

Strategic Management of Technological Innovation

Seventh Edition

Melissa A. Schilling

New York University





STRATEGIC MANAGEMENT OF TECHNOLOGICAL INNOVATION, SEVENTH EDITION

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Melissa Schilling is the John Herzog family professor of management and organizations at New York University's Stern School of Business. Professor Schilling teaches courses in strategic management, corporate strategy and technology, and innovation management. Before joining NYU, she was an Assistant Professor at Boston University (1997–2001), and has also served as a Visiting Professor at INSEAD and the Bren School of Environmental Science & Management at the University of California at Santa Barbara. She has also taught strategy and innovation courses at Siemens Corporation, IBM, the Kauffman Foundation Entrepreneurship Fellows program, Sogang University in Korea, and the Alta Scuola Polytechnica, a joint institution of Politecnico di Milano and Politecnico di Torino.

Professor Schilling's research focuses on technological innovation and knowledge creation. She has studied how technology shocks influence collaboration activity and innovation outcomes, how firms fight technology standards battles, manage platform ecosystems, and utilize collaboration, protection, and timing of entry strategies. She also studies how product designs and organizational structures migrate toward or away from modularity. Her most recent work focuses on knowledge creation, including how breadth of knowledge and search influences insight and learning, and how the structure of knowledge networks influences their overall capacity for knowledge creation. Her research in innovation and strategy has appeared in the leading academic journals such as *Academy of Management Journal*, *Academy of Management Review*, *Management Science*, *Organization Science*, *Strategic Management Journal*, and *Journal of Economics and Management Strategy and Research Policy*. She also sits on the editorial review boards of *Academy of Management Journal*, *Academy of Management Discoveries*, *Organization Science*, *Strategy Science*, and *Strategic Organization*. She is the author of *Quirky: The Remarkable Story of the Traits, Foibles, and Genius of Breakthrough Innovators Who Changed the World*, and she is coauthor of *Strategic Management: An Integrated Approach*. Professor Schilling won the Organization Science and Management Science Best Paper prize in 2007, an NSF CAREER award in 2003, and Boston University's Broderick Prize for research in 2000.

Preface

Innovation is a beautiful thing. It is a force with both aesthetic and pragmatic appeal: It unleashes our creative spirit, opening our minds to hitherto undreamed of possibilities, while accelerating economic growth and providing advances in such crucial human endeavors as medicine, agriculture, and education. For industrial organizations, the primary engines of innovation in the Western world, innovation provides both exceptional opportunities and steep challenges. While innovation is a powerful means of competitive differentiation, enabling firms to penetrate new markets and achieve higher margins, it is also a competitive race that must be run with speed, skill, and precision. It is not enough for a firm to be innovative—to be successful it must innovate better than its competitors.

As scholars and managers have raced to better understand innovation, a wide range of work on the topic has emerged and flourished in disciplines such as strategic management, organization theory, economics, marketing, engineering, and sociology. This work has generated many insights about how innovation affects the competitive dynamics of markets, how firms can strategically manage innovation, and how firms can implement their innovation strategies to maximize their likelihood of success. A great benefit of the dispersion of this literature across such diverse domains of study is that many innovation topics have been examined from different angles. However, this diversity also can pose integration challenges to both instructors and students. This book seeks to integrate this wide body of work into a single coherent strategic framework, attempting to provide coverage that is rigorous, inclusive, and accessible.

Organization of the Book

The subject of innovation management is approached here as a strategic process. The outline of the book is designed to mirror the strategic management process used in most strategy textbooks, progressing from assessing the competitive dynamics of the situation, to strategy formulation, and then to strategy implementation. The first part of the book covers the foundations and implications of the dynamics of innovation, helping managers and future managers better interpret their technological environments and identify meaningful trends. The second part of the book begins the process of crafting the firm's strategic direction and formulating its innovation strategy, including project selection, collaboration strategies, and strategies for protecting the firm's property rights. The third part of the book covers the process of implementing innovation, including the implications of organization structure on innovation, the management of new product development processes, the construction and management of new product development teams, and crafting the firm's deployment strategy. While the book emphasizes practical applications and examples, it also provides systematic coverage of the existing research and footnotes to guide further reading.

Complete Coverage for Both Business and Engineering Students

This book is designed to be a primary text for courses in the strategic management of innovation and new product development. Such courses are frequently taught in both

business and engineering programs; thus, this book has been written with the needs of business and engineering students in mind. For example, Chapter Six (Defining the Organization's Strategic Direction) provides basic strategic analysis tools with which business students may already be familiar, but which may be unfamiliar to engineering students. Similarly, some of the material in Chapter Eleven (Managing the New Product Development Process) on computer-aided design or quality function deployment may be review material for information system students or engineering students, while being new to management students. Though the chapters are designed to have an intuitive order to them, they are also designed to be self-standing so instructors can pick and choose from them "buffet style" if they prefer.

New for the Seventh Edition

This seventh edition of the text has been comprehensively revised to ensure that the frameworks and tools are rigorous and comprehensive, the examples are fresh and exciting, and the figures and cases represent the most current information available. Some changes of particular note include:

Six New Short Cases

Netflix and the Battle of the Streaming Services. The new opening case for Chapter Four is about a battle unfolding for dominance in movie and television streaming. Though the case focuses on Netflix, it also details the moves made by competitors such as Amazon Prime Video, Disney, Hulu, and HBO. The case reveals the very interesting synergies Netflix has reaped in being both a content developer and a distributor, and it highlights the tradeoffs content developers make in choosing to have their content exclusive to a particular streaming service.

Failure to Launch at Uber Elevate. The opening case for Chapter Five in the sixth edition was about UberAIR, Uber's plan for launching an air taxi service; the opening case for Chapter Five for the seventh edition is about Uber's withdrawal of plans to launch its own air taxi service and the other companies that are still moving forward. This case highlights the range of challenges in launching something as new as air taxi service. While battery life and flight time are still considered areas that need improvement, the primary challenges to this market are now regulatory and infrastructure oriented: Where will the eVTOLs land? Who will regulate air traffic and how? Will the eVTOLs be too noisy? Will the eVTOLs be manned by pilots or autonomous? It is pretty easy to conclude from the case that Uber probably tried to enter this market too early, but it remains unclear whether the remaining players (who are almost all manufacturing startups dedicated wholly to producing eVTOLs) will fare better.

Zeta Energy and The "Holy Grail" of Batteries. Chapter Eight now opens with a case about Zeta Energy, a young battery technology startup that is in the process of developing a lithium metal sulfur battery. The technology is impressive and the potential markets are huge and diverse (e.g., electric vehicles, grid storage, consumer devices, and drones), but Zeta faces a dilemma of how to reach the stage of commercialization. Battery development is expensive and risky; Zeta has had problems raising enough funding to build the kind of facility it needs to produce the batteries at scale. The case highlights the various partnering strategies Zeta is considering, setting up a nice opportunity for students to analyze the pros and cons of types of collaboration agreements and types of partners.

The Patent Battle Over CRISPR Cas-9 Gene Editing. The new opening case for Chapter Nine is on what has been described as one of the most important patent battles in the last 50 years. CRISPR Cas-9 is a breakthrough technology that enables live animals (including humans) to be gene edited—potentially enabling us to eliminate and/or treat a wide range of diseases. Even more exciting is the fact that the technology itself is relatively inexpensive and simple, prompting a flood of students, researchers, and manufacturers to enthusiastically begin using it. The ownership of the intellectual property rights, however, are contested between a group at Berkeley and a group at MIT. The way each group’s patents were filed, concomitant with the change of patent law, collectively created one of the most interesting—and high-stakes—battles patent lawyers have seen in decades.

How Apple Organizes for Innovation. Chapter Ten now opens with a case that describes how Apple is organized. The case tells the story of when Steve Jobs returned to Apple and dramatically reorganized the firm, yielding a big firm that has a structure that is much more commonly seen in small firms. The case provides detail on why Jobs felt the structure was appropriate, what its tradeoffs are, notably highlighting how much power the structure gives to its top leader. While this was probably a very desirable feature for Jobs, the case raises the question of whether or not the same structure makes sense for Apple under Tim Cook and whether it would make sense for different kinds of firms.

Magna International’s Carbon Fiber “Lightweighting” Project. The opening case for Chapter Twelve describes in detail how Magna International, a Tier 1 automotive supplier, developed a scalable manufacturing method for carbon fiber auto parts in response to BMW’s announcement of its intentions to build cars with the new material. With details and quotes from Tom Pilette, the VP of Product and Process Development of Magna who led the project, we learn about how the team was assembled and managed, how the team culture evolved, how team members were compensated, and more. BMW ends up deciding to make carbon fiber composites in house rather than buying from a supplier, but Magna’s efforts transform it into an award-winning world leader in carbon fiber composite manufacturing.

Cases, Data, and Examples from around the World

Careful attention has been paid to ensure that the text is global in its scope. The opening cases and examples feature companies from China, India, Israel, Japan, The Netherlands, Kenya, the United States, and more. Wherever possible, statistics used in the text are based on worldwide data.

More Comprehensive Coverage and Focus on Current Innovation Trends

In response to reviewer suggestions, the new edition now provides an extensive discussion of the use of “Big Data” in guiding innovation, the strengths and weaknesses of grand prizes (like the XPRIZE) in generating innovation, characteristics of breakthrough innovators, the role of organization culture in innovation, a detailed example of Failure Modes and Effects Analysis that helps students set up their own FMEA spreadsheet, and more. The suggested readings for each chapter have also been updated to identify some of the more recent publications that have gained widespread attention in the topic area of each chapter. Despite these additions, great effort has also been put into ensuring the book remains concise—a feature that has proven popular with both instructors and students.

Supplements

The teaching package for *Strategic Management of Technological Innovation* is available online from Connect at connect.mheducation.com and includes:

- An instructor's manual with suggested class outlines, responses to discussion questions, and more.
- Complete PowerPoint slides with lecture outlines and all major figures from the text. The slides can also be modified by the instructor to customize them to the instructor's needs.
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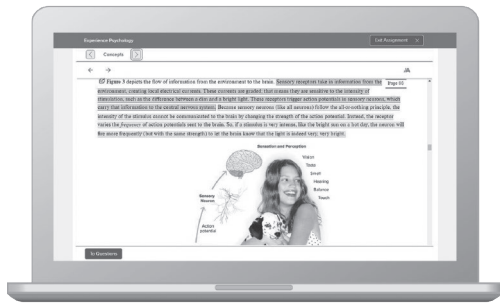
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Acknowledgments

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Melissa A. Schilling

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