chapter and introduction to the book

The premises presented in this chapter and subsequent chapters of the book pertain to IPD and NPD processes that are based on process-management theories, methods, and practices. They examine the strategies, approaches, methods, and techniques used to develop new products systematically in the demanding world of the twenty-first century.

The discussions are geared toward sophisticated practitioners and graduate-level students (as well as advanced undergraduates) who need to understand and manage the entire NPD process. The models, methods, techniques, processes, and practices are intended for an audience that aspires to actually use them in the world of product innovation. They are also devised to provide a sense of balance for those practitioners who are experts in a technical field but lack the breadth of knowledge about the whole NPD process, and its implications and requirements.

This chapter explores the basic definitions and implications of product innovation, IPD, and the NPD process. It provides background concepts on the evolutionary trends of business models and new-product development and sets the stage for understanding the driving forces of change in today’s complex business environment. Furthermore, the chapter includes the fundamentals of the NPD process and the basic types of new products. The aim of the chapter is to provide an overview of the essential elements of product innovation.

Chapter 1 includes the following topics and main learning objectives:

- Understanding the meaning and purposes of product innovation and new-product development.
- Exploring the overarching pressures and driving forces for product innovation in a corporate setting.
- Linking product innovation to product management and the product delivery system.
- Identifying and assessing the types of new-product programs.
- Describing the fundamentals of IPD.

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- Examining the primary elements of the NPD process.
- Exploring the fundamentals of NPD processes, methods, and techniques.

Product innovation and new-product development

Overview of product innovation

The primary objectives of product innovation are to create value, to obtain a competitive advantage, and to achieve long-term success through the development and commercialization of new products and services. The principal drivers of product innovation are customers, markets, stakeholders, and the other constituents in the business environment. The focus is on meeting their needs and expectations as they evolve.

Product innovation is a subset of the strategic-management system. Strategic management provides the direction, strategies, objectives, and the overarching decision-making process to determine what options should be addressed and how to create an atmosphere within the organization for discovering opportunities and responding to the challenges. Product innovation provides new solutions to old problems; creates new opportunities to exploit existing capabilities, resources, and assets; ensures sustainable outcomes through the systematic replacement of obsolete products; and builds new capabilities and resources for sustaining the future.

The business environment includes the social, economic, political, regulatory, ecological, market, and technological forces that impinge on the organization causing changes and providing opportunities and challenges. Social and economic forces have significant effects on stakeholders and other constituents of the organization. Political and regulatory factors establish mandates that drive the need for new products and specify requirements that must be included in the NPD process to ensure that all legal requirements are fulfilled. Ecological factors are critical for satisfying the basic underpinnings of the natural world and for maintaining a sustainable position in the future. Market forces generally influence the viability of existing products in the market place. Changing market conditions and trends establish new provisions that may not be satisfied by existing products. Such changes have effects on the life cycle of current product offerings, creating opportunities for new products. Technological forces provide new ways and means of dealing with customer and stakeholder needs and providing the mechanisms to create the products that customers demand, expect, or would like if they were available. All of these forces provide opportunities to create new solutions for satisfying the needs of the business environment, thus fueling product innovation and the NPD process. Each of these forces is discussed in more detail in the subsequent chapters of Part I.

Figure 1.1 depicts the elements of a simplified view of the main forces impinging on product innovation and the subset of relationships.

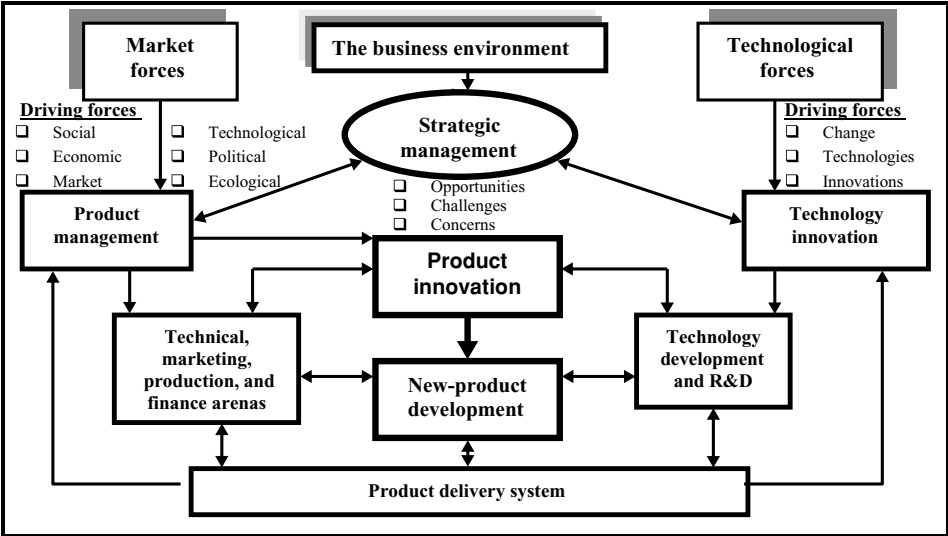


Figure 1.1 Simplified model of the primary elements of product innovation

Technological innovation includes technology development and R&D activities. These involve creating new technologies, developing the next generation (technology platform) of existing technologies,⁹ improving existing technologies and new-to-the-world products and processes thereof, discovering new technologies to improve existing products, and finding new opportunities to exploit the technical capabilities and resources of the organization. Most of these topics are beyond the scope of these discussions since they are related to technological innovation.

Product management involves the technical and marketing functions for delivering products and services to existing customers and markets using the organization’s product delivery system. Product management provides information and data to support requests for new products. Depending on the organizational structure, it may have a direct role in leading and/or managing product innovation and new-product development.

In most organizations, current products and services constitute the primary functions and modalities of the product delivery system. The product delivery system consists of the resources and capabilities to produce, market, and deliver the product lines and the related support services for satisfying customers and generating cash flow. The product delivery system includes all of the elements of the value chain necessary to produce and deliver products to customers successfully.¹⁰ The product delivery system is critical to the ongoing success of any organization. It is the flow of products and services to customers that provides the cash flow for sustaining the life-blood of the organization. However, most products and services have a limited life cycle or

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attractiveness in the served markets. Products and services have to be refreshed, reinvigorated, or replaced on a periodic basis to avoid deterioration of market positions or obsolescence.

Product innovation examines the need for innovative products and processes, and the requisite NPD programs. It determines the role that new-product development plays in providing the mechanisms to create change.

The NPD Process

The NPD process is a horizontal construct that links activities and actions for converting inputs into outputs in a systematic way. The NPD process incorporates phases and reviews that ensure a comprehensive progression of accomplishments for creating a new product(s) based on the strategic direction and the operating capabilities and requirements. The NPD process follows a logical flow from the strategic phase, through the development phases, to the product launch.

The NPD process is a prescribed pathway that practitioners use to formulate and implement an NPD program. This book discusses an NPD process that can be described as a “standardized”¹¹ (generic) process. The NPD process includes **phases, steps, activities, and reviews**. The phases are the major areas that include the description, analysis, and development of the action items and are typically followed by a management review and/or approval prior to moving to the next phase.¹² Generally, the phases include the following:

Phases and reviews of the generic NPD process

- *Phase 0. Strategic Logic and Alignment*
- *Phase 1. Idea Generation*
- *Phase 2. Concept Development and Selection*
- *Phase 3. Program Definition*
- *Phase 4. Design and Development*
- *Phase 5. Validation*
- *Phase 6. Pre-commercialization and Launch*

The phases and reviews provide a standardized format for executing the NPD program within the management system. They give management the ability to review and evaluate outcomes without interfering with the normal flow of activities and accomplishments or constraining the creativity of the practitioners. Reviews are flexible activities that may be simple discussions or involved presentations and debates. They are dependent on management style and the criticality of the elements under discussion and awaiting approval.

The phases allow the participants to carry out the specific requirements of the program with flexibility. The activities within the phases are generally accomplished using parallel streams, providing the means to minimize the time and effort spent on individual activities. The format of the book follows the NPD process. Figure 1.2

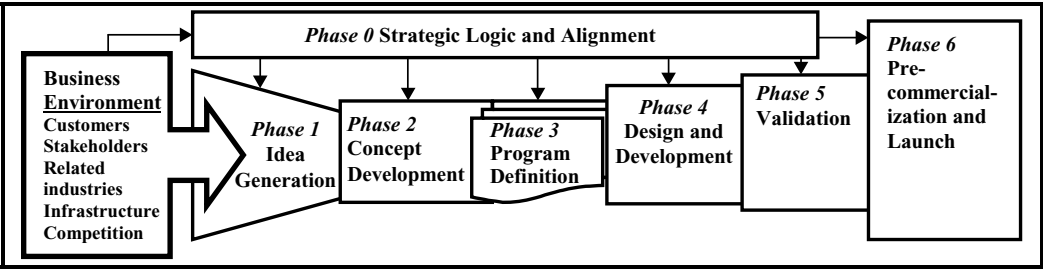


Figure 1.2 The standardized NPD process

provides a general framework for the NPD process. The overarching goals are to develop the new products successfully and to satisfy the needs of the business environment.

For an NPD program, the basic approach is to identify the required phases, steps, activities, and reviews, and to map out a pathway (in series and in parallel) that builds value, minimizes time, and ensures thoroughness. A key to success is to implement as many of the activities as possible on a parallel basis.

The NPD process provides the mechanisms (through phases and reviews) to simplify the flow of the activities into less-complicated, easily understandable steps so that everyone knows what to do. Given that NPD programs tend to be related and have similar requirements, the execution of the NPD process provides answers to the following:

- Why is the new product being developed?
- What is required to develop it?
- When does the new product have to be available in the market?
- Who is responsible for the NPD program and the activities?
- What are the outcomes required to meet expectations and how are they measured?

The NPD process provides structure for ensuring that activities are linked with the upstream and downstream requirements and participants. Decisions are made on the basis of what has to be done and when it has to be accomplished. The NPD process depends on the organizational capabilities and resource management. People perform tasks and get results and they need to have the capabilities and resources to achieve those results.

The framework for product innovation

The framework for managing new-product development provides linkages between the chapters and the flow of the content of this book. The NPD framework provides a unified approach to guide the way to the ultimate results. It is based on the opportunities and challenges in the business environment and the strengths and weaknesses of the organization.