

Elias G. Carayannis • David F.J. Campbell

Mode 3 Knowledge Production in Quadruple Helix Innovation Systems

21st-Century Democracy, Innovation,
and Entrepreneurship for Development



Springer

Contents

Mode 3 Knowledge Production in Quadruple Helix Innovation Systems	1
1 Introduction to Knowledge and Definition of Terms	1
1.1 Open Innovation Diplomacy, Quadruple Helix Innovation, “Mode 3” Knowledge Production System, and Fractal Research, Education and Innovation Ecosystem (FREIE).....	2
1.2 Definition of Terms.....	6
1.3 Mode 3, Quadruple Helix, Quintuple Helix, Democracy of Knowledge, Schumpeter’s Creative Destruction, and the Co-evolution of Different Knowledge Modes	12
2 The Conceptual Understanding of Knowledge and Innovation.....	28
2.1 Innovation Placed in Context.....	28
2.2 The Relationship Between Knowledge and Innovation	30
2.3 The “Mode 3” Knowledge Production System Multilevel Approach to Knowledge and Innovation: The “Multilevel Innovation Systems”	32
2.4 Linear Versus (and/or) Nonlinear Innovation Models (Modes).....	35
2.5 Extending the “Triple Helix” to a “Quadruple Helix” Model of Knowledge and Innovation	37
2.6 Coexistence and Co-evolution of Different Knowledge and Innovation Paradigms.....	39
2.7 The “Co-opetitive” Networking of Knowledge Creation, Diffusion, and Use	41

3	Sectoral Systems of Innovation and Technology Dynamics.....	41
3.1	Sectoral Systems of Innovation and Technology Dynamics in IT/ICT (Information Technology/Information and Communication Technology) in the Software Sector	42
3.2	Sectoral Systems of Innovation and Technology Dynamics in Life Sciences, Biotechnology, and the Pharmaceutical Industry	44
3.3	Sectoral Systems of Innovation and Technology Dynamics in the Machine Tool Sector.....	46
4	Conclusion	47
	References.....	56