

Knowledge management in doctoral education toward knowledge economy

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Abstract

Purpose – The purpose of this paper is to investigate the role and the scope of knowledge management (KM) in doctoral education, in the emerging knowledge economy (KE) context, and the recommendation of a framework for KM in doctoral education.

Design/methodology/approach – An extended literature analysis was conducted to elaborate the role and the scope of KM in universities and research institutions in the context of global KE, and the role of knowledge workers, including doctoral students, as well as, the current directions for doctoral education. Literature analysis is followed by synthesis of the proposed framework for KM in doctoral education toward KE.

Findings – A framework for KM in doctoral education is proposed, which could be used to enhance quality of doctoral studies and could lead to research optimization and innovation growth. Finally, proposals are recommended for enhancing KM in doctoral education and utilize doctoral students as knowledge workers and change factors toward the notion of global KE.

Originality/value – The paper is an effort to start filling the literature gap in the emerging but under-researched subject of KM regarding doctoral education in the context of KE, with the purpose to enhance quality of doctoral studies and capture the socio-economic development advantages that come from training such a highly skilled workforce.

Keywords Knowledge management, Innovation, Knowledge economy, Doctoral education, Knowledge workers, Research management

Paper type Research paper

1. Introduction

There is a continuing discussion in both academia and business sector, arguing that an ideas-driven, global knowledge economy (KE) constitutes a promising scenario for the near future (Sundać and Fatur Krmpotić, 2011). In this context, universities and research centers revise their roles and objectives in order to get accustomed to the emerging economic environment (Deiaco *et al.*, 2012). The strategic role of universities in enabling innovation and economic growth has become a key subject considering policies related to innovation and science in several countries' economies (Hughes and Kitson, 2012). In fact, universities and research centers constitute strategic factors in the KE, as highly skilled population is needed in order to create new knowledge and transform research outcomes into innovative products (Hughes and Kitson, 2012). Therefore, knowledge management (KM) practices in universities and research centers can be used as leverages, toward the direction of prosperity and long-term economic growth. What is more, Stephan *et al.* (2004) claimed that doctoral education in science and engineering is critical to the university's role in promoting economic development to the whole region and the country.

However, many countries fail to capture the economic development advantages that come from training a skilled work force, known as the brain-drain phenomenon. Furthermore, despite the crucial importance of doctoral education, currently the management of quality in doctoral education is far from ideal. According to McWilliam *et al.* (2002), universities have

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been perceived by funding bodies to be paying insufficient attention to issues related to change, people and risk management. In addition, according to a recent study (Pyhälä *et al.*, 2012), international studies on doctoral programs suggest that on average, only 50 percent of postgraduate students finish their thesis. Therefore, a universal framework for KM in doctoral education would enhance quality of doctoral studies and would lead to research optimization and innovation growth.

The paper aims to illustrate the role and the scope of KM in doctoral education, in the emerging context of KE – with a focus in science and engineering disciplines, as well as, to propose a framework for KM in doctoral education, which could be used as an incentive scheme to enhance quality of doctoral studies and utilize doctoral students as knowledge workers and change factors in the context of global KE. More precisely, in Section 2, an introduction to the subject of knowledge and KM is presented. In Section 3, KE and the role of universities and research institutes is discussed, while in Section 4, aspects considering KM in universities and the role of knowledge workers are highlighted. Following that, Section 5, provides issues considering the current view of doctoral education and future directions. In Section 6, the reader can find the proposed framework for KM in doctoral education in the context of KE, followed by the conclusions and future research directions in Section 7. The current study is intended to be used as a stimulus for future studies, which could utilize the current paper's presented ideas, and use confirmatory research designs, in order to measure and test relationships among relevant variables.

2. Knowledge and KM

The question of the meaning and the definition of knowledge had occupied the minds of philosophers since the classical Greek era and has led to many epistemological debates (Alavi and Leidner, 2001). The Greek philosophers at fifth century BC began to consider questions about the meaning of knowledge, perception, memory and thought. According to Nonaka (1994), two types of knowledge can be distinguished, namely the tacit knowledge, which is based on personal experience and is hard to be transferred, and the explicit knowledge, which can be transferred and discussed.

In the early 1970s, the view of organizations as social collectives and “knowledge systems” came up (Alavi and Leidner, 2001); however, KM emerged as an independent scientific discipline in the early 1990s. KM objectives include “sustainable competitive advantage, improved performance, innovation, the sharing of lessons learnt, integration and continuous improvement of the organization” (Gupta and Sharma, 2004). Furthermore, KM includes organizational knowledge, and may be distinguished from that by a greater focus on the management of knowledge as a strategic asset and a focus on encouraging the sharing of knowledge (Maier, 2007). KM can be defined as “a strategic and systematic organization-wide effort to plan, control, and deploy resources in order to identify, create, store and distribute knowledge for reuse and learning across the organization” (Gill, 2009). The enablers that assist in the successful KM, according to Davenport and Prusak (1998), are the organizational culture, the organizational structure, as well as, the information technology. Another, crucial entity is the organization's knowledge base, which is depended from the storage/retrieval process, and ensures the retrievability of knowledge, among the organization.

3. KE and the role of universities and research institutes

To begin with, a KE is one that uses knowledge as the key engine of economic growth (Suh and Chen, 2007). That tempts to result to higher value-added goods and services, which increases the probability of economic success in the current highly competitive and globalized world economy. The World Bank Institute's Knowledge for Development Program has developed a four-pillar framework to be used as the basis for a country's transition to a KE (The World Bank, 2013). More analytically, the first step is to understand the country's

strengths and weaknesses, as well as, the strengths and weaknesses of actual and potential competitors. Accordingly, the country should then formulate its goals and develop the relevant strategy, including policies and investments, in order to achieve those goals.

More specifically, according to the first pillar of KE, which is about economic and institutional regime, a country that is interested in turning its economy to a KE, should provide incentives for the efficient use of existing and new knowledge and the flourishing of entrepreneurship. What is more, according to the second pillar of KE, the country should ensure that its people have access to education and skills that will enable them to create, apply and share their acquired knowledge. In addition, according to the third pillar, a dynamic information infrastructure is crucial in order to facilitate the effective communication, diffusion and processing of information. Moreover, according to the fourth pillar of KE, it is proposed that a country's innovation systems, such as firms, research centers, universities, think tanks, consultant and other organizations, should become capable of tapping the growing stock of global knowledge, assimilating and adapting it to local needs, in order to create new tools and technologies (The World Bank, 2013).

The strategic role of universities in enabling innovation and economic growth has become a key subject considering policies related to innovation and science in several countries' economies (Hughes and Kitson, 2012). According to Giuliani and Rabellotti (2012), universities and public research organizations have been identified as key organizations that can assist developing economies to compete in the global KE. More specifically, the knowledge produced by universities is a source of competitive advantage, as it is a main driver of innovation and business productivity, considering especially the emergence of "new" technology-driven industries, such as biotechnology, information and communication technology and nanotechnology (Geuna and Muscio, 2009).

Furthermore, the emergent demand for a more skilled workforce, which raised the number of higher education students, as well as, augmented the percentage of students that complete secondary education (both essential factors for the second pillar of the KE), increased the attraction of higher education. In addition, according to Geuna and Muscio (2009), the growing dependence of the state and regional governments on universities, utilizing them as policy instruments that drive local development processes, establishes them as key actors in regional innovation systems. Considering the previous, universities may have to be specialized on multiple roles that derive from the production and exploitation of knowledge in the context of KE. On the other hand, the view of universities as strategic actors and competitors, as well as, their role in the KE, is a controversial issue. It is believed by many that the university does, and should, remain an organization dedicated exclusively to the creation of public goods for the good of society (Deiaco *et al.*, 2012). In addition, according to Deiaco *et al.* (2012), technology transfer constitutes a vital but partial and incomplete element of the KM process; however, many economists narrowly focus on promoting technology transfer from universities, concentrating on the commercialization of science, through patents, licenses and spin-outs. Furthermore, according to Hughes and Kitson (2012), the extent and breadth of knowledge exchange beyond the science, technology and mathematics disciplines is not properly recognized, denoting the significance of social sciences.

4. KM in universities and research institutes and the role of knowledge workers

To begin with, based on the notion that the knowledge-based society has already arrived, it is obvious that successful organizations in the global KE will be those that are able to identify, value, create and evolve their knowledge assets, utilizing knowledge as their main competitive tool (Rowley, 2000). In particular, considering higher education, according to Petrides and Nguyen (2008), KM can be seen a tool for continuous organizational learning,

effective decision making and also as a tool that enables capitalization on the deriving improved knowledge creation and knowledge-sharing activities. Therefore, KM should represent a basic priority for universities and research centers, being implemented as an ongoing process. However, effective KM may require significant change in culture and values, organizational structures and reward systems (Rowley, 2000). Furthermore, academic and research institutions and their personnel have to recognize and respond to their changing role in a KE, managing the processes associated with the creation of their knowledge assets, including all staff and students and not only senior management, following an evolutionary process (Rowley, 2000).

Moreover, there is a plethora of benefits of implementing KM in universities and research institutes. To begin with, KM can provide positive feedback to manage new activities, such as the offering of training courses and the use of laboratory facilities for industrial applications. What is more, according to KM can lead to better decision-making capabilities, enhanced “product cycle” (e.g. curriculums), improved academic and administrative services and reduced operational costs (Lyman, 2001). Additionally, by implementing KM, universities and research centers will be able to attract qualified knowledge workers, increase graduation rates, and retain employees (Milam, 2001). Also, universities and research institutes can use KM practices in order to share their knowledge and enhance transparency in their processes, enabling public authorities to know “what exactly people behind walls are doing, how the institute can contribute to region’s well being and economic improvement and finally where exactly public funds are given” (Alexandropoulou *et al.*, 2008). In Figure 1, a summary of the domains that are benefited by implementing KM in universities and research centers are depicted, as described above.

Considering the role of knowledge workers, it has been previously analyzed that universities can play a significant role in implementing a knowledge-based society by recruiting skilled and competent knowledge workers and empowering them to create and manage knowledge assets effectively (Hoq and Akter, 2012). More specifically, universities

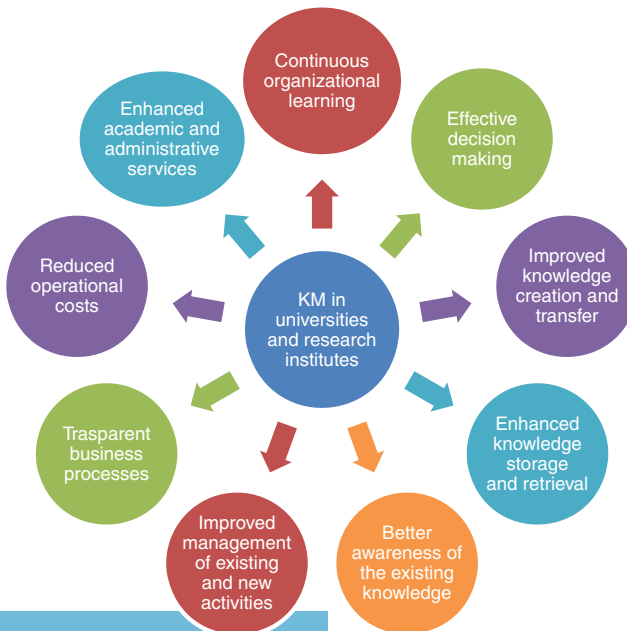


Figure 1. The domains that are benefited by implementing KM in universities and research institutes

have to use and advance information infrastructure and create a favorable atmosphere, enabling students, researchers and other stakeholders to be included in various KM activities (Hoq and Akter, 2012). Therefore, the role of knowledge workers is essential, since they can bring about changes in the university's organizational cultures and individual behaviors relative to knowledge by promoting knowledge discovery and use (Hoq and Akter, 2012). Furthermore, Davenport and Prusak (1998), suggest that university knowledge workers can utilize their insight in knowledge creation and provide critical input improving such processes. In addition, they can enable changes in organizational cultures and individual behaviors relative to knowledge. Also, they can assist in the design and implementation of knowledge infrastructure of the university, including its libraries, knowledge bases and human networks.

5. Doctoral education management objectives

To begin with, Wendler *et al.* (2010) concluded that graduate education programs are the key to long-term growth and the future of the innovation economy. Furthermore, according to Stephan *et al.* (2004), graduate students are key subjects in the creation of new knowledge and in technology transfer, as doctoral programs train individuals who, on graduation, provide training for future highly educated employees, which results in productivity growth, and consequently growth in tax revenues. They also serve as a talent magnet, attracting gifted students and faculty from outside the country, they provide a source of expertise for local businesses, enhancing the productivity of industries already established in the area (Stephan *et al.*, 2004). Ultimately, successful graduate students enhance the global reputation of the institution, and also boost the country's profile of global success.

However, Stephan *et al.* (2004) highlight that many countries fail to capture the economic development advantages that come from training a skilled work force (brain-drain phenomenon). Also, despite the crucial importance of doctoral education, currently the management of quality in doctoral education is far from ideal. According to McWilliam *et al.* (2002), universities have been perceived by funding bodies to be paying insufficient attention to issues related to change, people and risk management. In addition, according to a recent study (Pyhältö *et al.*, 2012), international studies on doctoral programs suggest that on average, only 50 percent of postgraduate students finish their thesis. It has also been suggested that distress experienced by the PhD students is quite high, as well as, a feeling of isolation from the academic community (Pyhältö *et al.*, 2012). Finally, a recent international survey showed that younger academics are in many countries dissatisfied with their chosen profession (Altbach, 2015).

Furthermore, based on (Campbell *et al.*, 2005) recent surveys have shown that the typical model of doctoral education (i.e. traditional dissertation research) is no longer sufficient to prepare graduate students for the rapidly changing work environment. For example, candidates for academic employment are increasingly being asked about their teaching experience and about their philosophy on education (Campbell *et al.*, 2005). In addition, there is a growing trend toward interdisciplinary approaches in doctoral programs and schools to provide key skills and qualifications for careers in mixed research settings outside academia (Kehm, 2006), seeking candidates with collaborative ways of thinking, ability to work in teams, problem-solving skills, interpersonal skills, entrepreneurial initiative and interdisciplinary experience (Campbell *et al.*, 2005; Pyhältö *et al.*, 2012; Wendler *et al.*, 2010). What is more, Wendler *et al.* (2010) highlight the need of improving completion rates for PhD students, enhanced mentoring and attention to social and academic needs.

Therefore, we suggest that the aforementioned issues considering doctoral education could be addressed by implementing KM principles, as an ongoing process (Petrides and Nguyen, 2008; Lyman, 2001; Milam, 2001), based on the analysis contacted in the previous sections. KM would also assist in the utilization of doctoral students as knowledge workers

and change factors, toward the notion of global KE. More specifically, Pearson (1999) suggested that in order to address the growing concerns for quality management, improvement and effective innovation, a framework for doctoral education must be developed, which will integrate all aspects of the doctoral education experience. Consequently, as we have already emphasized, knowledge is the main focus of doctoral education; thus, a framework for KM in doctoral education would enhance quality of doctoral studies and would lead to research optimization and innovation growth.

6. Proposed framework and recommendations

To begin with, according to the best of our knowledge, there is no known definition of KM for doctoral education. However, KM for academic institutions is defined as: "The organized and systematic process of generating and disseminating information, and selecting, distilling, and deploying explicit and tacit knowledge to create unique value that can be used to strengthen teaching-learning environment" (Adhikari, 2010). Focusing on KM for doctoral education, we propose that the aforementioned definition should be enhanced, adding the element of knowledge application, as well as, the deriving need for research and development outcomes, except for learning and teaching optimization. Therefore KM for doctoral education could be defined as: "The organized and systematic process of generating and distributing information, and selecting, processing, organizing and applying explicit and tacit knowledge to create unique value that can be used to strengthen learning, teaching, research and development."

Accordingly, the researcher proposes a framework for KM in doctoral education, in order to make an effort to start filling the literature gap. It has to be mentioned that several of the following techniques may already be in use in universities and research centers, and especially the leading ones; however, still there is a lack of a unified framework for KM in doctoral education toward KE, which could be used as an incentive scheme to manage and further optimize knowledge. Therefore, emerges the need for an academic or research institution to recognize KM activities intended for doctoral education, and use them as foundations for further development, utilizing the already "unofficial" KM procedures that has already been using (Rowley, 2000). Based on Alavi and Leidner (2001), we found it essential to propose the following distinct processes: access to sources of knowledge (online and physical presence); knowledge gathering and recoding; participation in organized access to and retrieval of knowledge; knowledge creation, sharing and distributing the research outcomes, as well as; professional skills development. In Table I, the reader can find the components that are related to the aforementioned processes. Analysis of each KM component follows in the following paragraphs.

To begin with, according to Holdaway *et al.* (1995), access to resources and expertise is essential to conduct high-quality research. Online libraries are nowadays the main source of knowledge for scientists and researchers; therefore, it is strongly recommended that the access to online libraries has to be guaranteed, for all PhD students. However, currently online libraries cannot substitute physical libraries, mainly because they usually keep a wider collection of books on basic scientific subjects, as well as rare and historic documentation. In addition, the importance of a selection of courses (both online and physical presence) to PhD studies curricula, has to be evaluated, as well as, their influence in doctoral students' research excellence. A question that derives is if and in what degree online courses could substitute physical presence, as the latter offers strong bonding between student-tutor and student-student relationships (Ginns and Ellis, 2007). Furthermore, the contribution of seminars and conferences attendance has a special significance, as PhD students have the chance to gain experience and build networking skills.

Another important aspect of KM is the gathering and recording of the research progress and outcomes. It would be advisable to inform early stage researchers, such as PhD

Table I.
Components that
are related to KM
framework for
doctoral education in
the context of KE

Access to sources of knowledge	Knowledge gathering and recoding	Participation in organized access and retrieval of knowledge	Knowledge creation, sharing and distributing the research outcomes	Professional skills development
Libraries (online and physical presence)	Keeping records	Institutional knowledge base (IKB)	Internal meetings Presenting at conferences and publishing in scientific journals	Strategic role and responsibilities of PhD students KM and research management seminars
Courses (online and physical presence)		Institutional newsletters and blogs	Informal meetings	Personal development and stress management seminars
Seminars and conferences (online and physical presence)	Writing progress reports	Motivations for contribution to IKB	Presenting to general public Practices in sharing and creating new knowledge	Pedagogical and teaching seminars Meetings with entrepreneurs and visits to innovative companies

students, how to organize their archives, and also, to ensure that they keep them in digital form, so that it would be easier to share them with others. What is more, progress reports should be used as project management tools, between the student and the supervisors that would assist the student to realize his/her progress and to finish more timely. Furthermore, considering organized access to and retrieval of knowledge content, it would be highly beneficial a well-organized institutional knowledge base, including institutional magazines, newsletters and blogs, where each knowledge worker could contribute with his/her publications and achievements, giving recognition both to them and to the institution. Moreover, a well-structured knowledge base can assist in the creation of knowledge maps, which represent the knowledge capital, according to various management objectives, in a meaningful way, becoming a tool for decision making (Ermine, 2009). An important issue that arises is what would encourage knowledge workers, and especially doctoral students to share more and contribute to the institution's knowledge base (Alavi and Leidner, 2001). Perhaps, physiological and social motivations may be proven more influential to PhD students than external motivations. Team spirit and recognition of doctoral students' work, could be used as a motive and encourage them to share more, as for example a distinction to the PhD assessment, based on his/her efforts on knowledge sharing.

Possibly, the most important aspect of KM is the creation, sharing and distribution of research outcomes (Petrides and Nguyen, 2008), with the aim to promote individual knowledge and transform it into collective knowledge (Psarras, 2006). According to Holdaway *et al.* (1995), adequate supervision for administrative matters and for intellectual leadership has to be ensured, and also, ensure that students engage with practicing researchers and be in conversation with a community of peers and other experts. A vital part of knowledge creation and sharing processes concerning doctoral education is the internal meetings with one or more PhD students and the supervisor(s) and possibly other colleagues, as well. In addition, it is proposed that department and lab wide meetings should be promoted to know "what researcher next door is working on" (Petrides and Nguyen, 2008), and that especially meetings with other PhD colleagues, as they share knowledge and experiences that would assist in knowledge "reuse," saving them time and efforts, which

constitutes an essential issue regarding productivity (Davenport *et al.*, 1996). In addition, the effectiveness of informal meetings has to be highlighted, as they can be seen as a chance of socialization, and accordingly, as an opportunity for sharing and creating new knowledge, as for example a common place that researchers can meet and discuss, such as a common lunch place inside the department of the university or the research institute. Notably, as it is referred by Argote and Ingram (2000), strong ties between units can promote knowledge acquisition, and also when there is a higher degree of social contact between student groups, learning is enhanced for all members.

Furthermore, another important aspect is the publications in scientific magazines and books, which potentially can enhance the young researchers' productivity and quality of research. On the other hand, the issue of quality instead of quantity has to be further investigated considering publications, as the "publish or perish" notion may be proven incorrect and ultimately degrade research quality and academic quality in general (Alexandropoulou *et al.*, 2008). In addition, conferences attendance and participation is an essential aspect of knowledge sharing and creation of new knowledge, as it helps PhD students to practice speaking in front of public, to receive fruitful feedback on their work, and of course to meet other colleagues and leading researchers, in order to network and get informed about their current work. Moreover, the various techniques for sharing and creating new knowledge, such as monothematic speeches, short presentations and discussion, brainstorming sessions, and gamification techniques, have to be investigated, as well as, their suitability according to the context, regarding the optimization of KM and therefore productivity and quality of research results for doctoral students.

In addition, presentations to general public could enhance co-operations that would lead to the creation of new knowledge. Young researchers who make presentations to general public help them realize the importance and applicability of their work and their role as PhD students. Such communication can be inspiring and give them motivation to work harder, as well as, to help them in building presentation skills. Moreover the profile of the PhD student, as well as, the profile of the university or the research institution is boosted, and collaborations may occur with companies or other organizations (Hughes and Kitson, 2012). Furthermore, the impact in society from such presentations has to be taken into account. For example, people have the chance to be informed about current scientific advances and also to acknowledge the work of researchers and its impact in society (Alexandropoulou *et al.*, 2008). What is more, it can motivate young people to become researchers, and ultimately it can boost the whole country's reputation (Stephan *et al.*, 2004).

Moreover, considering the role of doctoral students as knowledge workers in the context of KE, the training of doctoral students has crucial importance in order to help them build professional skills and competencies (Campbell *et al.*, 2005; Pyhältö *et al.*, 2012; Wendler *et al.*, 2010). Also, according to Holdaway *et al.* (1995), the doctoral program has to ensure its responsiveness to students' career goals and the opportunities and demands of relevant employment markets. Therefore, the responsibilities of a PhD student and young researcher in the context of KE have to be investigated. To begin with, a main responsibility of a PhD student in the environment of global KE is to be a change agent for the institution, the region and the whole country and society in general. Furthermore, among the responsibilities of PhD students' one can add the participation in collaborations with another institute or with industry, the representation of the institution in public, the production of significant knowledge (Stephan *et al.*, 2004), as well as, to become an inspirational teacher (Campbell *et al.*, 2005) and grow a culture inside the institution (Hoq and Akter, 2012). Considering the latter, according to Santos (2006), "culture as an enabler can be the key ingredient in a recipe that gives rise to competitive and innovative behavior in the higher education marketplace." Consequently, doctoral students have to be aware of their roles as knowledge workers in a KE context, in order to become eager to utilize their

knowledge and also optimize their capabilities adopting KM techniques, enhancing their productivity and quality of research, and thus, enhancing the institute's success and reputation, which constitutes a fundamental objective, according to Hughes and Kitson (2012), and Suh and Chen (2007), respectively.

Based on the above, we propose that "soft skills," such as leadership, creativity and entrepreneurship, as well as, KM, personal development and also stress management seminars, should be included in doctoral students' curricula. According to Santos (2006), "knowledge management requires people with interpersonal skills that can negotiate an organization's culture and still have strong skills in business processes and technology." Moreover, according to Wendler *et al.* (2010), skills that enhance research impact should be incorporated in PhD students' curriculum. Therefore, related seminars can assist doctoral students to operate locally as knowledge champions and enablers. What is more, another crucial aspect considering doctoral students, is how prepared they are to teach in universities, as they are going to become the future university tutors and professors. According to Griffiths (1993), "teaching deserves at least similar recognition to research in the university reward system." Therefore, it is advisable to add courses and/or seminars on pedagogical and teaching science, to PhD students' curricula. In addition, following the global directives, where collaboration between industry, universities, and government agencies is indispensable (Giuliani and Rabbellotti, 2012), meetings with entrepreneurs, visits to innovative companies/spin-offs should be promoted, with the aim to enable them match their talents with current workplace demands (Psarras, 2006), to promote co-operations and ultimately, potentially enhance their future career in general.

7. Conclusions

To sum up, it has been shown that knowledge and KM became critical success factors for competitive organizations, constituting the vision of an economy based on knowledge, known as KE, as a key to sustainable innovation and growth. Moreover, KM in universities and research institutes can be seen a tool for continuous organizational learning and effective decision making and also optimize knowledge processes, provide better awareness of the existing knowledge, improve the management of existing and new activities, reduce costs, and enhance academic and administrative services, as well. Therefore, KM should represent a basic priority for universities and research centers, being implemented as an ongoing process. On the other hand, it has been presented that despite the crucial importance of doctoral education, currently the management of quality is far from ideal. According to global directives graduate education needs to be broadened from its research focus to include a wider range of training for the students' careers, in the context of global KE, where collaboration between industry, universities, and government agencies is indispensable. PhDs are expected to develop career skills, as well as, "soft skills," such as leadership, creativity and entrepreneurship, as well as, the capability for multi-disciplinary approaches and the utilization of their research findings both commercially and socially.

Accordingly, a universal accepted framework for KM in doctoral education would enhance quality of doctoral studies and would lead to research optimization and innovation growth, in the emerging environment of KE. The researcher proposes a definition, as well as, a framework for KM in doctoral education, in order to make an effort to start filling the literature gap. Finally, proposals have been recommended for enhancing KM in doctoral education and utilize doctoral students as knowledge workers and change factors toward the notion of global KE. Concluding, the aim of the current paper to highlight the need and the potential beneficial outcomes that can be derived from a study, which includes the investigation of the role and the scope of KM in doctoral

education – with a focus in science and engineering disciplines – toward the notion of KE, has been accomplished. For future research purposes, further research, considering doctoral studies from different scientific areas, such as social sciences, would be beneficial, and could provide a holistic view, as well as, possible different outcomes to strengthen or generate additional insights into the selected area. The current research can be seen as a trigger to future studies, as for example case study research, investigating the KM practices in doctoral education that leading (regarding KM) universities and research institute departments utilize, creating confirmatory research designs, in order to measure and test relationships among relevant variables.

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