

Innovation, Technology, and Knowledge Management

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Gianfranco Dioguardi

Network Enterprises

The Evolution of Organizational Models
from Guilds to Assembly Lines
to Innovation Clusters

English Translation by Rachel Barrit Costa

 Springer

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Dedication

Dedication, that is, a premise whose role is to be a sign of esteem or affection for a particularly important or authoritative person or a person who is dear to us. Ancient texts very often feature a dedication, above all texts on scientific matters, and I have been filled with curiosity at these introductory tributes ever since my first acquaintance with bibliophily. This was on the occasion of my encounter with an important 18th century Neapolitan edition – published in 1714 by Bernardo-Michele Raillard – of the celebrated essays on natural science experiments conducted at the Academy of Cimento, entitled *Saggi di naturali esperienze fatte nell'Accademia del Cimento* (1667) [Natural Experiments Conducted at the Academy of Cimento] by Lorenzo Magalotti (1637–1712), who was the secretary of that eminent scientific association. I bought the book because I was fascinated by its sumptuous appearance in folio and by the rapturous praise it received from Elisabeth Seacombe, of the Roman antiquarian bookshop “*Rappaport*.” But I was equally fascinated by the motto of the Cimento Academy “TRY AND TRY AGAIN,” which was cited in numerous places by the author.

Precisely that motto was one of my favorites as a useful guide to the “business of living”; furthermore, the text on experimental science, which was most absorbing, formed an excellent accompaniment to the valuable bibliophilic edition. The work thus acted as my mentor, thanks also to the words of wisdom of Mrs. Seacombe, who led me into the wondrous magic world of antique books, the love of which I would cherish forever after.

It was the dedication placed as a foreword to the book that particularly attracted me, with its indication that the academy lived “*Under the Protection of the Most Serene and Noble Prince Leopold of Tuscany*.” The work was enhanced by the explicit dedication to “*His Serene Excellency Don Cesare Michel-Angelo Davalos D’Aquino, D’Aragona*,” followed by a string of noble titles. There was also a “*Proem to the Readers*,” in other words a sort of preface or preliminary explanation for those who wished to delve into the collection of essays.

From the very start my curiosity as a bibliophile constantly prompted me to browse through books, especially antique books, in search of this kind of preface, even if it might not be formally declared as an integral part of the text itself.

Such is the case, for instance, of *De Rerum Natura* by Titus Lucretius Carus, the Latin poet of whose life only sketchy details are known. Veiled in legend,

information on his life story was handed down by St. Jerome, according to whom the poet was born in 96 or 94 BC, committing suicide barely 44 years later, i.e., in 53 or 51 BC. *De Rerum Natura*, in the version that has come down to us, revised apparently by Cicero, does not include an explicit dedication, but in the major portion of Book I – not forming part of the text, according to some – Lucretius weaves a hymn to Venus, then proceeds to present the hero of this poem, namely the Greek philosopher Epicurus.

Lucretius opens his poem in terms which – it seems to me – are strikingly relevant to the contemporary age: “Mother of Rome, delight of Gods and men/Dear Venus [. . .]/Lull to a timely rest/O’er sea and land the savage works of war” (I, 2, 29, 30). Then there is a genuine dedication to Epicurus: “Whilst human kind/Throughout the lands lay miserably crushed/Before all eyes beneath Religion- who/Would show her head along the region skies/Glowing on mortals with her hideous face-/A Greek it was who first opposing dared/Raise mortal eyes that terror to withstand/Whom nor the fame of Gods nor lightning’s stroke/Nor threatening thunder of the ominous sky/Abashed; but rather chafed to angry zest/His dauntless heart to be the first to rend/The crossbars at the gates of Nature old.” (I, 62–71)

The lines cited appear in the translation of *De Rerum Natura* by William Ellery Leonard.¹

The explicit use of dedications became widespread with the advent of printing, but their period of greatest triumph was in the Renaissance and the following centuries. It was a trend that was immediately adopted by the great scientists such as Galileo Galilei (1564–1642). For example, his *Sidereal Messenger* (1610) opens with a long dedication to “*His Serene Highness Cosimo II of the Medici IV Grand-Duke of Tuscany*,” to whom, when the prince was still the young Prince Royal, Galileo himself had given some lessons in mathematics, upon the request of Cosimo’s mother Cristina of Lorraine, thereby gaining her profound affection. Moreover, Galileo’s most important and celebrated *Dialogue Concerning the Two Chief World Systems* (1632), defined in the introduction to the work by Francesco Flora as “the greatest masterpiece of scientific literature of all time and of all nations,”² was likewise dedicated to the Medici family, namely to Ferdinand II of the Medici Grand-duke of Tuscany, who had succeeded Cosimo II in 1621. The dedication was followed by a section entitled “To the Discreet Reader,” which acts as a proem to the entire work.

The custom of including a dedication continued into the enlightened 18th century, where Denis Diderot (1713–1784), one of the most significant interpreters of the age of Enlightenment, would offer a similar composition – even though in impersonal terms – in one of his most important treatises. I refer here to the *Thoughts on the Interpretation of Nature*, a small work devoted to the scientific method that drew its inspiration from Bacon’s *Novum Organum [The New Organon]*. It was published in a first and extremely rare edition in 1753, and subsequently in two further editions, which were enlarged in 1754. Diderot’s essay is dedicated to “*Young People Who Are Setting out on the Study of Natural Philosophy*” and he clarifies the aims of his work without further ado, addressing young scholars with the statement, among other things, that “Given that, rather than instructing you it is my aim to

exercise your mind, I am little concerned with the question of whether you accept or reject my ideas, provided that they engage your full attention. A more knowledgeable person will teach you to grasp the forces of nature; I will rest content with having made you put your own to the test.”³ These are concepts I wholeheartedly endorse in presenting this book on *The Network Enterprise*, and I express my equally wholehearted endorsement of other statements by the French philosopher, likewise taken from *The Interpretation of Nature*, for example, where he writes “7. As long as things remain merely within our understanding, they are our opinions; they are notions that can be true or false, granted or contradicted. They acquire consistency only by becoming linked to external beings. This link is achieved either through an uninterrupted chain of experiences, or through an uninterrupted chain of arguments that depend on the one hand on observation, and on the other on experience, or else through a chain of experiences scattered here and there amidst the arguments.”⁴

I have endeavored to follow the Diderotian teaching, which has led me to “try and try again” to observe the experiences connected to the “external beings” – in this specific case, entrepreneurs – in order to try to generalize the observations by constructing a theory. This accounts for the gratitude I feel toward those to whom I owe the prime cause of inspiration for this book.

I will therefore take up again the ancient custom of the dedication.

This book on *The Network Enterprise* is dedicated to an important entrepreneur who is dear to me, exactly as suggested by the aforementioned semantic explanation of dedications. It is dedicated to Claudio Navarra, who set up a prominent entrepreneurial group in the economic sector of the Built Environment, in which the *Italiana Costruzioni Company* is the leading firm and whose brilliant CEOs today are his sons Attilio and Luca, with the meticulous consultancy of Benedetta Navarra.

I met Claudio Navarra during the period when I too was working in the same sector of constructions. He proved to be a challenging but extremely principled competitor. I was thus able to engage in a relationship of profound and stimulating friendship. Later I was lucky enough to have the opportunity to work directly with him and with his group, which gave me solid experience in the field. I was thereby also able to perfect the experimental phase of how to be an entrepreneur and how to work in the world of business according to the dictates of intuition and the principles of organization which come to the fore, essentially, in the so-called enterprise spirit. This is why it is my desire today to dedicate this book to Claudio Navarra, who indirectly but fundamentally contributed to its composition.

The book grew out of a revisitation of the useful experiences described above: reflecting on those earlier days, I was able to draw a more general message that developed into a theoretical construct in its own right. This evolution was further enhanced by my teaching activity at the Faculty of Engineering at the Bari Politecnico University, in my course on *Economics and Business Organization*. As is typically the case with course design, preparation of a series of lectures requires a preliminary analysis of the various different experiences, so that they can be transmitted, during the lessons, with the connotation and dignity of a sound theory.

The forging of a theoretical framework is further aided by the constant dialectical interaction that takes place on a daily basis through in-depth communication with students and colleagues. It was in this manner that *The Network Enterprise* gradually took shape.

In accordance with the natural line of development of a dedication, I would now like to turn to the important moment of acknowledgments and thanks: directly to the students themselves who attended my course and, naturally, to my colleagues and coworkers with whom I engage in exchange of ideas day by day.

I would also like to mention and thank all the students, metaphorically one by one, who since 1971 have succeeded each other year after year as enrollees in my course. I would also like to express my thanks to the colleagues who have worked and are working with me at the Department of Engineering Management and who jointly have established the “Bari School” of Business Organization: Vito Albino, Nicola Costantino, Michele Gorgoglione and likewise Claudio Garavelli, Pier Paolo Pontrandolfo, and the delightful colleagues Nunzia Carbonara, Ilaria Giannoccaro, Barbara Scozzi, and all the others. Many of them have now become tenured professors and significant protagonists in the Italian world of science and worldwide science. Others are following on the challenging path that will lead them to the highest ranks of their university career.

To all of them I would like to convey my sincerest feelings of profound gratitude for the inspiration that supported me in composing this book, which without their contribution and their dialectical contribution probably would never have been created.

Let me also take this opportunity to mention Maurizio Alfieri, Marilde Longo, Enzo Maiorano, and Ferdinando Napoli: these graduates in engineering, no sooner had they completed their degree at the Politecnico University of Bari, entered the corporate world by launching the *Edilportale* company, an enterprise that has achieved considerable success in the field of the New Economy. They represent a concrete testimony of the potential of university teaching to stimulate, in those who have aptitude and flair, the resolve to set up successful enterprises.

As an afterword to the “Dedication,” together with the expression of thanks, I will offer a brief “Proem,” as was customary in the ancient texts I have had the pleasure and the good fortune to peruse.

The book is shaped as a “lesson,” inasmuch as it has arisen precisely from the lessons I held in Bari during the course in *Economics and Business Organization*.

A historical analysis of the world of organizations and the theories that have forged their development forms the framework for a description of the present-day complexity of the concept of the network enterprise. A number of definitions that I believe to be substantially innovative are put forward to give an account of this concept, carrying out in-depth investigations on its functioning and its connotations. The book presents a critical exploration of the evolution of production systems in the transition from the Tayloristic type of organization to that of the Japanese lean production models. The strategies involved in management of the network enterprise are examined, highlighting their ethical and cultural aspects, trailblazing a path that leads to rediscovery of the enterprise spirit and then analyzing the enterprise

networks that are external to the network enterprise itself; such enterprise networks are seen as new phenomena capable of energizing small- and medium-sized production units.

And since this is a book based on the network model, it is my pleasure to conclude this “dedication” with a statement by Denis Diderot, once again taken from his *Thoughts on the Interpretation of Nature*, a statement that in many ways foreshadowed his conception of a world pervaded with hidden connections, and therefore interpretable as a network within which all things are linked. Thus wrote the French philosopher: “6. When one compares the infinite multitude of the phenomena of nature with the limits of our understanding and the frailness of our organs, can one ever expect the slow pace of our work, its prolonged and frequent interruptions, and the rarity of creative geniuses, to yield anything other than just a few shattered and disconnected shards of the great chain that connects all things?”

Of these thoughts I fully share both the form and the content.

Notes

1. Titus Lucretius Carus, *De Rerum Natura [The Nature of Things]*, The Internet Classics Archive, <http://classics.mit.edu/index.html>. Translated by William Ellery Leonard.
2. Francesco Flora, *Introduzione a Galileo Galilei: Dialogo dei Massimi Sistemi*, Mondadori, Milan, 1996, xvi.
3. Denis Diderot, *Thoughts on the Interpretation of Nature*, Essay, 1753, <http://www.chez.com/ottaviani/diderot/dpnature.htm>. Fragment translated by Rachel Costa.
4. Denis Diderot, *ibid.*
5. *Ibidem.*

Series Foreword

The Springer Book Series on *Innovation, Technology, and Knowledge Management* was launched in March 2008 as a forum and intellectual, scholarly “podium” for global/local (gloCal), transdisciplinary, trans-sectoral, public–private, leading/“bleeding”-edge ideas, theories, and perspectives on these topics.

The book series is accompanied by the Springer *Journal of the Knowledge Economy* which was launched in 2009 with the same editorial leadership.

The series showcases provocative views that diverge from the current “conventional wisdom” that are properly grounded in theory and practice and that consider the concepts of *robust competitiveness*,¹ *sustainable entrepreneurship*,² and *democratic capitalism*,³ central to its philosophy and objectives. More specifically, the aim of this series is to highlight emerging research and practice at the dynamic intersection of these fields, where individuals, organizations, industries, regions, and nations are harnessing creativity and invention to achieve and sustain growth.

Books that are part of the series explore the impact of innovation at the “macro” (economies, markets), “meso” (industries, firms), and “micro” levels

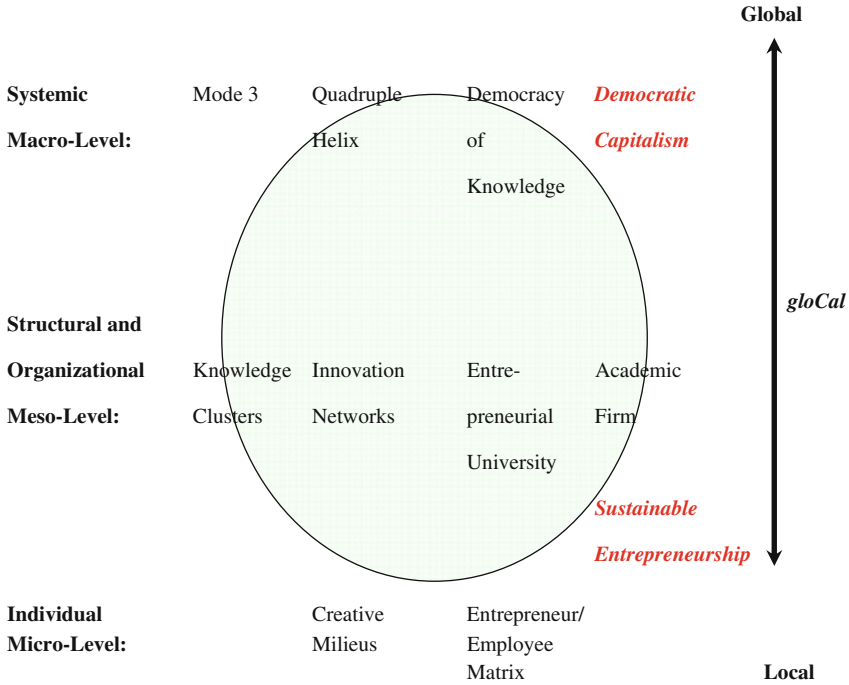
¹We define *sustainable entrepreneurship* as the creation of viable, profitable, and scalable firms. Such firms engender the formation of self-replicating and mutually enhancing innovation networks and knowledge clusters (innovation ecosystems), leading toward robust competitiveness (EG Carayannis, *International Journal of Innovation and Regional Development*, v. 1, n. 3, 2009, pp. 235–254).

²We understand *robust competitiveness* to be a state of economic being and becoming that avails systematic and defensible “unfair advantages” to the entities that are part of the economy. Such competitiveness is built on mutually complementary and reinforcing low-, medium-, and high-technology and public and private sector entities (government agencies, private firms, universities, and nongovernmental organizations) (EG Carayannis, *International Journal of Innovation and Regional Development*, v. 1, n. 3, 2009, pp. 235–254).

³The concepts of *robust competitiveness* and *sustainable entrepreneurship* are pillars of a regime that we call “*democratic capitalism*” (as opposed to “popular or casino capitalism”), in which real opportunities for education and economic prosperity are available to all, especially – but not only – younger people. These are the direct derivatives of a collection of top-down policies as well as bottom-up initiatives (including strong R&D policies and funding, but going beyond these to include the development of innovation networks and knowledge clusters across regions and sectors) (EG Carayannis and A. Kaloudis, *Japan Economic Currents*, January 2009, pp. 6–10).

(teams, individuals), drawing from such related disciplines as finance, organizational psychology, R&D, science policy, information systems, and strategy, with the underlying theme that in order for innovation to be useful it must involve the sharing and application of knowledge.

Some of the key anchoring concepts of the series are outlined in the figure below and the definitions that follow (all definitions are from EG Carayannis and DFJ Campbell, *International Journal of Technology Management*, 46, 3–4, 2009).



Conceptual profile of the Series on Innovation, Technology, and Knowledge Management

- The “Mode 3” Systems Approach for Knowledge Creation, Diffusion, and Use: “Mode 3” is a multilateral, multinodal, multimodal, and multilevel systems approach to the conceptualization, design, and management of real and virtual, “knowledge-stock” and “knowledge-flow,” modalities that catalyze, accelerate, and support the creation, diffusion, sharing, absorption, and use of co-specialized knowledge assets. “Mode 3” is based on a system-theoretic perspective of socio-economic, political, technological, and cultural trends and conditions that shape the co-evolution of knowledge with the “knowledge-based and knowledge-driven gloCal economy and society.”

- **Quadruple Helix:** Quadruple Helix, in this context, means to add to the triple helix of Government, University, and Industry a “fourth helix” that we identify as the “media-based and culture-based public.” This fourth helix associates with “media,” “creative industries,” “culture,” “values,” “lifestyles,” “art,” and perhaps also the notion of the “creative class.”
- **Innovation Networks:** Innovation Networks are real and virtual infrastructures and infra-technologies that serve to nurture creativity, trigger invention, and catalyze innovation in a public and/or private domain context (for instance, Government–University–Industry Public–Private Research and Technology Development Co-operative Partnerships).
- **Knowledge Clusters:** Knowledge Clusters are agglomerations of co-specialized, mutually complementary, and reinforcing knowledge assets in the form of “knowledge stocks” and “knowledge flows” that exhibit self-organizing, learning-driven, dynamically adaptive competences and trends in the context of an open systems perspective.
- **Twenty-First Century Innovation Ecosystem:** A 21st Century Innovation Ecosystem is a multilevel, multimodal, multinodal, and multiagent system of systems. The constituent systems consist of innovation meta-networks (networks of innovation networks and knowledge clusters) and knowledge meta-clusters (clusters of innovation networks and knowledge clusters) as building blocks and organized in a self-referential or chaotic fractal knowledge and innovation architecture (Carayannis, 2001), which in turn constitute agglomerations of human, social, intellectual, and financial capital stocks and flows as well as cultural and technological artifacts and modalities, continually co-evolving, co-specializing, and co-opeting. These innovation networks and knowledge clusters also form, re-form, and dissolve within diverse institutional, political, technological, and socioeconomic domains including Government, University, Industry, Nongovernmental Organizations and involving Information and Communication Technologies, Biotechnologies, Advanced Materials, Nanotechnologies, and Next Generation Energy Technologies.

Who is this book series published for? – The book series addresses a diversity of audiences in different settings:

1. *Academic communities:* Academic communities worldwide represent a core group of readers. This follows from the theoretical/conceptual interest of the book series to influence academic discourses in the fields of knowledge, also carried by the claim of a certain saturation of academia with the current concepts and the postulate of a window of opportunity for new or at least additional concepts. Thus it represents a key challenge for the series to exercise a certain impact on discourses in academia. In principle, all academic communities that are interested in knowledge (knowledge and innovation) could be tackled by the book series. The interdisciplinary (transdisciplinary) nature of the book series underscores that the book series scope is not limited a priori to a specific basket

of disciplines. From a radical viewpoint, one could create the hypothesis that there is no discipline, where knowledge is of no importance.

2. *Decision makers* – private/academic entrepreneurs and public (governmental, sub-governmental) actors: Two different groups of decision makers are being addressed simultaneously: (1) private entrepreneurs (firms, commercial firms, academic firms) and academic entrepreneurs (universities) interested in optimizing knowledge management and in developing heterogeneously composed knowledge-based research networks and (2) public (governmental, sub-governmental) actors that are interested in optimizing and further developing their policies and policy strategies that target knowledge and innovation. One purpose of public knowledge and innovation policy is to enhance the performance and competitiveness of advanced economies.
3. *Decision makers in general*: Decision makers are systematically being supplied with crucial information, for how to optimize knowledge-referring and knowledge-enhancing decision-making. The nature of this “crucial information” is conceptual as well as empirical (case study based). Empirical information highlights practical examples and points toward practical solutions (perhaps remedies); conceptual information offers the advantage of further driving and further carrying tools of understanding. Different groups of addressed decision makers could be decision makers at private firms and multinational corporations, responsible for the knowledge portfolio of companies; knowledge and knowledge management consultants; globalization experts, focusing on the internationalization of R&D, S&T, and innovation; experts in university/business research networks; and political scientists, economists, and business professionals.
4. *Interested global readership*: Finally, the Springer book series addresses a whole global readership, composed of members who are generally interested in knowledge and innovation. The global readership could partially coincide with the communities, as being described above (“academic communities,” “decision makers”), but could also refer to other constituencies and groups.

Elias G. Carayannis
Series Editor

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He is the author of a wide range of articles and books (in Italian, French, and English) that address management and entrepreneurship, as well as the world of ideas, with particular reference to history, philosophy, and science.

Some of the topics presented in this book, such as the concept of “macrofirm,” were originally introduced into economics by Dioguardi in 1983 in an ASCE publication. In 1996, the Italian Ministry of Education awarded him the gold medal for outstanding service to the School of Culture and Art, bestowed upon him by the President of the Italian Republic, and in 2001, upon the proposal of the Ministry of Universities and Scientific and Technological Research, he was awarded a similar medal for outstanding service to Science and Culture. Since 1989 he has been a Knight of the Italian Order of Merit for Labor and since 2004 a Knight of the Legion of Honor of the French Republic.