
CONTENTS

<i>List of Figures</i>	xiv
<i>List of Boxes</i>	xvi
<i>List of Tables</i>	xvii
<i>Abbreviations</i>	xviii
1. What is the Management of Technological Innovation and Why is it Important?	1
Specific areas to be managed	2
<i>A brief note on new growth theory</i>	6
General issues to be managed	7
Case studies in technology innovation management	9
Conclusions	17
2. The New Challenges of the Management of Technological Innovation	18
The changing nature of industry	18
Business and innovation systems and networks	25
The changing nature of management	32
<i>A brief note on the nature and extent of trust in industry</i>	38
The changing nature of the innovation process	40
<i>A brief note on measuring the economic contribution of technological innovation</i>	47
Globalization	48
<i>A brief note on globalization and national innovation systems</i>	52
Conclusions	53
3. The Management of Research and Development	55
What is research and development?	55
Centralized and decentralized R & D	57
Managing research teams	62
<i>A brief note on technological gatekeepers</i>	68

Balancing research portfolios	69
<i>A brief note on the importance of basic research</i>	70
Managing international R & D	72
Evaluation and assessment of R & D	80
Conclusions	82
4. The Management of New Product Development	84
What is a new product?	84
What makes a firm innovative in its new product development?	87
<i>A brief note on the dangers of listening exclusively to marketing departments</i>	90
<i>A brief note on product families and platforms</i>	92
<i>A brief note on bootlegging</i>	97
The development of new services: the case of Citibank	100
<i>A brief note on the importance of flexibility in design</i>	101
Innovation across-the-board: the case of Benetton	102
Conclusions and summary	104
5. The Management of Operations and Production	106
What are operations and production and why are they important?	106
Some techniques of operations and production management	108
Lean production	111
<i>A brief note on benchmarking</i>	113
Automation	114
Investment appraisal techniques	118
National differences in approaches to production	119
<i>A brief note on the role of the engineer in industry</i>	120
The internal integration of operations and production	121
The external integration of operations and production	124
Manufacturing strategy	128
<i>A brief note on the product life cycle and the manufacturing process used</i>	130
Conclusions and summary	131
6. Technology Strategy	133
Why is technological innovation a strategic management issue?	133
What is technology strategy?	134
What are technological competencies?	138
Balancing investments in resources and innovative capabilities	155
<i>A brief note on dynamic-capabilities theory</i>	157
Learning and technology strategy	157
Technology strategies in small and medium-sized enterprises	159
<i>A brief note on financing growth in technology-based SMEs</i>	163
Conclusions	164

7. Technological Collaboration	166
What is technological collaboration?	166
Why do firms collaborate in their technological activities?	167
The extent of technological collaboration	169
The challenges of managing technological collaboration	170
Organizational learning and technological collaboration	175
Trust and technological collaboration	178
International technological collaboration: joint ventures in China	180
Conclusions and summary	186
8. The Commercialization Process	187
What is the commercialization process?	187
Marketing technology products	187
Industrial (intellectual) property rights and know-how	191
<i>A brief note on international law on intellectual property rights</i>	193
Licensing	196
Technology pricing	200
Technical standards	200
Technology transfer	202
<i>A brief note on the importance of personnel transfer</i>	204
Conclusions and summary	207
9. Five Future Challenges for the Management of Technological Innovation	209
Managing technology-based competition in the knowledge economy	210
Managing the new innovation process	214
Managing relationships with government	215
Managing science and basic research	216
Managing global science and technology	218
<i>References</i>	221
<i>Index</i>	239

LIST OF FIGURES

1.1.	Management of technological innovation: specific areas	2
1.2.	Management of technological innovation: general issues	8
2.1.	Waves of technological development, 1770–1990	19
2.2.	Networking relationships in Australian mining	40
2.3.	Towards the fifth-generation innovation process	43
2.4.	Short product life of personal stereos	46
2.5.	Management of technological innovation: contextual issues	54
3.1.	R & D activities and outputs	57
3.2.	Centralized and decentralized R & D organizational structures	58
3.3.	Hitachi's R & D organization in 1997	60
3.4.	Integrated R & D teams	65
3.5.	SEC's sources of technological learning	68
3.6.	Research portfolio mix	70
3.7.	R & D intensity of overseas R & D, selected major international companies	75
3.8.	How information flows between home-base and foreign R & D sites	77
3.9.	Coordination of international R & D	79
4.1.	Categories of a new product	85
4.2.	A new model of product performance	88
4.3.	Attrition rate of new product projects	98
4.4.	New chemical entities in R & D	99
5.1.	The evolution of quality management	109
5.2.	SAP's enterprise application software	110
5.3.	Targeting improvement through benchmarking	113
5.4.	Forms of automation	114
5.5.	Aligning technology and organizational change	122
5.6.	Major influences on the way work is organized around new technology	123
5.7.	Samsung's regional production network in Asia	126
5.8.	Productivity and the use of modern manufacturing concepts	127
5.9.	The product life cycle and process choice	131
6.1.	Technology and corporate control	142

6.2.	Technology monitoring and forecasting in NEC	143
6.3.	Product and industry life cycles	144
6.4.	Honda's core competencies	145
6.5.	The technological basis of Honda's core competencies	146
6.6.	Representative complementary assets needed to commercialize an innovation	147
6.7.	Strategic archetypes	152
6.8.	A tool mapping competitive position, business attractiveness, and technology	152
6.9.	A tool for mapping a firm's market-share strategy and product-line needs	153
6.10.	A tool for mapping customer demand and level of technology	153
6.11.	Technical audit to discover new applications	154
6.12.	Dimensions of product acceptability	154
6.13.	Managing the innovation stream	155
6.14.	Assessing the balance of investments	156
6.15.	Schumpeter's Mark 1 model of innovation	160
6.16.	Innovation in SMFs	161
6.17.	Primary investment preferences of capital sources in the United States	164
7.1.	Number of newly established technology alliances, 1980-1994	170
8.1.	Commercialization map	204

LIST OF BOXES

2.1. Major features of industry, 1950s–1990s	22
2.2. Modes of producing knowledge	24
2.3. Key characteristics of regional differences in business and innovation systems	28
2.4. Two paradigms of management	34
2.5. A typology of knowledge management	36
2.6. The five generations of innovation process	42
3.1. Overall rank-ordered importance of sources for research and development work	61
3.2. Project management system based on the roles of key individuals	63
3.3. Factors enhancing and impeding project performance	64
3.4. Overseas research centres of selected companies	75
3.5. Global versus regional R & D strategies	76
3.6. R & D effectiveness index	83
5.1. CIM a solution?	116
5.2. Success and failure in implementing automation	117
5.3. Assembly robots in the United Kingdom and Japan	120
5.4. The German and Japanese systems of production	121
5.5. Ideal perspectives on manufacturing	129
6.1. Typologies of technology strategy	135
6.2. The dangers of predicting technology development	137
6.3. Conceptualizing the resources and innovative capabilities that define technological competencies	139
6.4. Types of technology firm	141
6.5. Governance structures linking R & D with complementary assets	148
6.6. Roberts's four levels of technology evolution	163
7.1. Motives for joint-venture creation in China	182
8.1. A comparison of intellectual and physical property	192
8.2. Assessment of commercial potential: Quicklook	206

LIST OF TABLES

5.1. Rationalization process for US suppliers	112
5.2. Work functions undertaken by the machine tool operator in three companies	123
8.1. International top ten patenting companies in the US patent system, 1998	191