Innovation, Technology, and Knowledge Management

Series Editor
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Sustainable Learning in Higher Education

Developing Competencies
for the Global Marketplace

Springer

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Series Foreword

The Springer book series *Innovation*, *Technology*, *and Knowledge Management* was launched in March 2008 as a forum and intellectual, scholarly "podium" for global/local, transdisciplinary, transsectoral, public–private, and 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.

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[1] We 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 (E.G. Carayannis, *International Journal of Innovation and Regional Development* 1(3), 235–254, 2009).

[2] We 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) (E.G. Carayannis, *International Journal of Innovation and Regional Development* 1(3), 235–254, 2009).

[3] The 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 topdown policies as well as bottom-up initiatives (including strong research and development policies and funding, but going beyond these to include the development of innovation networks and knowledge clusters across regions and sectors) (E.G. Carayannis and A. Kaloudis, *Japan Economic Currents*, p. 6–10 January 2009).

Books that are part of the series explore the impact of innovation at the "macro" (economies, markets), "meso" (industries, firms), and "micro" levels (teams, individuals), drawing from such related disciplines as finance, organizational psychology, research and development, science policy, information systems, and strategy, with the underlying theme that 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 E.G. Carayannis and D.F.J. Campbell, *International Journal of Technology Management*, 46, 3–4, 2009).
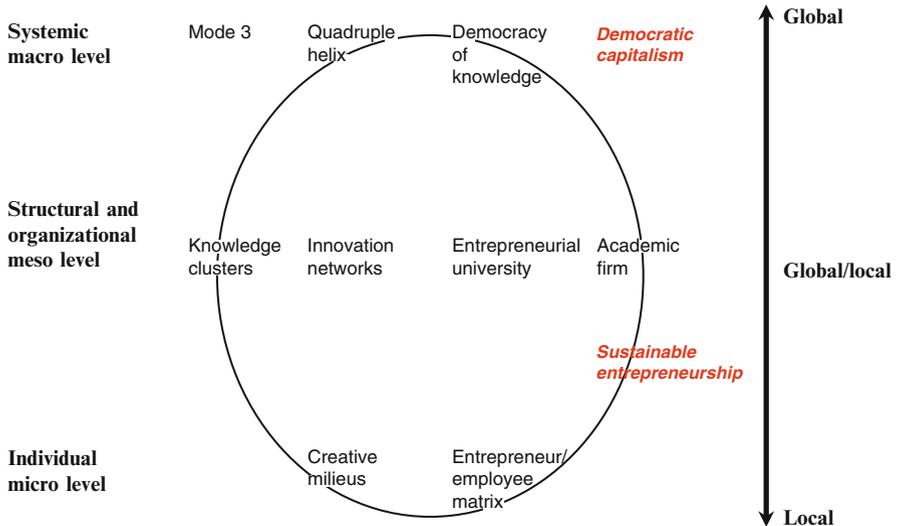
Conceptual profile of the series *Innovation*, *Technology*, and *Knowledge Management*

- 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 cospecialized knowledge assets. "Mode 3" is based on a system-theoretic perspective of socio-economic, political, technological, and cultural trends and conditions that shape the coevolution of knowledge with the "knowledge-based and knowledge-driven, global/local 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," "life styles," "art," and perhaps also the notion of the "creative class."

- Innovation Networks: Innovation networks are real and virtual infrastructures and infratechnologies 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 coopetitive partnerships).
- Knowledge Clusters: Knowledge clusters are agglomerations of cospecialized, 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 twenty-first century innovation ecosystem is a multilevel, multimodal, multinodal, and multiagent system of systems. The constituent systems consist of innovation metanetworks (networks of innovation networks and knowledge clusters) and knowledge metaclusters (clusters of innovation networks and knowledge clusters) as building blocks and organized in a self-referential or chaotic fractal knowledge and innovation architecture,[4] 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 coevolving, cospecializing, and cooperating. These innovation networks and knowledge clusters also form, reform, and dissolve within diverse institutional, political, technological, and socioeconomic domains, including government, university, industry, and 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 scope of the book series 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, subgovernmental*) *actors*: Two different groups of decision makers are being addressed simultaneously: (1) private entrepreneurs (firms, commercial firms,

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[4] E.G. Carayannis, *Strategic Management of Technological Learning*, CRC Press, 2000.

academic firms) and academic entrepreneurs (universities), interested in optimizing knowledge management and in developing heterogeneously composed knowledge-based research networks; and (2) public (governmental, subgovernmental) 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 in private firms and multinational corporations, responsible for the knowledge portfolio of companies; knowledge and knowledge management consultants; globalization experts, focusing on the internationalization of research and development, science and technology, 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 described above ("academic communities," "decision makers"), but could also refer to other constituencies and groups.

<div style="text-align: right">Elias G. Carayannis</div>

Preface

This book comprises 12 original contributions related to sustainable learning in higher education. These chapters examine the development of competencies to assure that graduates leave fully prepared to face the global marketplace.

In recent years, a dramatic change has taken place in our environment, dominated by major social, economic, and political transformations. The globalization of markets, technological innovation, and overall, the evolution towards a society of highly interconnected, ubiquitous, and interdependent knowledge require a new approach in order to study and understand the complexities and new challenges of today's society. These demands of society imply that the universities must educate their students in the development of competences linked to different sectors and the development of an innovative and sustainable economy. At present, graduates must be prepared to respond successfully to the global challenges of the future. Yesterday's jobs have been replaced by positions that require knowledge management, abstract reasoning, real-time response, ethical behavior, and the ability to provide personal services.

In consequence of all the above, universities worldwide are designing different models based on the acquisition of competencies to plan their students' curriculums so that their graduates fulfill the requirements currently demanded by the labor market. The use of different skill management models in the student curriculum makes it possible to improve the graduates' skill capabilities and facilitates their insertion in the workplace.

These demands of today's society represent a major challenge for both the university and its teaching staff as well as the professor's method of teaching his/her courses. A conceptual and methodological change has taken place, precisely due to the need to achieve a balance between the new social demands and the teaching–learning process. This involves a change in the university organizational culture and requires the commitment of the entire community.

One of the challenges which universities face is to prepare new generations of students who will be capable of selecting, updating, and using knowledge in their specialist fields and in society; capable of learning in different contexts and

modalities throughout the student's professional career; and able to understand the potential with which they continually learn, so that they can adapt their knowledge to new situations.

The chapters we go on to describe look at university as a dynamic source of society; a new challenge in which firms receive graduates who fulfill the competencies demanded by the market. Universities are challenged to train their students to develop the key competencies linked to different productive sectors and cooperate in the development of a sustainable economy. This book presents different cases and observations about the competencies developed in the curriculums of different universities, with the aim to assure that graduates leave fully prepared to face the challenges of the new economy.

Chapter 1—Assessment as Learning and Empowerment: Towards Sustainable Learning in Higher Education

This chapter focuses on what authors refer to as *Assessment as Learning and Empowerment*. This approach to assessment is centered on three key challenges: (a) involving students in the assessment of their own learning; (b) giving feedforward designed to provide information about the results of assessment that can be acted upon proactively; and (c) implementing high-quality assessment tasks. These three challenges further divide into ten core principles which, when operationalized via a series of questions, facilitate the implementation of innovative instruments and tasks to enhance assessment practice for both lecturers and students.

Mindful of the current state of society, inundated by unrestrained technological development, the chapter will consider the need for overcoming the former concept and use of Information and Communication Technologies by analyzing the potential contribution of Technologies for Learning and Knowledge and evaluating the role that Technologies for Empowerment and Participation can have in the area of assessment.

Through the use of technology, the planning and implementation of innovative interventions based on the three challenges mentioned above will lead, in an academic context, to empowerment within the learning process and enable a whole range of strategies and competencies that derive from strategic learning to transfer into extra-academic contexts (personal and professional).

In accordance with the concept of sustainability in higher education, as supported by several authors, this type of learning is characterized by the use of strategies and the development of transferable skills which lead to self-awareness of learning needs, self-regulation of the learning process, autonomous lifelong learning, and self-determination in decision making, based on an ecological and socially responsible approach.

Chapter 2—Is University Students' Self-Assessment Accurate?

The paper's main objective is to assess the self-assessment accuracy of university students. Specifically, the study analyzes the self-assessment of oral communication competence. The study was conducted in a course of the Organization of the Firm Area included in Labor Relations and Human Resources Degree. The literature on self-assessment in higher education has not reached a clear conclusion about its accuracy, detecting a number of methodological problems. To reduce them, authors have taken a number of precautions. Thus, a rubric has been designed and students have been trained to use it, several teachers and peers have been introduced as references, and a segmented analysis has been made according to gender and the student level of competence from their tutor's point of view. Results show that self-assessment accuracy is low. It is also observed that men, regardless of the degree, rate themselves higher than women do. Another finding suggests that the scoring rubric improves the accuracy of self-assessment when the speaker has high oral communication competence but not when this level is low. These results propose a method of developing correction factors, adaptable to every situation, which allows using self-assessment for summative purposes.

Chapter 3—Value Co-creation, Collaborative Learning and Competences in Higher Education

Value co-creation is a key topic today. Little co-creation knowledge, however, has been applied to improving students' skills in the context of university education. To fill this research gap, the main objective of the authors of this chapter is to discuss the dominant achievements of a project of educational innovation associated with learning in marketing. The project was developed jointly by the universities of Seville and Malaga within the framework of the Tech Andalusia Project. Data from a survey of students who participated in the project reveal that their taking part in the project has allowed them to improve the following skills: (a) collaborative teamwork; (b) efficient time use; (c) handling new online resources; and (d) finding new ideas and solutions.

Chapter 4—A Model for Implementing Nonspecific Competencies in Degree Studies, Defined Using a Delphi Study in Spanish Universities

Using the Delphi technique, the authors of this chapter perform an exploratory study to facilitate implementation or advancement of nonspecific competencies. The chapter collates opinions and proposed actions regarding this issue based on curricula of university degree studies introduced in the European Higher Education Area.

The study's primary contribution is to establish an implementation model, consisting of a sequential process in three phases: (a) concept design; (b) organizational design; and (c) launch and monitoring. The tasks involved in the planning, organization and development of the process are intended to facilitate the coordinated and gradual implementation of nonspecific competencies in university degree studies.

The model helps to resolve many problems currently restricting progress in universities' social commitment to comprehensive education of new graduates. Furthermore, the model is focused on university management and teaching staff, and therefore provides solutions related to organization and coordination.

Chapter 5—Linking the Development of Teamwork and Communication Skills in Higher Education

The development of generic skills and competencies in higher education is paramount, according to the new educational philosophy fostered by the Bologna process. These competencies, abilities, and skills include teamwork, oral and written communication, problem solving, analysis, critical evaluation, information literacy, and information analysis. They are developed throughout all courses and subjects, and are usually taught and evaluated independently, and lack any clear structure or coordination. In some cases, generic competencies are acquired gradually, from beginner to advanced level, on an ad hoc basis.

The present study was conducted under the premises that the development of generic competencies in higher education must have a progressive, linear approach, and that the level reached in certain abilities and skills influences the development of other high-level competencies. Specifically, this work explores the relationship between communication skills and the effectiveness of teamwork. Hypotheses were tested among first- and third-year students of the Industrial Organization Engineering degree at the Universitat Politècnica de València. Results show that teamwork effectiveness depends strongly on members' communication skills, and that focusing on teamwork in the first year may be ineffective if communication skills are not developed beforehand.

Chapter 6—First Contact with the Word of Work: The Competence Built in the Teaching Practices

This paper describes a study of teacher trainees undergoing students during teaching practice in preschool education. Its authors analyze competences that teachers believe they build through contact with their professional context. Data come from their portfolios, since they highlight competences built during practice activities and the most interesting aspects to analyze.

The study shows that teaching practice enhances professional competence building, although the building of these competences varies according to the educational action model and the supervision model.

Kindergarten teachers' actions are complex, and they develop by combining different types of knowledge. Teacher–child interactions define the framework of professional competence building.

Teaching practice marks the socialization process that allows future kindergarten teachers to make contact with values, language, and knowledge specific to their profession. This gives them a more realistic view of their working environment.

Chapter 7—Leadership Development Through Experiential Learning in University Studies at Florida Universitària

The development of complex skills such as leadership requires experiential learning. The educational model of Florida Universitària develops social competences through integrated projects undertaken in teams in each academic course. Leadership skills are developed in the fourth year of all university degrees using an experiential approach. Each fourth year student assumes the role of team leader of an integrated first-year project team. They thus develop their leadership skills. The process is accompanied by specialist training in leadership and individual coaching. A multidisciplinary teaching team that monitors the whole process gives this training. During the academic year 2013–2014, 45 students were involved as leaders in this experience.

Chapter 8—Simulation Games and the Development of Competences: Empirical Evidence in Marketing

The use of simulation games in education is a growing tendency in universities. This has been spurred on by their need to renovate their teaching methodologies to adopt them to the European Higher Education Area. These simulators are used in teaching to develop the students' competences and skills related to, for example, encouraging the entrepreneurial spirit, teamwork and competitiveness among peers. This study means to contribute by presenting the results of an experience in teaching innovation founded on the use of the Quantum marketing simulator, which was developed by investigators in the Carlos III University, Madrid. From a questionnaire given to 138 students, the global valuation of the Quantum experience is analyzed, as well as its relationship with motivational aspects and the acquiring of capacities and competences. The results suggest a positive global valuation conditioned by prior motivation and the student's perception of the simulator's impact on the acquiring of competencies and skills.

Chapter 9—Feedback and Self-Regulated Learning: How Feedback Can Contribute to Increase Students' Autonomy as Learners

Feedback is a scaffolding process that provides continuity to student learning. Without it, the assessment in Higher Education would become a firewall that separates the effort from the reward of learning. Without feedback there is no formative assessment and the possibilities to improve student learning are substantially reduced.

Research and experiences in this field allow increasingly accurate feedback mapping, in which it is possible to locate a growing level of detail the aims, focus, agents, kinds, means or moments in which feedback can be offered to students.

In the last decade it has deepened in the theoretical framework that supports feedback, so that a set of principles that guide its development have been identified, new concepts have been introduced, such as "sustainable feedback" or "feedforward," amplifying and diversifying the theoretical basis of the feedback. Similarly, the participation of students in the feedback process has opened new territories to explore, supported by self-assessment and peer-assessment.

Finally, technology is redefining the way in which feedback is conceived and managed. In recent years, new technologic systems are allowing new ways of communication between students and teachers through a synchronous or asynchronous dialogue, which can enhance learning.

The relationship between feedback and self-regulation has brings on the interest about feedback so that we can bring to light that a renaissance of feedback is taking place, especially if we consider nowadays social and academic scenario marked by uncertainty, building-capacity for conflict resolution and lifelong learning skills.

Chapter 10—Measuring Competencies in Higher Education: The Case of Innovation Competence

Within the context of permanent change, innovation has become a vital value for the survival and development of the organizations. Development of this increasingly important value will help students to gain access to the labor market and adapt to their future jobs in a context of these characteristics. Competency describes what training participants should be able to do at the end of such training. The competency is acquired through various learning objectives to be achieved. Innovation competency is closely related to self-assessment and the development of skills and learning methods, ability to work according to the principles of ethics and social responsibility, ability to work in interactive communication situations, ability to create and maintain connections work, networking capacity, ability to cooperate in a multidisciplinary and multicultural environment, ability to communicate and interact in an international environment, etc. In this chapter a method for measuring the innovation competencies in higher education, by introduction of different levels of mastery is developed.

Chapter 11—Three-Dimensionality in Competencies: The Inclusion of Ethics in the Generic Competency of Teamwork and Leadership

The context of the European Higher Education Area requires the alignment of teaching degrees and research projects on offer at university level with social and labor market needs. This chapter provides a sufficient base upon which scoring rubrics on teamwork and leadership can be established and/or expanded. Such rubrics will guide and assess not only what to do but also how must it be done. This approach will be built on both the classical Greek foundation of what constitutes action—*praxis* and *poiesis*—and on two areas of knowledge—management and ethics.

Chapter 12—Student Opinion on the Application of Active Methodologies

The newly established European Higher Education Area has prompted a reformulation of teaching methodologies, placing greater focus on student-centered learning. Integration of theory and practice together with development of academic skills have become important educational objectives.

The purpose of this research is to determine student perceptions of the application of active teaching methodologies, including collaborative learning and case studies for the development of generic skills.

Finally, I would like to thank everyone who has contributed to this publication. Thanks to their effort and dedication, we have been able to provide a valuable and informative guide on an extremely important subject.

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