Allan Anderson
Chad McAllister
Ernie Harris

Product Development and Management Body of Knowledge

A Guidebook for Product Innovation Training and Certification

Third Edition

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Product Development & Management Association

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PRODUCT DEVELOPMENT AND MANAGEMENT BODY OF KNOWLEDGE

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Contents

About the Authors

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Allan is currently Emeritus Professor in Product Development in the School of Engineering and Advanced Technology at Massey University, New Zealand. He has extensive experience in product innovation over 40 years in general management, product management, consultancy, and academia. Research, teaching, and application of innovation management in a wide range of organizations internationally has provided Allan with a depth of knowledge and experience across the broad spectrum of practices, processes, and techniques that define product innovation management.

Allan was part of the establishment team for PDMA-NZ in 2007; president of PDMA-NZ until December 2011; was Vice President Asia-Pacific until 2015 and PDMA President and Chairman from 2016 to 2019; has NPDP certification; and is an accredited NPDP training provider. Allan's passion for product innovation education prompted his active involvement in the expansion of PDMA's New Product Development Professional Certification (NPDP) into new markets including China, India, and Indonesia. In 2016, he compiled the first edition of PDMA's Body of Knowledge (BoK) which laid the foundation for the second edition in 2019 and for this, the third edition.

Chad McAllister, PhD, PMP, NPDP, CIL

Chad is a recognized Top 40 Product Management Influencer and a Top 10 Innovation Blogger. He is the host of *Product Mastery Now,* a top-1% business podcast enjoyed by thousands of product managers, leaders, and innovators since 2014. Each week he provides a valuable discussion exploring topics that equip you for success. Find the podcast on your favorite podcast player by searching for *Product Mastery Now,* or at www.ProductMasteryNow.com.

With 30+ years of product experience, he helps product managers and leaders move toward product mastery, creating greater value for customers and their organizations. He frequently works with product teams, facilitating their move to higher performance. He also teaches product and innovation management graduate courses at Boston University, Colorado State University, University of Fredericton, and other universities. He holds two degrees in Electrical Engineering, a PhD in *Innovation*, and professional certifications from PMI (Project Management Professional), PDMA (New Product Development Professional), and AIPMM (Certified Innovation Leader). Connect with Chad via LinkedIn at https://www.linkedin.com/in/chadmcallister/.

Ernie Harris

For more than 30 years, Ernie has been involved in new product innovation in the software and services industry. Ernie was part of the establishment of the PDMA Tampa chapter in Florida and since joining PDMA in 2007 has gone on to serve in many capacities. Ernie has chaired PDMA's International Innovation conference, founded multiple chapters, and served as the Treasurer for the PDMA International Board of Directors. In 2019, he was elected President and Chairman of PDMA International where he helped build on the foundation of PDMA's international growth through education and certification. Working closely with the Board of Directors and many others, he also helped to expand PDMA into countries like Turkey, Egypt, and more.

Ernie holds the NPDP certification and sits on the International NPDP certification committee supporting the global NPDP exam. He has traveled on behalf of PDMA as a recognized innovation leader speaking on innovation management best practices in China.

Ernie currently serves as the President and Chief Operating Officer of a leading Third-Party Administrator offering employee benefits administration solutions to employers in the United States of all sizes.

Acknowledgments

PDMA's Body of Knowledge is founded on over 40 years of research and application of "best practices" in product innovation and product management. Those who have contributed to the evolution of PDMA's Body of Knowledge are far too many to list individually. We are reminded of Sir Isaac Newton's saying, "If I have seen further, it is by standing on the shoulders of giants." Thank you to all the PDMA "giants" who have made BoK3 a reality.

Following is specific acknowledgement to those who have been directly involved in the preparation of BoK3**.**

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CASE STUDIES

Thanks to the following who have provided case studies for BoK3, presented in Appendices B and C:

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Market Research: OBO Hockey Equipment, Simon Barnett
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Introduction

The Product Development and Management Association (PDMA) is proud to introduce the 3rd edition of its Body of Knowledge (BoK).

1 ABOUT PDMA

The Product Development and Management Association (PDMA) was founded in 1976. Founded in the USA, it has International Affiliates in Europe, South/Central America, and Asia/Pacific. It is the premier association worldwide for everyone involved in product innovation.

Membership includes practitioners, academics, and service providers and represents a broad cross-section of product and service industries, both "business-to-business" (B2B) and "business-to-consumer" (B2C). Members come from many industries, with a few including:

- Consumer goods
- Heavy machinery
- Information Technology
- Food and beverage
- Banking
- Healthcare
- Software
- Consultancy

Central to PDMA is its Body of Knowledge (BoK). This book is the guide to the PDMA BoK. PDMA also provides a professional qualification, the New Product Development Professional (NPDP) certification. Earning the certification demonstrates competency in the BoK concepts.

The BoK is founded on a broad spectrum of independent research, gathered by PDMA globally, from academic and practitioner sources, over the past 50 years. These include:

- **The Journal of Product Innovation Management:** an interdisciplinary, international journal that seeks to advance theoretical and managerial knowledge of innovation management and product development. The journal publishes original articles on organizations of all sizes (start-ups, small to medium-sized enterprises, and large corporations) and from the consumer, business-to-business, and policy domains.
- **The PDMA Knowledge Hub (kHUB):** a website of resources facilitating the creation and exchange of product management and development knowledge and best practices.
- **The Outstanding Corporate Innovators Award (OCI):** a rigorous assessment of the innovation capabilities of award applicants. The award-winning company or companies have created and captured long-term value through product and service innovation, demonstrating their innovation leadership.
- **Research forums and Conferences:** virtual and in-person meetings organized to facilitate the global exchange of ideas and practices among thought leaders.
- **Publications covering a range of topics:** PDMA explores current and emerging topics through a variety of publications. These are listed at the end of this introduction.

- **Best Practice Surveys:** these research studies started in 1997 and are conducted globally on a regular basis. The survey results identify the factors leading to high product innovation performance in organizations. Specifically, the results identify what is different between the *best*-performing organizations and the *rest*, lower-performing organizations.

The latest PDMA Best Practice Survey (Bsteiler & Noble, 2023) provides a compelling finding in support of the imperative for ongoing improvement in product innovation practices.

PDMA Best Practice Survey 2021 Finding

"The overall NPD [New Product Development] success rate (59.6%) has not changed materially in 30 years of PDMA's Best Practice surveys. Although many differences between the Best and the Rest are statistically significant, the absolute differences are not that large. Numerous new tools and practices such as stage-gate, concurrent, waterfall, and agile product development processes, Voice-of-the-Customer research, virtual team management, and electronic communication techniques and advanced digital development tools, have been implemented by firms, and they have improved the efficiency and effectiveness of NPD programs. Together, these results imply that all firms must continually evolve their NPD capabilities just to "stay in the game" as circumstances and the environment change."

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2 ABOUT THIS BOOK

PDMA's 3rd edition of its Body of Knowledge (the BoK3) is designed to present a holistic view of Product Innovation Management, discussing individual components and their integration into the whole.

The Product Development Handbook, 4th edition (also published by PDMA) presents an Innovation Management (IM) Framework to help new product development managers identify those activities required to be a successful innovator (Markham, 2023). The IM Framework (Figure 1) was developed by the Center for Innovation Management Studies (CIMS). It describes a systematic way to think about managing innovation, breaking it down into competencies across several dimensions that can be learned, practiced, measured, and improved.

Levels:
- Firm
- Industry
- Macroenvironment

Dimensions:
- Strategy
- Organization and culture
- Processes
- Techniques and tools
- Metrics

Competences:
- Idea management
- Market management
- Portfolio management
- Platform management
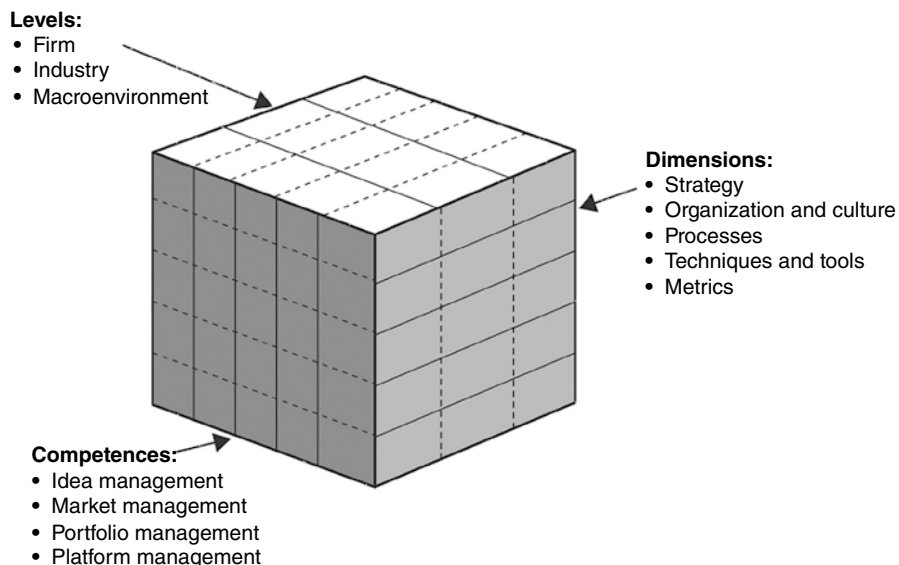
FIGURE 1   An innovation management framework.
Source: Markham, 2023 / John Wiley & Sons.

3 THE BOOK STRUCTURE

Inspired by the IM Framework, BoK3 provides a structured description of the key activities involved in product innovation management, comprising an "end to end" description of the product innovation: product strategy, portfolio management, product innovation processes, product design and development, market research, and organizational culture. All are presented in the context of an overall framework of product innovation management.

BoK3 is divided into seven chapters, diagrammatically presented in Figure 2. At the center of the figure is strategy, which defines the direction and goals for product innovation. This provides the basis for the product innovation portfolio, for the process leading to individual new products, and the consequent management of these products through their life cycles. Contributing at all levels of strategy, portfolio, and life cycle management are market research, specific tools for design and development, and people (culture, organization, leadership, and teams).
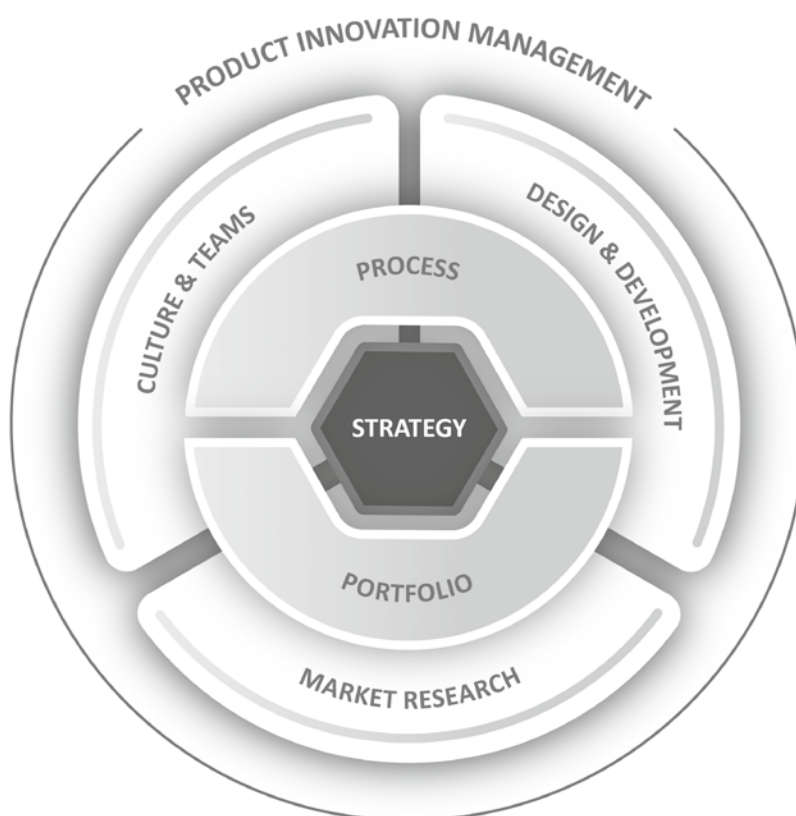
FIGURE 2   The seven chapters of PDMA's BoK3

A brief outline of each chapter is provided below:

Chapter 1 Product innovation management

The first chapter addresses the role of product innovation management. The first part defines product innovation and the key factors that lead to successful products. The breadth of the product innovation management role is discussed, together with the skill sets and knowledge required to manage across a range of disciplines and functions and how this differs from project management. Management of product innovation through the stages of the product life cycle – development,

introduction, growth, maturity, decline, and retirement – is addressed with a focus on the product innovation strategies required at each stage. The second part focuses on the product life cycle and how product innovation is managed through this life cycle. While specific tools and techniques are discussed in other chapters, specific reference in this chapter is placed on road-mapping – product and technology, and light coverage of project management with reference to the Project Management Institute's PMBoK (2021).

Throughout BoK3, we emphasize the fundamentals for successful product innovation. There is no single recipe that can be used across all organizations. The third part of this chapter discusses the development and application of product innovation metrics, particularly how these form critical ingredients in organizational learning and continuous improvement.

Chapter 2 Strategy

The strategy chapter covers various strategies, from corporate, business, and functional strategies. An emphasis is placed on the innovation strategy, particularly as it sets out the framework and provides direction for product innovation. The benefits and limitations of specific innovation strategic frameworks are discussed. The role of supporting strategies from technology, marketing, platforms, intellectual property, and capability are presented, both as being directed by higher-level business strategy and in their mutual contribution to the overall business strategy.

Chapter 3 Portfolio management

The portfolio management chapter relates strategy to project selection, selecting the right innovation projects for the organization. A product portfolio is defined as the set of current and potential new products that can form the basis for a program of product innovation, including product improvement, cost reductions, line extensions, and new-to-the-company products.

Methods for project selection are presented, both as a means of assessing project potential and of achieving strategic alignment regarding individual project prioritization and balance across specific categories of product innovation. Portfolio management is presented as a cross-functional activity that encompasses the development of new products through to launch and the ongoing review of existing products to ensure optimal alignment with strategy and resource availability.

Chapter 4 Product innovation process

Rapid changes in technology, communication, and market demands have placed considerable pressure on companies to become more effective and efficient in their product innovation. A greater understanding of the success factors for new product innovation has resulted in the application of a range of new product processes to specific contexts. This chapter outlines many of these processes, including Stage-Gate®, Concurrent Engineering, Integrated Product Innovation, Hybrid Agile-Stage-Gate, Lean, Agile, and Lean Startup. The benefits and limitations of each process are discussed, and specific contexts for application are recommended. Reference is made to the tools and metrics that are required to underpin a successful new product process.

Chapter 5 Product design and development

This chapter focuses on the Design and Development stage of the product innovation process. The chapter is divided into two sections: Design (concept and embodiment design) and Development (specifications, usability testing, performance testing, endurance testing, quality assurance, design for manufacture and assembly, and design for sustainability). The evolution of the product through each of these phases is discussed, and specific tools are introduced together with their benefits and limitations. Some of these tools are applicable across a range of industries and products, while others are more specific in their application.

Chapter 6 Market research in product innovation

Market research is required to provide market-related information and data to underpin decision-making in all aspects of strategy development, portfolio management, product design and development, and life cycle management. The application of market research extends across the full cycle of product innovation, from initial idea generation to final product launch and post-launch reviews. This chapter covers a range of market research tools, including primary vs. secondary research, qualitative vs. quantitative, focus groups, customer site visits, ethnography, consumer panels, social media, big data, crowdsourcing, alpha and beta testing, biometric methods, multivariate techniques, and market testing. The benefits and limitations of each tool are discussed together with their potential for application at various stages of product innovation. Specific emphasis is placed on the accuracy and reliability of the various tools and their value in decision-making.

Chapter 7 Culture and teams

It is widely recognized that new product innovation cannot be successful through good processes alone. Success is dependent on people, the culture of the company, and the environment that is created to foster innovation. This chapter outlines the characteristics of an innovative culture. It also focuses on the requirements for a high-performing team and of team structures to support cross-functional teams in an innovative environment and in different project contexts, including virtual. Management roles and responsibilities at various levels and within different stages of product innovation are also discussed.

4 WHAT IS NEW IN BoK3?

New product innovation techniques and practices are continually being developed. PDMA is committed to keeping abreast of this through a periodic update of its BoK. This, the 3rd edition, succeeds the 2nd edition published in 2020. Following is a summary of changes made in this latest edition:

1. Although much of the concepts remain unchanged from previous editions, emphasis in BoK3 has been placed on the interrelationships between content across the various chapters, thus providing a greater appreciation of how individual components of the BoK work in concert to deliver improved product innovation performance. Examples and case studies have also been added to provide relevance and application of specific techniques and processes. This includes an appendix summarizing the practices of PDMA's Outstanding Corporate Innovators award winners (Appendices B and C).
2. *Chapter 1,* Product Innovation Management provides an overview of the Product Innovation Management role and a context for the remaining chapters of the BoK3. The basic content remains much the same, moved from Chapter 7 in BoK2, with greater details in some areas, including product life cycle management and benchmarking for continuous improvement. Feasibility analysis and financial valuation have been moved from this chapter to Chapter 3, Portfolio Management.
3. *Chapter 2* has added Porter's 5 forces to the Strategy Framework section, and the Digital Strategy and Open Innovation section have been expanded.
4. *Chapter 3*, Portfolio Management has been re-structured based on four goals of portfolio management: *value maximization, business strategy alignment, balance*, and *the right number of projects*. Although some may argue that *ideation* is not strictly part of portfolio management, we have included it at the beginning of Chapter 3 to demonstrate its relationship with and value to portfolio management. Chapter 3 also includes an extensive discussion of financial analysis as applied to selection of projects to be included in the product portfolio. Some new techniques have been added to this section – *Bang for Buck Index*, *Expected Commercial Value*, and *Options Pricing Theory*. Other new topics included in this chapter include the challenges of adapting traditional portfolio management to dynamic processes such as *agile* and hybrid *Agile-Stage-Gate*.

5. *Chapter 4*, Product Innovation Process, places greater emphasis on the *front end of innovation (FEI)* and the *product innovation charter (PIC)* in providing context at the start of the chapter. Discussion of most processes included in previous editions continues in BoK3 with the addition of benefits and limitations of each process. The sections on *design thinking*, *lean product innovation,* and *hybrid models* have been extended. A new section on *jobs to be done* has been added. The chapter concludes with a comparison of the various processes and a discussion of the question, "*is there a right process*?".

6. *Chapter 5*, Design and Development, although focusing on most of the tools discussed in previous editions, has been structured into two sections: *design* and *developmen*t. This is intended to better describe the stage of application and the contribution of each tool to the design and development stages of product innovation.

7. *Chapter 6*, Market Research includes most of the tools as the previous edition, expanding sections including biometrics-based methods and multivariate techniques. Summaries of the strengths and weaknesses of most techniques have been added.

8. *Chapter 7*, Culture and Teams addresses similar topics as the previous edition with the addition of examples and expansion of the *virtual team* section.

5 WHO WILL BENEFIT FROM THIS BOOK?

PDMA's BoK provides a singular reference for anyone currently involved in or planning a career in product management and product innovation. It provides a proven framework for product innovation which can be applied to a wide cross-section of product and service industries at various levels of an organization, including and not limited to:

- Senior executives
- Product managers
- Brand managers
- Product owners
- Portfolio managers
- Program managers
- Project managers
- Business analysts
- Product designers
- Product developers
- Educators and trainers

6 HOW TO READ THIS BOOK?

The book is organized in a logical manner from the beginning to the end. You can read it straight through and be introduced to the topics (practices, concepts, tools, processes, and methodologies) that lead to successful product innovation. If you are new to product innovation or beginning a career that emphasizes innovation, you will gain a better understanding of how the topics relate to each other by reading the chapters in order. Perhaps unexpectedly, we suggest the same reading order for those moving into an innovation leadership role. Many practitioners have found the tremendous breadth of topics presented in BoK3 allows them to integrate their previous experiences while strengthening a strategic perspective they must have as leaders. The need for strategic thinking is both blatant and subtle throughout the chapters. For the strategic thinker, the chapters are organized like scaffolding, with later chapters building upon previous chapters.

However, suppose you already have product innovation knowledge and experience, and your immediate needs don't involve moving into a leadership role. In that case, you will find benefit in reading specific chapters to meet your needs. For example, if viable product ideas are failing to gain support and resourcing, the Strategy topics in Chapter 2 along with the project selection topics in Chapter 3 are essential to apply. If proper team formation or fostering an innovation culture are where current challenges are, skip to Chapter 7 to learn about both topics. So, if you have a clear immediate need and already possess a reasonable framework for product innovation, skip to the chapter(s) addressing your needs.

7 WHAT IS A PRODUCT?

A product is a term used to describe all goods, services, and knowledge comprising bundles of attributes (features, functions, benefits, and uses). A product can be tangible, as in the case of physical goods; intangible, as in the case of those associated with service benefits; or can be a combination of the two.

Products are classified into two categories: Consumer and Industrial. Each of these are divided into further categories as shown in Figure 3.
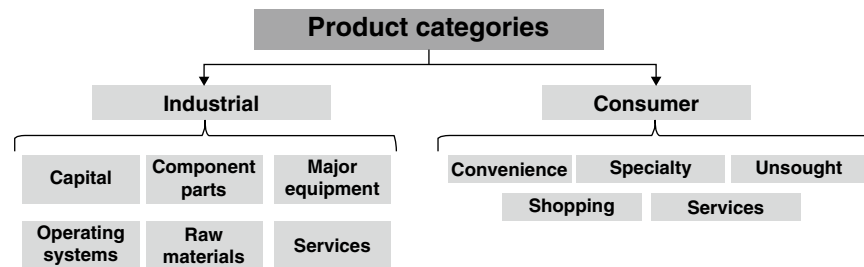
FIGURE 3   Types of products

Consumer Products

Consumer products can be further classified as convenience products, shopping products, specialty products, unsought products, and services:

- **Convenience products** are purchased by consumers repeatably and without much thought. Once consumers choose their convenience products, they typically keep to it unless they see a reason to switch — such as an interesting advertisement that compels them to try it or mere convenience at the checkout aisle.
- **Shopping products** include higher-end items like cars or houses or smaller items like clothing and electronics. Consumers typically spend more time conducting research, comparing prices, and chatting with salespeople when they're looking to purchase shopping goods. These are more one-off purchases and are typically more important and higher economic-impact products compared to toilet paper, soap, and other convenience products.
- **A specialty product** is the *only* one of its kind on the market, which means consumers typically don't feel the need to compare or deliberate as much as they would with other products. Examples include the iPhone or Mercedes car, where consumers have become dedicated to a specific brand.
- **Unsought products** are those that people aren't typically *excited* to buy and, don't buy on impulse. Good examples of unsought goods include fire extinguishers, batteries, and life insurance.
- **Services** normally should not be considered as a separate product classification. Depending on the particular service, they are either consumer or industrial goods. They are activities, benefits, or satisfactions offered for sale or are provided in connection with the sale of goods.

Industrial Products

Industrial products can be further classified into capital, raw materials, component parts, major equipment, accessory equipment, operating supplies, and services.

- **Capital products** are directly used in production. Capital goods consist of installations and accessory equipment. Buildings, plants, and machinery are examples of installations.
- **Raw materials** are used in the making of other products. This category includes natural resources such as forest products, minerals, water, oceanic products, agricultural products, and livestock. In most instances, raw materials lose their individual identities when used in the final product.

- **Component parts**, unlike raw materials, parts usually have been processed before being used in the finished product. Although they may not be visible, parts are left intact and assembled into the total product.
- **Major equipment** comprises industrial products used to make, process, or sell other goods. These include machinery, typewriters, computers, automobiles, tractors, engines, and so on. This equipment includes industrial products used to facilitate the production process or middleman sales. It does not become part of the finished product but aids in the overall production or selling effort.
- **Accessory equipment** includes tools, shelving, and many other products that tend to have a lower cost and shorter life than major equipment.
- **Operating supplies** include office stationery, repair, and maintenance items. Supplies can be treated as convenience products of the industrial market as they are purchased with minimal effort.
- **Industrial services** include maintenance and repair services, factory premise cleaning, office equipment repair, and business consultancy services. These services are generally provided through contracts by small producers and manufacturers of the original equipment.

The Scope of the BoK

The fundamental principles and framework used in this book are applicable to all the above categories and for profit and not-for-profit organizations, with the application of specific techniques and the emphasis with which they are applied.

The definition of a *new product* as applied in the BoK

The PDMA BoK regards a *"new product"* as being a product that is new in any aspect. This includes improvement to an existing product, a line extension, a new to the organization product or a new to the world product.

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8 WHAT IS PRODUCT INNOVATION?

Innovation is turning a creative idea into value.
Product innovation is the creation and subsequent introduction of a good or service that is either new or an improved version of previous goods or services.

In BoK3, product innovation is used as an all-embracing term to include all aspects of bringing a product to market from strategy and initial idea through to commercialization, and includes the processes and tools required throughout. It encompasses product improvement, line extensions, cost reductions, and new-to-the-company products.

Although the term product innovation specifically refers to *product*, most of the principles discussed throughout the book are equally applicable to services and not only products (either where the service is a product in its own right or where the service is part of a product offering).

The scope of product innovation

Put simply, successful product innovation is about choosing the right products to develop (doing the right things) and using the right processes, practices, and tools to develop the products (doing things right). Figure 4 extends this to include the essential ingredients of people (culture, organization, and teams), and performance metrics used as a basis for continuous improvement.
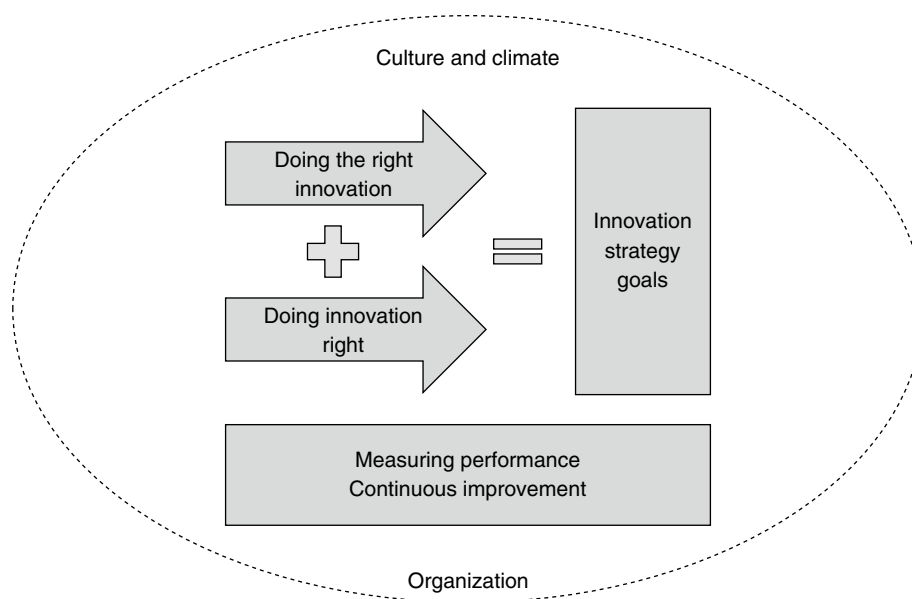
FIGURE 4   A macro view of product innovation

9 THE ROLE OF PRODUCT INNOVATION IN THE ORGANIZATION

Most organizations rely on their products or services for both sustenance and growth. The ongoing review and refreshing of an organization's product offering, through product improvement and new product innovation, is fundamental to its survival. New products and services are frequently referred to as the *lifeblood* of an organization, providing new revenue. Here are some insights from business leaders about the value of product innovation:

- "Investing in new product innovation and expanding the product catalog are the most difficult things to do in hard times, and also among the most important." *Bill Hewlett and David Packard*.
- "I would rather gamble on our vision than make a 'me too' product." *Steve Jobs*.
- "We see our customers as invited guests to a party, and we are the hosts. It's our job to make every important aspect of the customer experience a little better." *Jeff Bezos, founder of Amazon*.
- "I think that too often, companies tend to have engineers working in individual cubes. They are isolated. They often don't see themselves as part of a larger process with a complex web of interdependencies." *Jim Morgan, senior advisor, Lean Enterprise Institute*.

10 APPLICATION OF PDMA'S BODY OF KNOWLEDGE

The BoK has been applied in several ways, including self-learning for career advancement, personal and in-company training, university courses, and its major focus, preparation for PDMA's professional certification, the NPDP.

11 THE NEW PRODUCT INNOVATION PROFESSIONAL CERTIFICATION (NPDP)

The NPDP was first introduced in 2001, mainly in the USA. It is now a recognized qualification for product management and product developers worldwide.

Detailed information on the NPDP can be obtained from the Certification section of the PDMA website: www.pdma.org.

The Benefits of Certification:

For *individuals***:** Confirms mastery of product innovation principles and best practices leading to professional advancement, new job opportunities, and greater remuneration.
For *management***:** Identifies those who have the product innovation skills and knowledge to move into leadership roles.
For **organizations:** Promotes better product innovation discipline, leading to greater new product success with associated obvious benefits.

About the Examination

The exam consists of 200 multiple-choice questions. The allocation of questions across the seven chapters of the BoK.
To pass the examination, 150 questions must be answered correctly (75 percent).

12 RELATED PDMA BOOKS

BoK3 is a guide to the product innovation body of knowledge, drawing on research and practice from multiple sources, including other PDMA resources. Over a number of years PDMA has supported the publication of a range of books related to product innovation. For additional information, refer to the PDMA website at www.pdma.org.

PDMA Toolbook 1
The first of the Toolbook series, it provides practical cross-functional coverage of the entire product innovation process from idea generation through delivery of the final assembled product. Includes sections on benchmarking and changing your new product innovation process and managing your product portfolio (Belliveau et al., 2002).

PDMA Toolbook 2
This book covers all aspects of product innovation, from the creation of the concept through development and design to the final production, marketing, and service (Belliveau et al., 2004).

PDMA Toolbook 3
The third volume in the Toolbook series covers the best practices of product innovation, including critical aspects of product innovation from the creation of the concept through development and design, to the final production, marketing, and service (Griffin & Somermeyer, 2007).

PDMA History, Publications, and Developing a Future Research Agenda
This book describes the many publications that PDMA has created and provides influences that may impact the future of PDMA itself (Hustad, 2013).

PDMA Handbook of New Product Development 3rd Edition
The handbook provides a comprehensive picture of what managers need to know today for effective new product innovation (Kahn et al., 2013).

Open Innovation: New Product Innovation Essentials from the PDMA
Many organizations have adopted Open Innovation. This book provides a comprehensive guide to the theory and practice of Open Innovation (Griffin et al., 2014).

Design Thinking: New Product Innovation Essentials from the PDMA

This is a guide to better problem-solving and decision-making in product innovation and beyond. You'll learn how to approach new product innovation from a fresh perspective, with a focus on systematic, targeted thinking that results in a repeatable, human-centered problem-solving process (Luch et al., 2015).

Leveraging Constraints for Innovation

This PDMA Essentials Book, the third in this series, provides a framework of individual, organizational, market, and societal constraints that guides managers in identifying specific constraints related to their innovation activities, and provides them with corresponding tools and practices to overcome and leverage those constraints (Gurtner et al., 2018).

PDMA Handbook of New Product Development and Innovation 4th Edition

The 4th edition continues in providing an updated contribution to product innovation professionals for effective new product innovation, "revisiting familiar topics with fresh approaches and insights and will likely introduce you to entirely new concepts that take you to the leading edge of this exciting world of new product development and innovation" (Bsteiler & Noble, 2023).

13 THE 10 PRINCIPLES OF SUCCESSFUL PRODUCT INNOVATION

There is no singular recipe for product innovation success. The diversity of industry, organizational size and structure, products and services, markets, internal capabilities, geographic spread, and external environment are some considerations that preclude a "one size fits all" approach to applying product innovation processes and practices. However, there are some basic principles that provide a foundation for success, irrespective of organizational differences. Based on concepts in this book, the principles are:

1. **People first**, affirmed by the creation and maintenance of the right culture and climate to enable the successful application of process and practice, not vice versa.
2. **Empower all employees** to identify opportunities for creating new value instead of designating specific individuals or teams as the sole innovators.
3. **Clarity of direction**, provided through a well-developed organizational strategy and vision, communicated to, and understood by the whole organization.
4. **Effective product portfolio management**, ongoing, and founded on clear strategic goals and criteria throughout all stages of the Product Life Cycle. This includes rigor in selecting the right projects, managing resources responsibly, and investing in the future.
5. **A product innovation process or processes** tailored to the specific needs of teams and the whole organization, well communicated, understood, and adhered to.
6. **A strong emphasis on the Front End of Innovation** to ensure that continuation to the more expensive and risky stages of product innovation is well founded.
7. **A strong focus on the customer**, capturing the voice of the customer throughout product innovation with the application of appropriate market research techniques.
8. **Development and maintenance of high-performing teams**, based on cross-functional membership and the practices that create high performance (i.e., trust, accountability, positive conflict, result-focused, clear communications, and appropriate recognition/rewards).
9. **A strong focus on sustainability**, including the triple bottom line or the three Ps of People, Profit, and Planet.
10. **Continuous improvement** through applying performance metrics and benchmarking that underpin a culture of learning, both from successes and failures.

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Product Innovation

Management

Maximizing the return from product innovation through application of sound management practices throughout the product life cycle

WHAT YOU WILL LEARN IN THIS CHAPTER

This book presents a comprehensive overview of product innovation from the definition of clear strategic goals, through the development of a balanced portfolio to the processes required for successful new product outcomes. Supporting this overall product innovation framework are the tools related to design and development, market research, business analysis, culture, teams, and leadership. This breadth of activities requires input from, and coordination of, wide-ranging disciplines, making management of product innovation both complex and challenging. In this chapter, we present the key factors for product innovation success and the attributes required in Product Innovation Management from strategic planning to initial product concept through to launch and onwards through the product's entire life cycle.

CHAPTER ROADMAP

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┌─────────────────────────────────────┐
│   What is product innovation?        │
│   What are the critical success      │
│   factors for product innovation?    │
└─────────────────────────────────────┘
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┌─────────────────────────────────────┐
│  What makes product innovation       │
│  management so complex and           │
│  challenging? What management        │
│  structures are used for product     │
│  innovation?                         │
└─────────────────────────────────────┘
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┌─────────────────────────────────────┐
│  What is the role of the product     │
│  manager in product innovation?      │
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What skill set is required for a product manager?	What is the difference between a product manager and a project manager?	How does the product manager's role relate to the content of this BoK?

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┌─────────────────────────────────────┐
│  What is the Product Life Cycle      │
│  (PLC)? What are the specific        │
│  stages of the PLC?                  │
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What is the impact of the PLC stages on cash flow?	What are the different categories of customer adoption throughout the PLC?	What strategies can be used at different stages of the PLC?	What is the impact of the PLC on the product portfolio?

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┌─────────────────────────────────────┐
│  What is the product manager's role  │
│  at different stages of the PLC?     │
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┌─────────────────────────────────────┐
│  What is "Chasm" – the critical      │
│  stage of the PLC before growth      │
│  kicks in? How best to cross the     │
│  Chasm? Go-to-market processes.      │
└─────────────────────────────────────┘
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┌─────────────────────────────────────┐
│  What are product and technology     │
│  roadmaps? How are these used in     │
│  product management?                 │
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┌─────────────────────────────────────┐
│  What are the basic principles of    │
│  project management and risk         │
│  management as applied to product    │
│  innovation?                         │
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┌─────────────────────────────────────┐
│  How are metrics and key performance │
│  indicators used for continuous      │
│  improvement in product innovation?  │
└─────────────────────────────────────┘
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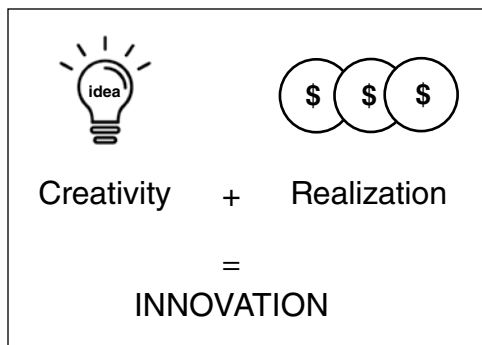
1.1 WHAT IS PRODUCT INNOVATION?

To best understand product innovation, let's break the term into two components.

Innovation is the combination of *creativity* and *realization*, as shown in Figure 1.1.

Creativity   +   Realization

=

INNOVATION

FIGURE 1.1   Innovation as a combination of creativity and realization

Product innovation is defined as the creation and subsequent introduction of a good or service that is new or an improved version of previous goods or services.

The scope of product innovation from strategy direction through portfolio management and from individual project management through to commercialization, implies a high degree of complexity. It is influenced by a wide range of inputs and variables, some of which are controllable by the organization and others that are not:

- **Controllable:** company culture, strategy, capability, organization, finances.
- **Uncontrollable:** competitors, government policies, international environment.

It involves a cross-section of players:

- **Internal:** board of directors, general management, marketing, sales, engineering/development, production, finance, purchasing.
- **External:** consultants, suppliers, regulators, agents, customer/consumers.

Successful product innovation seldom happens by accident. Reports from a range of sources quote failure rates for new product launches from 40% to 90% (Catstellion & Markham, 2013; Kocina, 2017; Schneider & Hall, 2011). Moreover, a large proportion of financial and human resources devoted to product innovation are focused on products that will fail in the marketplace.

PDMA's 2021 Best Practice Survey concludes that organizations ". . .must continually evolve their NPD capabilities just to stay in the game" (Knudsen et al., 2023).

1.1.1 Variation Across Industry and Product Sectors

This book focuses on a basic framework and core principles that are generally applied across all industries and product sectors. Strategic planning, portfolio management, a defined product innovation process, appropriate design and development tools, the voice of the customer, and an over-arching innovation culture and environment are fundamental to successful product innovation, irrespective of industry and product. The specific application of each of these fundamental elements will vary among industries and product sectors and even between organizations within the same sector, as each seeks to apply the most fit-for-purpose practices for their specific organization.

> ## Introducing the Core Principles of Product Innovation Management
>
> Although examples of the application of various practices in different sectors are provided, emphasis throughout is placed on providing an understanding of the core principles and encouraging the reader to explore how these principles might best be applied within their specific context.

1.1.2 Critical Factors for Product Innovation Success

Results from PDMA benchmarking studies (Markham & Lee, 2013; Knudsen et al., 2023) point to the following differentiating factors for organizations that are high performers in product innovation:

Innovation culture in the best companies:

- Failure is an understood aspect of innovation.
- Managers establish objectives.
- Innovation is considered in recruitment.
- External sources are used.
- Innovation and risk-taking are valued.
- Constructive conflict is encouraged.
- Internal communication is effective.

New product strategy in the best companies:

- Use a well-defined new product strategy to direct all new product innovation activities.
- Likely use a "first to market" strategy.
- Are more likely to focus on sustainability.
- Are more likely to apply intellectual property considerations.
- Apply a global business model (operations in multiple countries).

Portfolio management in the best companies:

- Use portfolio management tools to select projects and to ensure ongoing balance across projects:
  - Radical vs. incremental innovation.
  - Low vs. high risk.
  - New vs. existing markets.
- Specific tools used include:
  - Scoring models.
  - Strategic buckets.
  - Financial models.

New product process in the best companies:

- Use formal, cross-functional processes.
- Continuously re-design the process.
- Use specialized structures to drive new product innovation.
- Adopt flexibility according to product category.
- Have senior managers who understand and support the new product's process.

The front end of innovation in the best companies:

- Spend considerably more effort to understand customer needs.
- Use formal processes for idea assessment (recognizing the importance of making the right decisions at this early stage).

- Use open innovation to gather and develop new ideas.
- Use social media – discussion forums, blogs, innovation hubs, wikis, etc. – to gather customer information and opinion.

Development tools in the best companies:

- Use market research tools significantly more.
- Use engineering design tools more frequently.
- Place more emphasis on project planning tools.

Measures and metrics in the best companies:

- Use formal metrics for measuring and reporting on new product performance.
- Use metrics for both outputs and processes:
  - **Outputs:** such as profits from product innovation over the past five years.
  - **Process:** such as milestones on time or time to market.
- Use metrics as a basis for learning and continuous improvement.

Cooper (2023) provides further insight into *what separates winners from losers* in Chapter 1 of PDMA's 4th edition of its Handbook of Innovation and New Product Development (Bsteiler & Noble, 2023). He summarizes these drivers for success under three headings as shown in Tables 1.1–1.3:

1. Success drivers of individual new-product projects.
2. Drivers of success: organizational and strategic factors.
3. The right systems, process, and methodologies.

TABLE 1.1   Success drivers of individual new-product projects

Driver name	Success driver description
1. Product advantage	A unique superior product – a differentiated product that delivers unique benefits & a compelling value proposition to the customer or user; also the role of "smart products"
2. VoC	Building in the voice-of-the-customer – market-driven & customer-focused NPD
3. Up-front homework	Pre-development work – doing the homework & front-end loading the project; doing the due diligence before Development gets underway
4. Product definition	Sharp, early, & fact-based product definition to avoid scope creep & unstable specs; leads to higher success rates & faster to market
5. Iterative development	Building into the project a series of "build & test" iterations; putting something in front of the customer, early & often, to get the product right; early & frequent technical validations of versions of the product
6. Speed & order of entry	The impact of speed and time to market; timing & the order of market entry (first to market)
7. Agility	Responsive to making rapid changes in the portfolio of projects; able to react to changing customer needs; ability to pivot from the original plan of action
8. Proficient launch	A well-conceived, properly executed market launch, driven by a solid, properly resourced marketing plan
9. Global orientation	A global or "glocal" product (global platform, tailored for local markets) and targeted at international markets (as opposed to the product designed to meet home-country needs)
10. Expectations of success	Expect success, get success – success is a self-fulfilling prophecy: when project team members expect success, they are empowered & thus realize success

Source: Cooper, 2023 / John Wiley & Sons.