Elias G. Carayannis • Elpida T. Samara Yannis L. Bakouros

Innovation and Entrepreneurship

Theory, Policy and Practice



Contents

1	Intr	oduction to Technological Innovation	1	
	1.1	Basic Concepts and Definitions	1	
		1.1.1 Technology	1	
		1.1.2 Technology Management	2	
		1.1.3 Invention	2	
		1.1.4 Creativity	2	
		1.1.5 Innovation	6	
		1.1.6 The Concept of Technological Innovation	7	
	1.2	Innovation Posture, Propensity and Performance	11	
	1.3	Innovation Measurement		
	1.4	Competitiveness		
	1.5	A Historical and Socio-Technical Perspective		
		on Innovation	1 6	
	1.6	Common Frameworks and Typologies		
		to Characterize Innovations	19	
	1.7	Innovation Process	21	
	Refe	rences	23	
2	Intr	oduction to Innovation Management	27	
	2.1	Innovation Management Through Management		
		of Knowledge and Education	27	
		2.1.1 The Role of Knowledge in Innovation	28	
		2.1.2 Knowledge/Meta-Knowledge	29	
		2.1.3 Knowledge-Learning Relation	30	
		2.1.4 The Model of Organizational Cognition Spiral	33	
	2.2	Difference Between Innovation-Invention	36	
	2.3	Types and Characteristics of Innovation	38	
		2.3.1 Types of Technological		
		(and Non-technological) Innovation	38	
		2.3.2 Characteristics of Innovation	40	
	Refe	erences	42	

.

.

,

3	Lana	ovation and Competitiveness: Case Study	47				
	3.1						
	3.2	Innovation-Case Study XEROX	47				
		3.2.1 XEROX Background and History	47				
		3.2.2 Innovation: Sequence of Errors	51				
	3.3	Creativity, Innovation and Competitiveness (CIC)					
		in Public and Private Sectors					
	3.4	Concepts and Empirical Observations: Case Studies	62				
		3.4.1 Subject 1: Key Figures of Innovation and Creativity	64				
		3.4.2 Subject 2: Drivers of Innovation-Catalysts and Prohibitive Factors	64				
			04				
		3.4.3 Subject 3: A Quick Look at the Current State					
		of Play in Various Countries-Challenges	66				
	25	and Opportunities	00				
-	3.5	The Role of the Public Sector in Promoting Creativity, Innovation	20				
		and Competitiveness (CIC)	68 69				
		3.5.1 Public-Private Partnerships Promoting CIC	09				
		3.5.2 The Role of Multilateral Development Banks (MDBs),	70				
		such as the World Bank in Promoting CIC	70				
	Refe	erences	71				
4	Inno	ovation as a Management Process	73				
	4.1	Introduction to Technological Innovation Management	73				
		4.1.1 How Could a Company Enhance					
		Its Capacity for Innovation	74				
	4.2	What Is the Management of Technological Innovation					
		and Why Is It Important?	75				
		4.2.1 A Corporate Perspective	79				
		4.2.2 A National Perspective	80				
		4.2.3 A Theoretical Perspective-Evolutionary Economy	81				
		4.2.4 Significant Characteristics of the New Growth Theory	82				
		4.2.5 An Individual Perspective	83				
	4.3	Challenges in Technological Innovation Management	83				
	4.4	Case Study in Technological Innovation Management	84				
		4.4.1 Biotechnology Company	84				
	4.5	Innovation Management Techniques (IMTs)	86				
		4.5.1 Examples of IMTs	89				
	Refe	erences	104				
5	Inne	ovation Systems	105				
	5.1	What Is a System?	1 05				
	5.2	The Concept of Innovation Systems	106				
		5.2.1 Types of Innovation Systems	108				
	5.3	Basic Principles of Innovation Systems	109				
	5.4	Innovation Systems and Simulation Systems	110				

-

-

Contents

. . .

•

	5.5	•	Dynamics as a Concept, Tool, and Process	1 10				
			Building a System Dynamics Model	1 10				
	5.6	Innovat	ion Systems: Sectoral, Regional, National—Case Studies	112				
			Sectoral Innovation Systems	112				
		5.6.2	Regional Innovation Systems	114				
		5.6.3	National Innovation Systems	116				
	5.7	Applica	ation of System Dynamics in the Study					
			onal Innovation Systems	130				
	Refe	rences		133				
6			to Technological Entrepreneurship	1 37				
	6.1		ction-Definitions	137				
	6.2	Types o	of Entrepreneurship	139				
			Mixed Entrepreneurship	139				
		6.2.2	Pure Entrepreneurship	140				
		6.2.3	Social Entrepreneurship	140				
		6.2.4	Collaborative Entrepreneurship	140				
		6.2.5	Internal Entrepreneurship	141				
		6.2.6	External Entrepreneurship	141				
	6.3	Sustain	able Entrepreneurship	144				
	6.4	The Mo	del of the Learning Lifecycle					
		and the	Learning Strategy	149				
		6.4. 1	Environmental Context	150				
		6.4.2	Learning Strategy	151				
	6.5	Incubat	Ors	152				
		6.5.1	What is a Business Incubator (BI)?	152				
		6.5.2	Determination of the Five Incubator Services	154				
	Refe	rences		156				
7	Entrepreneurship and Innovation Practices							
	7.1	Techno	logy Management and Transfer	159				
		7.1.1	General	159				
		7.1.2	Technology	160				
		7.1.3	Technology Transfer	16 1				
		7.1.4	Technology Transfer Mechanisms	164				
		7.1.5	Technology Transfer Models	172				
		7.1.6	The Vicious Circle of Underdevelopment					
			Versus Technology Transfer	174				
		7.1.7	Technology Transfer Obstacles	176				
		7.1.8	Success Factors for Technology Transfer	176				
		7.1.9	Cooperative Research and Development Agreements	+				
			(CRADAs)	178				
		7,1.10	Spin Offs	179				
			Strategic Alliances	180				
			Technology Transfer and Commercialization Metrics	180				
				-				

e de la constante de	
7.1.13 The Case Study as an Evaluation Tool	184
7.1.14 NASA Case Studies	185
7.1.15 New Mexico Federal Laboratories Originating	
Case Studies	190
7.2 Conclusions and Recommendations	196
References	199
••	
Literature	203

.

.