Understanding the benefits of standardizing innovation management

Abstract

In 2007, COTEC Portugal set in motion the DSIE initiative with the aim of enhancing Portuguese companies' innovation performance. Under the auspices of this Business Association, the first Portuguese standard for Research, Development and Innovation management systems (NP 4457:2007) was published by the IPQ. So far, around 150 companies have been certified to the standard.

This *work in progress* explores the key question of whether a standardized framework for innovation management improves innovation management practices of organizations and thus, leads to better innovation results. Conclusions are based on the perceptions of top representatives of five ICT companies with NP 4457:2007 certified systems. Their narratives offer a critical and first-person perspective about the difficulties experienced with the integration of the Portuguese RDI management normative, the advantages brought about by the adoption of the standard and the relevance attached to certification.

Resumo

Em 2007, a COTEC Portugal deu início à iniciativa DSIE com o objetivo de apoiar as empresas portuguesas a melhorarem o seu desempenho em matéria de inovação. Sob a égide daquela associação empresarial, foi publicada, pelo IPQ, a primeira norma portuguesa sobre sistemas de gestão da Investigação, Desenvolvimento e Inovação (NP 4457:2007). Até à data, 150 empresas foram certificadas na NP 4457:2007.

Neste artigo, resultado de uma pesquisa em curso, explora-se uma questão central que é a se uma norma sobre gestão de inovação promove a melhoria das práticas de gestão do processo nas organizações, conduzindo a melhores resultados de inovação. A questão é abordada a partir da análise das perceções de representantes da Gestão de Topo de cinco empresas TIC com sistemas de gestão da IDI certificados segundo a NP 4457:2007. As narrativas oferecem uma perspetiva crítica, na primeira pessoa, sobre a adoção da norma, as dificuldades associadas à integração do referencial normativo, os principais benefícios resultantes e a relevância atribuída à certificação.

1. Introduction

The 1934 Joseph Schumpeter's influential work, *The theory of economic development,* became the landmark of science recognition of the positive relationship between innovation and economic development (MÍR; CASADESÚS, 2011, p.172). Since then, several models have emerged proposing more or less distinct frameworks and approaches to describe the innovation process, many of them with the ultimate purpose of providing organizations with the necessary knowledge to manage it and improve innovation performance (GOFFIN; MITCHELL, 2005; NADA, 2010; THURIAUX-ALEMÁN;

EAGAR; JOHANSSON, 2013, p.5). Innovation management[1] is defined in this paper as an "*organizational structure, responsibilities, procedures, practices, processes, activities and resources for developing, implementing, achieving and maintaining policies and objectives of an organization*" (MAIER *et al.*, 2012, p. 1733) with regard to Research, Development and Innovation (RDI).

From the side of companies, there is too a common understanding that innovation is of fundamental importance to set or, at least, keep the pace with the markets and to create and sustain organizational growth (GOFFIN; MITCHELL, 2005; NADA, 2010). This explains why innovation management has turned into a strategic pivotal activity for many organizations in recent years. Despite the plethora of models that are at managers' disposal to improve the process of innovation, there is still little empirical evidence of how to effectively achieve value-based innovation, with many organizations continuing to rely on *ad hoc* arrangements (THURIAUX-ALEMÁN; EAGAR; JOHANSSON, 2013, p.5).

In recent years, steps have been taken at different levels towards the development of standardized approaches regarding innovation-related fields of activity, including that of innovation management. Spain has become a paradigmatic example for having developed one of the few standards for innovation management systems in the world in conjunction with an accredited certification scheme (MÍR; CASADESÚS, 2 011) that has influenced the creation of similar standards in both European and non-European countries, including the Portuguese standard *NP 4457:2007 - Management of Research, Development, Innovation (RDI), RDI Management Systems Requirements* and, more recently, the Brazilian standard *ABNT NBR 16501:2011 – Guidelines for Research, Development and Innovation Management Systems*. In the meantime, two other proposals have been submitted to the International Organization for Standardization (ISO) to develop international standards covering innovation aspects.[2]

Standards are normative guidelines or normalized requirements for materials, goods, processes or systems (EUROPEAN UNION, 2012) that foster verifiable harmonization, in particular when standardization is attached to accredited certification. There are two opposite trends in the innovation management debate with regard to the *locus* of standards: one that takes a negative view of the relationship between standardization and innovation, based on the argument that prescribing rules, routines and boundaries for the purpose of managing and controlling the process requires giving up the freedom and creativity that are at the root of innovation, thus hindering it (MIR; CASADESÚS, 2011; CASTILLO-ROJAS *et al.*, 2012); the other one, on the contrary, contends that the balanced introduction of systematization and formalization promoted by standards to the range of intertwined activities required to generate ideas and turn them into "useful added values to customers" (NADA, 2010, p.57), contributes to process improvement and, ultimately, and more importantly, to innovation success (KONDO, 2000; MÍR; CASADESÚS, 2011; CASTILLO-ROJAS *et al.*, 2012). In support of this argument, the metaphor of jazz fits well with the vision of innovation as an apparently loose, spontaneous and organic process,

[11] For simplification reasons, the terms "innovation management" and "innovation management systems", will be used as they place the R&D-based innovation in parallel with other equally relevant innovation sources. When referring to specific standards, the term RDI (Research, Development and Innovation) may, however, be applied.

[2] Proposal ISO/TC 279 was submitted by AFNOR (*Association Française de Normalisation*, France) and its technical scope is "Innovation process: interaction, tools and methods"; a new work item proposal was also put forward by ABNT (*Associação Brasileira de Normas Técnicas* - Brazil) covering Research, Development and Innovation Process Management and will be taken into account after votes for AFNOR proposal are received. Available at NISO website, http://www.niso.org/apps/group_public/download.php/10274/sc9n684_TMB_Communique_no43_february2013.pdf (accessed 10 May 2013).

taking place within a guiding (management) structure (WALZER; SALCHER, 2003), that is, within clear boundaries and aligned with corporate strategy.

This paper adds empirical evidence to the body of scientific work on innovation management standardization by examining in particular the case of the NP 4457: 2007, the Portuguese Standard for Research, Development and Innovation Management Systems. The standard has been in force for six years only, a fact which explains, to some extent, why its impact remains poorly understood. The incursion to the standard is made through the narratives of the top management representatives of five Portuguese Information and Communication Technologies (ICT) companies that have adopted the normative framework as a *guiding structure* to design, implement or improve a system to manage their organizations' overall innovation process. All of the companies have been certified to the standard by accredited certification bodies.

The paper deals with three fundamental questions:

- Firstly, what have been the motivational factors driving companies to implement a standard-compliant innovation management system?
- Secondly, what difficulties have been experienced by the companies as far as standard adoption is concerned? And what perceived benefits have resulted so far?
- Thirdly, what have been the certification drivers?

The responses of the five representatives were analyzed with the aim of understanding whether a normative framework such as the NP 4457:2007 does actually improve innovation management practices of organizations and therefore is connected to better innovation results.

2. The Portuguese standard for RDI Management Systems

2.1.The state of the art in Europe: innovation-related standards

Standards correspond to model specifications or technical requirements that materials, products, services or systems may have to comply with (EU, 2012, p.12) They encapsulate best practices and collective knowledge and result from a transparent, open and consensus-based process bringing together different interested parties on a voluntary-basis[3]. Usually private and industry-driven, standards are acclaimed by the Europe Union as a fundamental block piece in the continuous building of a European single market and in the opening-up of international markets (EU, 2012, p. 12). They often go hand in hand with certification (whether accredited[4] or not), a procedure under which a third party gives assurance that the certified *object* meets the applicable normative requirements. Certification to a standard, however, is not obligatory, except when it is a contractual or regulatory condition[5].

[3] Extracted from CEN website, available at https://www.cen.eu/cen/NTS/What/Pages/default.aspx (accessed 26 April 2013).

[4]According to ISO, "*accreditation is the formal recognition by an independent body, generally known as an accreditation body that a certification body is capable of carrying out certification. Accreditation is not obligatory but it adds another level of confidence, as 'accredited' means the certification body has been independently checked to make sure it operates according to international standards*". Extracted from ISO website, available at http://www.iso.org/iso/home/standards/certification.htm (accessed 5 May 2013). In Portugal, the IPAC (Instituto Português de Acreditação) is the Portuguese Body for Accreditation recognized by the Portuguese Government to assess and verify, according to international legal standards, the technical capabilities of organizations that provide certification services.

[5]As it is shown further in this paper, accredited certification of companies to the Portuguese RDI standard may have been in many cases linked with eligibility requirement for public aid, thus, with contractual obligations.

As far as innovation management is concerned, the consensus required to create a European standard has not been reached so far. Nevertheless, the first efforts to develop a common normative framework date back to the early 1990s, with the creation of the "CEN-STAR" Committee which proposed ways to integrate R&D in standardization (MÍR; CASADESÚS, 2011, p. 174). Since 2008 other significant efforts have been under way towards a potential and future harmonization in the technical field of innovation management at European level: the CEN/TC 389 "Innovation Management" was created with the specific purpose of delivering a technical specification dealing with innovation management systems and the first documents are to be finished in the short term[6]. At national level, only few European countries have developed standards either for innovation management systems as a whole, or for specific parts of the innovation process and not all of them are associated with accredited certification (Table 1).

Table 1 – Examples of existing standards in Europe covering innovation-related aspects

Country	Year	Standard	Title/Technical Field	General Description	Accredited Certification
France	2011	FD X50-052: 2011[7]	Innovation management - Strategic intelligence management	Provides guidelines for the implementation and control of a strategic intelligence system.	Not foreseen.
France	2011	FDX50-146: 2011[8]	Innovation management - Intellectual Property Management	Describes the required aspects to ensure appropriation and protection of IP of organizations with the aim of creating value.	Information not found
Spain	2011	UNE 166006:2011 [9]	R&D&i management – R&D&i management Technology Watch System	Outlines guidelines to help with the systematization of the technology monitoring process in order to develop a permanent system of technology surveillance and competitive intelligence.	Foreseen
Germany	2010	DIN 77110:2010 [10]	Patent valuation – General Principles for monetary patent valuation	Contains guidelines to quantitatively assess and assign a monetary value to patents	Information not found
UK	2008	BS 7000-1: 2008[11]	Guide to managing innovation – Part 1: Design innovation management systems	Gives guidance on managing innovation: specifically the development of innovative and competitive products that will satisfy the customer's perceived and latent needs in the long-term future.	Information not found

[6] Extracted from CEN website, available at http://www.cen.eu/cen/Sectors/Sectors/Innovation/Pages/TC%20389.aspx (accessed 13 May 2013).
[7] Extracted from AFNOR website, available at http://www.boutique.afnor.org/norme/fd-x50-052/management-de-l-innovation-management-de-l-intelligence-strategique/article/771076/fa167461 (accessed 13 May 2013).
[8] Extracted from AFNOR website available at http://www.boutique.afnor.org/norme/fd-x50-146/management-de-l-innovation-management-de-la-propriete-intellectuelle/article/765033/fa169016 (accessed 13 May 2013).
[9] Extracted from AENOR website, available at http://www.en.aenor.es/aenor/certificacion/innovacion/innovacion.asp#.UZgsgcrN3Ds. Information concerning all UNE standards listed in Table 1 have been extracted from the same website page.
[10] Extracted from BEUTH wesbite, available at http://www.beuth.de/en/standard/din-77100/140168931 (accessed 13 May 2013).
[11] Extracted from BSI Shop, available at http://shop.bsigroup.com/en/ProductDetail/?pid=000000000030164295 (accessed 13 May 2013).

Table 2 – Examples of existing standards in Europe covering innovation-related aspects (cont.)

Country	Year	Standard	Title/Technical Field	General Description	Accredited Certification
Portugal	2007	NP 4457:2007[12]	Management of Research, Development, Innovation (RDI), RDI Management Systems Requirements	Specifies the requirements for a research, development and innovation management system that enable an organization to develop and implement an RDI policy aiming to increase the effectiveness of their innovation performance.	Foreseen
Portugal	2007	NP 4458:2007	*Management of Research, Development, Innovation (RDI), RDI Projects requirements*	Outlines the requirements to help systematize activities in RDI projects	Foreseen
Spain	2006	UNE 166001:2006	*R&D&i management – Requirements related to the planning, organization, execution and control of R&D projects*	Outlines guidelines to help with systematize activities in RDI projects	Foreseen
Spain	2006	UNE 166002:2006	*R&D&i management -R&D&i management system*	Provides guidelines to systematize the formulation and development of RDI policies, and to establish goals in line with activities, products and services that are specific to each organization.	Foreseen

Portugal is among the first group of European countries to have developed a standardized certifiable integrated framework to specifically manage RDI activities. In 2007, COTEC Portugal - Business Association for Innovation, set in motion the *Sustained Development of Business Innovation* (DSIE), with the aim of enhancing Portuguese companies' innovation performance (CAETANO; GUIMARÃES SÁ, 2011, p. 28) by relying on the "*Research, Development and Innovation Management System (RDI) as a fundamental method to create knowledge and transform it into economic and social wealth*" (IPQ, 2007b, p.4).

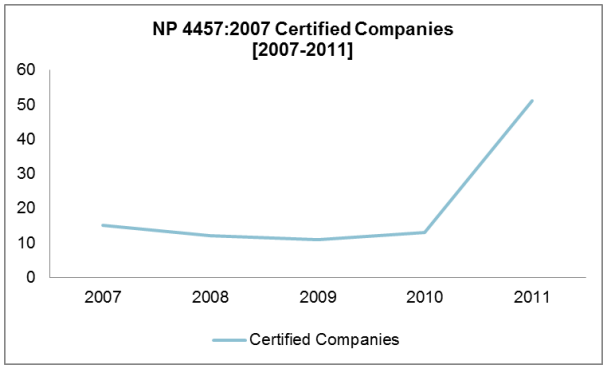
Under the auspices of this association, a family of R&D and Innovation standards (among which the NP 4457: 2007) was published by the IPQ, the Portuguese Institute for Quality. The standards created a new *locus* of action for both consulting and certification organizations, as, in parallel, accredited certification schemes to the standards NP 4457: 2007 and NP 4458:2008 were developed and came to force[13]. Between 2007 and 2011, 102 Portuguese companies had implemented NP 4457:2007-certified RDI management systems (Graphic 1). In the first semester of 2013, this number rose to 150 companies[14].

The boost in the number of companies certified to NP 4457:2007, particularly from 2010 onwards, cannot be disconnected from a public institutional setting, very much related to

[12] Extracted from IPQ website, available at http://www.ipq.pt/custompage.aspx?pagid=4050 (accessed 13 May 2013).
[13] Extracted from IPQ website, available at http://www.ipq.pt/custompage.aspx?pagid=4050 (accessed 2 May 2013)
[14] Data was provided by Isabel Caetano from COTEC Portugal.

the *National Strategic Reference Framework, Portugal 2007-2013* (*QREN*), and more specifically, to the *Company Investment Incentive Systems*, which has supported the implementation of the standard by Portuguese companies, and in many cases, turned implementation and accredited certification into a mandatory eligibility condition to grant companies access to co-funding. Indeed, although a cause-effect link cannot be clearly established, it is admissible that external requirements (or external motivational factors) directly related to the funding schemes rules underpinned the steady growth in certified RDI management systems between 2007 and 2011.

Graphic 1 – Number of companies certified to NP4457: 2007 (2007 – 2011)[15]



In order to raise awareness about the advantages of implementing the innovation standard, COTEC Portugal published the *Guide for Best Practices for Innovation Management* (2010) which included the perceptions of 24 companies that had been certified to the normative framework. Statements collected in favor of the standard pinpoint:

- The creation of structural conditions to support decision-making;
- Development of indicators and monitoring processes with a positive impact on the organization's overall management capability;
- Implementation of a systemic approach to innovation that facilitates the access to information;
- Systematization of information;
- Focus on value-creation;
- Promotion of an innovation culture and enhancement of creativity and idea generation;
- Creation of communication pathways both within the organization and between the organization and external environment (CAETANO; GUIMARÃES SÁ, 2011, p.29)

The Guide does not shed light, however, on the difficulties or drawbacks related to the implementation of a standard-compliant innovation management system.

[15] Extracted from COTEC Portugal website, available at http://www.cotecportugal.pt/index.php?option=com_content&task=view&id=261&Itemid=238 (accessed 3 January 2013)

2.2.The NP 4457:2007: An overview

In the introduction to the NP 4457: 2007, it is referred that the standard is based on the state of the art about innovation and innovation management (IPQ, 2007a, p.4). The standard draws on the 2005 Oslo Manual's broad concept of innovation, which is defined as the "*implementation of a new or significantly improved solution for the organization, a new product (good or service), process, organizational method or marketing approach with the aim of reinforcing its competitive positioning, improve its performance or knowledge*" (IPQ, 2007a, p.8)[16]. Therefore, because the Portuguese standard embraces different types of innovation, it goes beyond the conceptual *locus* adopted by the Spanish experimental standard[17] (developed prior to the publication of the 3rd version of the Oslo Manual) which was very much attached to a technology centered view of innovation and to product and process innovations (IPQ, 2007a, p. 7). The NP 4457:2007 is underpinned by the multi-channel interactive learning model, a model that makes the transition of the well-known Kline and Rosenberg's model into the knowledge-based economy (IPQ, 2007b, p.5). According to this improved conceptual approach, companies are at the center of the innovation process, a process which takes place in a rather complex innovation ecology with many potential intervening stakeholders and interfaces and with many possible pathways (not just science and technology-based) (CARAÇA *et. al*., 2009). This leads to product, process, organizational or marketing innovations. Drawing on the representational schema of the model, the standard identifies, to an abstract level, a number of activities, roles, processes and tools that companies should put in place to be continuously aware of their internal and external environment.

The standard provides guidance on how to implement an "*effective management system for Research, Development and Innovation (RDI), allowing organizations that adopt this standard to define an RDI policy in order to reach their innovation objectives*" (IPQ, 2007b, p. 4). Made to be adopted by any type of organization[18] and integrated with other systems, the normative framework specifies the requirements to systematize organizations' innovation process. Instead of prescribing quick fixes, each organization is responsible for the solution that best meet those requirements[19]. Based on the PDCA (Plan, Do, Check, Act) approach, the standard covers five major sections:

Table 3 – Structure of the NP 4457:2007

General Requirements:	Organizations are required to: 1. Devise, implement, document (in a similar way to the ISO 9001 standard), monitor and maintain an RDI overall process; 2. Set the boundaries of their RDI activities (RDI focus or scope); 3. Control outsourcing activities with connections to the RDI management system
Management Responsibilities	Implementation and maintenance of the system requires continuous commitment and well-defined accountabilities of stakeholders, including of top management (in particular with regard to establishing an RDI policy and RDI objectives, assigning resources to innovation activities, leading and supporting a culture of innovation and reviewing the system for continuous improvement) and management representative
Planning RDI	This section outlines requirements to planning of RDI activities, with a

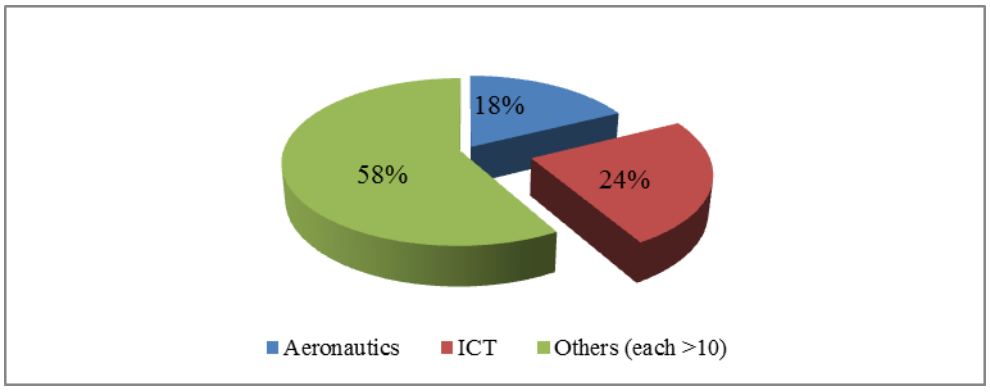
[16] Authors' translation of the Portuguese version of the text.
[17] UNE 166002 EX.
[18] Again in line with the views of the 2005 Oslo Manual and Caraça et *al.*'s model (2009) that innovation may be transversal to any organization, whether low or high technology-based.
[19] "*This standard does not intend to establish rigidity in the RDI systems' structure nor in its documentation*" (IPQ, 2007b, p. 4).

	particular emphasis on interface and knowledge management activities (internal and external environment), idea management and opportunity assessment and planning of RDI projects.
Implementation and Operation	This section recommends: 1. The identification of RDI management activities (portfolio management, intellectual property management, knowledge management, identification and analysis of problems and opportunities, creativity, idea management, and project management); 2. Awareness and training of personnel performing and managing RDI activities; 3. Communication, documentation and control of records;
Evaluation of Results and Improvement	In line with its purpose to help companies accomplish their innovation goals, the normative framework dedicates a section to guidelines about the assessment of RDI results as well as of RDI management system, with the aim of improving the system continuously.

3. Methodology

This paper presents a case study research concerning five ICT companies, all of them with NP 4457:2007 certified systems. The ICT sector was selected for two main reasons: it is reported as a sector that heavily relies on innovation to deliver customer value, with its innovation outputs driving innovations in practically almost every sector of economy (WEF; INSEAD, 2012); and as far as NP 4457:2007 adoption is concerned, it is the sector in Portugal with the largest number of companies certified to the normative framework (Graphic 2). The reason to include companies at different stages of their business development and of different sizes (Table 4) was also intentional and responds to the aim of understanding whether the standard is, in reality, structured to be adapted by any organization irrespective of its maturity or size[20].

Graphic 2 –NP4457: 2007 impementation by sector (based on 141 certifications) [21]



Face-to-face interviews were conducted with top management representatives of the companies using a questionnaire based on innovation audit schemes and built to induce respondents to critically analyze a group of processes covered by the Portuguese standard before and after the deployment of the standard within their organizations.

[20] In the introductory section of the Standard, it is referred that it "*can be used by organizations of any type in the management of their innovation processes*." (IPQ, 2007b, p. 4)

[21] Extracted from IPAC website, available at http://www.ipac.pt/pesquisa/pesq_empcertif.asp/ (accessed 15 August 2013)

The impact of the implementation of the Portuguese innovation standard (and, in parallel, the use of a certification seal by organizations) is still an underresearched topic that merits attention, in particular, at present time, when some countries are on the move to create ISO standards on innovation-related technical fields (more precisely, on management of innovation and on innovation tools, methods and partnerships).[22] These case studies do not allow us to draw generalizable conclusions but they provide in-depth insights about the motivational factors behind the standard adoption, the most relevant challenges experienced throughout the implementation process, and the perceived benefits resulting from the NP 4457:2007 innovation management framework, thus providing inputs for the development of further empirical studies involving more companies. As Mir and Casadesús (2011) note in support of a one-case based research "a *single study in new areas of research, if conducted with sufficient rigour and depth, has the potential to provide insights and knowledge that are not accessible with other research methodologies"* (p. 178).

Table 4 – General features of the interviewed companies

General Characteristics	Company A	Company B	Company C	Company D	Company E
Year of foundation	1998	1999	2001	2007	2008 (2011)[23]
Number of workers in 2012[24]	230	18	33	28	4
Main products/ services	Solutions, services and technologies for information systems	Software solutions for different market segments and consultancy services	Software for different segment markets (Health, Telecommunications, etc.), customized ICT solutions	Software solutions for video production and broadcast industry	Interactive 3D software application for leisure and business purposes
Year of RDI management system certification	2010	2009	2011	2011	2012
Duration of the implementation (in months)	1	9	24	8	6
Access to external consulting team for implementation	Yes	Yes	Yes	No	Yes

Large-sized company

Small and medium-sized company

4. Main Findings

Table 5 summarizes key data extracted from the interviews with the companies' representatives, grouped according to the research driving questions. All five respondents admitted that, in general, advantages had outweighed disadvantages associated with the

[22] See section 1 of this paper.
[23] The company was legally established in 2008, but only started running in 2011.
[24] Number of workers in Portugal

implementation of the standard. This perception is particularly interesting when analyzed in face of the main motivational factors that supported the use of the standard as a guiding structure for innovation management.

Table 5– Main perceptions of companies' representatives in accordance with key research questions

Driving Questions	**Key Perceptions**	**Companies**				
		A	**B**	**C**	**D**	**E**
Motivations For Implementation	Primarily mandatory (related with public funding requirements)			✓	✓	✓
	Primarily voluntary (*nothing that required any additional or meaningless efforts*)	✓	✓			
Advantages of Implementation	Knowledge systematization	✓	✓	✓	✓	✓
	Driver of change	✓	✓	✓	✓	✓
	Creation of new communication channels/flows supporting the process			✓		✓
	Identification of different innovation types			✓		
Disadvantages/ Drawbacks of Implementation	Bureaucratic side of standard implementation	✓	✓	✓	✓	✓
	Lack of full-time resources to keep system running effectively	✓	✓	✓	✓	✓
Reasons to keep with certification	Differentiation factor in relation to competitors	✓	✓	✓		
	Requirement of some public funding schemes				✓	
Reasons to drop certification	Not significant (for the market, for the company development)					✓

4.1. Motivational Factors – External Requirements

As mentioned previously, since its creation, the NP4457: 2007 has been closely related to governmental financing, and certification to the standard became a mandatory requirement for companies to get public incentives under specific programmes. In this study, the most recurrent motivational factor for implementing the standard was - to use the terminology of Castillo-Rojas *et al* (2012) - an "*external requirement*" (p. 1081), more precisely, a commitment determined by government regulations. In fact, companies C, D and E were forced not only to implement but also to certify their RDI management systems to receive the public incentives they had applied for. Interestingly, they all admitted that, from the very beginning, they addressed such external requirement in a rather constructive way, as an argument for change. "*We didn't want the standard to be an anti-body, but rather turn it into an instrument of organizational change […] I guess standards are good to force people to change. Of course change is related to discomfort, but when there is a good leadership driving change, well, discomfort is blurred over time",* stated the CEO from

company D. The existence of an organizational culture open[25] to change was decisive to facilitate the implementation of the RDI management system and to overcome the feeling of having to do something for the sole purpose of complying with external rules.

As far as companies A and B are concerned, external pressures were not a key determinant in implementing a standardized process for RDI management. Adopting the standard was a voluntary decision that nevertheless was backed up by the recognition that the market did reward innovative companies – and compliance with an innovation standard could provide verifiable evidence that a company was committed to innovation. Voluntary adoption of the NP 4457:2007 may be justified, to some extent, by the maturity of both companies, even though they are of different sizes. Both companies have been in the market for around 15 years and the standard implementation perceived as something "*natural*", as a validation of the organization's established innovation framework, rather than an add-on or a starting point ("*when we read the standard we realized that it was pretty much what we were already doing,[…] we didn´t start from scratch."*[26]). On the contrary, in the case of company E, a startup where implementation was pushed by a funding scheme, the innovation process workflow had not been even thought of and many of the organization's processes neither designed nor minimally integrated when implementation kicked off.

4.2. Perceived benefits and difficulties related to the standard adoption and importance of the certification seal

With regard to the benefits arising from implementing the standard, systematizing and formalizing processes and activities (by means of codification and channel creation) and promoting change have been unanimously referred as the major positive aspects by all respondents. Systematization and formalization were particularly felt in relation to idea management and interface management processes: "*Before the standard, we can say that there was an innovation culture…but the process was not systematized… We had ideas, we commented on them, but we would never write them down*", stated the CEO of company C. The CEO of company D, in turn, stated that the standard had been very important with regard to market and technology monitoring activities.

At project management level, even though the standard makes some recommendations about planning and management of RDI projects, it did not add much as ICT companies had already other methodologies in place stemming from software development approaches (e.g.: Scrum).

Respondents have also positively acknowledged that the standard did not impose predefined solutions (such as tools and methodologies) for organizations to meet the normative requirement. On the contrary, only orientation is provided in relation to what should be observed by organizations so as to ensure the implementation of an efficient integrated RDI process management. It is, therefore, up to each organization to choose what tools or activities are the most suitable to meet the standard requirements in a somehow natural, organic way. By taking such approach, the "*antibodies"* (that is, the artificial features created for the sole purpose of obtaining the certification seal from a third party) that would eventually lead to the death of the system may be minimized; nevertheless, as shown further ahead, the production of non-value added content cannot be completely avoided. Considering that all companies are software developers, the

[25] These are companies with few workers (most of them software developers) with a flat working structure and horizontal relationships, supportive of entrepreneurial spirit, and with links to the academia.

"freedom" that lives in the standard is rather important particularly when it comes to select ICT tools to support key activities of the organization's RDI management system such as idea management or management of interfaces. "*If the standard came with predefined tools […] I am a technologist, […] I would have to refuse it*", argued the representative of company E. Company C also took advantage of this freedom: capitalizing on its ICT knowledge, the company developed a specific software tool – under an RDI project – to map organizational knowledge and improve the allocation of people to the company's RDI projects. This in-house developed software evolved into an innovative product that was launched in the market in 2012. Also the representative from company B stated that some of the tools developed in-house to support their RDI management system were successfully turned into commercial solutions for other companies running RDI management systems.

Other positive aspects highlighted by the interviewees included the ability to identify other types of innovation taking place in the organization (apart from product innovation) and to clearly define RDI scope, thus making it possible to concentrate resources and activities.

Implementation timeframe ranged in the study from 1 up to 24 months, depending, for instance, on the starting position of companies as regards innovation management-related processes or on how the system was envisioned and planned. In the case of company A, implementation was conducted in a very short time, because the existing innovation framework was very much aligned with the normative requirements: "*We just had to make small adjustments to the standard requirements; we did not have to invent the wheel*". In company C, on the other hand, it was about improving existing processes – some of them corresponding at the time to *ad-hoc* arrangements – and about integrating the innovation standard requirements with the ISO 9001 normative framework, whose implementation was dealt with during the same period time. This may explain, to some extent, obviously, why the implementation process of the NP 4457: 2007 in Company C took 24 months. Castillo-Rojas *et al.* (2012) highlights that integrating various management systems can be indeed a rather complex, time-consuming task, "*considering the broad amount of knowledge and skills that specialized people may require and manage*" (p.1086). Another reason why this process was rather lengthy in company C was that illusion ended up overpowering reality (with top management setting too many ambitious goals for the management system and finding itself tangled in too complicated tools and procedures that in some cases inhibited the commitment of workers and/or flow of processes).With regard to company E, the design and implementation of a formal RDI process was done in parallel with the drawing-up of the company's overall processes, something perceived positively by the CEO - six months were needed to create the foundational framework for business and innovation processes. Nevertheless, he raised the question whether the standard is, in reality, adaptable to any organization irrespective of its maturity: "*I guess* the *standard is still very much designed to companies in more mature cycles of business development. In this [startup] stage, we can´t be always innovating, pushing for new ideas, we need to consolidate innovation results instead*".

Among the difficulties perceived by all of the companies in adapting the standard to their organizations are: 1) creating evidence for certification purposes (the "*bureaucratic side of the standard",* a recurrent phrase during the interviews) and 2) the lack of resources fully dedicated to the system during and after implementation. Tis holds true for large and small and medium sized-companies.

As far as the first negative aspect of the standard is concerned, interviewees agreed that when certification is a goal (whether self-imposed or third-imposed), compliance with certain requirements may lead to non-value added content in the system. The definition of

indicators to monitor the system performance and RDI results was mentioned as an illustrative example: many indicators were built with the purpose of ensuring verifiable evidence of compliance with the standard for certification reasons (to be carried out within a time limit, imposed by the co-funding programmes) not with the spirit of developing meaningful indicators.

This explains to some extent why company E, for example, is considering not pursuing with certification renewal and making the most of the good practices that have resulted from adopting the standard, especially because the company operates in markets that value more a company's partnerships than a "badge" that may not be recognized elsewhere besides Portugal. Company D has considered dropping certification but this may not be a viable option, according to the company's representative, should they go on applying for specific public funding schemes. Within the group of companies forced into implementation by external requirements, only company C is planning to continue voluntarily with certification. It makes sense to them as many of their clients are NP 4457: 2007 certified: "*certification is something that distinguishes us from other organizations*." Therefore, even though companies C, D and E were rushed into certification, their perception about the value of certification to the NP 4457:2007 differs.

As previously mentioned, the other difficulty experienced by the companies was the lack of human resources. Despite being at different stages of business maturity and having different sizes, the five companies had the same perception about the importance of having dedicated people to implement and effectively run the system and keep momentum going. In fact, at a given point in the NP 4457: 2007 text, it is outlined that top management should allocate the necessary human resources to RDI activities and RDI management activities (IPQ, 2007b, p. 8; 15). The lack of staff was, in most cases, minimized with collaborators having to play different roles and conciliating RDI system-related tasks with their core functions to ensure that the system ran. Somehow related to this problem, some interviewees reported that it was also difficult to keep people committed to the system (or, in other words, to have them complying with procedures or rules resulting from standard adoption or to engage further) after the initial momentum. With regard to company C, for example, inertia ended up taking over some parts of the implemented systems. This inertia was very much perceptible in the idea management process. "*We gave people a full day per month to work on idea generation and development, but we realize that they prefer catching up on unfinished work. We have people bringing in many new ideas, but many of them give up registering them [in our platform] because they know they will need to develop them further ahead*". Tracking return on RDI investment was another difficulty highlighted by the interviewees.

Final Remarks

This paper examined the implementation of the first Portuguese Standard on RDI Management Systems in five ICT companies. The standard has been in force for almost six years and 150 companies have been certified to the NP 4457:2007 - so far, the majority of them in the last two years. Public funding schemes available through the National Strategic Reference Framework, Portugal 2007-2013, have not only raised awareness about the normative framework, but also pushed companies to implementation and certification, by turning both stages into contractual obligations that companies had to comply with to receive public incentive for specific projects.

The impact of the standard on the improvement of companies' innovation management practices and thus on their ability to better deliver innovation results is still an underresearched topic that calls for attention, especially at a time when efforts are under

way towards the creation of standardized frameworks regarding innovation-related aspects, including innovation management. Therefore, the apparent weakness of this study – it is based on five cases only, making it impossible to generalize conclusions – becomes its strength, for it provides in-depth analysis of the perceived contribution of the standard to the organizations, an understanding that quantitative approaches would fail to provide. Nevertheless, further research calls for the involvement of a larger number of companies with NP 4457:2007-certified RDI management systems.

The paper focused on three key research questions. With regard to the first question, about the motivational factor driving companies to implement the standard, it became obvious that external pressures, namely related to government regulations to grant companies access to co-funding for project development, were the key driver for at leastthree companies to engage in NP 4457:2007-based RDI management systems, whereas for the other remaining two –apparently those that have been operating in the market for a longer period – adoption resulted firstly from a voluntary decision.

Despite the fact that for some of the companies, engagement did not come first as a real need and rather came as an obligation, from the very beginning these companies have approached such requirement as an argument for positive change and have committed themselves to develop a value-added system for their organizations. Therefore, in general, the standard was reported to be more beneficial than harmful even when its adoption was third-imposed. Also, the voluntary adoption of the NP 4457:2007 by the two other companies may indicate that, at some point in time, organizations turn to external dashboards to validate their existing RDI management systems even when they are aware that a certification seal is irrelevant for their clients and/or partners.

Respondents have also agreed that the standard's most positive aspects were related not only to the introduction of systematization and routinization of RDI management activities by documenting and creating channels for knowledge flow, but also to the non-prescription of (*one-size fits all*) solutions for companies meeting the normative requirements. Nevertheless, there is a shared feeling that when standard adoption is attached to certification there may be some space for the production of content in the system with little value for organizations, be it a startup or an established company. And when certification is to be carried out within a time-limit, imposed by third-party obligations, companies may be even more compelled to create meaningless evidence.

Another problem identified during the research work field was the lack of people to implement and run the system on a regular-basis so as to ensure efficiency of processes and to keep momentum going. Having motivated and dedicated people has been indicated as a foundational requirement for the success of the system which must become somehow organic over time or it will be a burden on the organization's shoulders. Apparently, all respondents were supportive of the idea that innovation propensity is first and foremost concerned with the people working in organizations and with leadership, the fundamental pillars of innovation capability and success, and not with standards. This is in line with Goffin and Mitchell's understanding of people as the foundation stone of innovation (2005, p. 265). "*We innovate because of our people [..] because we have a strong innovation culture, not because of the standard; if we just relied on the standard to achieve innovation result*s, *well, it would be very complicated […]"*

During the interviews all companies stated that they were already innovative companies prior to deploying the standard, but they have never argued that the standard made them become more innovative (in fact, one of the companies stated that the standard helped

them identify other types of innovation, besides product innovation, that probably were already taking place prior to adopting the NP 4457:2007). Any evaluation on innovation performance would be mostly perceptual-based as the measurement capability of the companies is still weak. It is important to remember that the standard encourages the measurement of RDI results as well as of RDI management activities; nevertheless, some interviewees reported that at, present time, most of the indicators developed during implementation were not effective and, to some extent, were forced by certification. As a matter of fact, companies stated that they were still not able to measure whether the implementation of the standard has had any positive impact on the return of their investments in innovation. This is a challenging task for two reasons: firstly because it is well known the inherent complexity of innovation measurement exercises; secondly, because for companies to state that they have been performing better or worse since adopting the standard, based on the ROI indicator for instance, they would have to be able to measure current performance against past performance, which may not be documented. Even if they were able to carry out this exercise it would be very complicated to establish a direct causative relationship between the standard and innovation performance, so, to some extent, any consideration about this relationship could only be a perceptional one, yet equally relevant.

In fact, companies have highlighted that they have realized the qualitative value brought by the standard, particularly, at the organizational level, by strengthening some capabilities that have influence over the innovation process. When the negative aspects of the standard were highlighted, they were mostly related to the certification process which calls for verifiable evidence, with auditors failing to understand sometimes the innovation peculiarities or constraints of each organization. Therefore, on balance, the study reveals that there is a shared perception that the Portuguese innovation normative framework may be a plus factor for organizations.

Bibliographical references

CAETANO, I.; GUIMARÃES SÁ, J. dos. **A certificação dos sistemas de gestão da Inovação.** Revista da Ordem dos Engenheiros, Ingenuim p. 28-29, July/August 2011

CARAÇA, J.; LUNDVALL, B.; MENDONÇA, S. **The changing role of science in the innovation process: From Queen To Cinderella.** Technological Forecasting & Social Change, 76, p. 861-867, 2009.

CASTILLO-ROJAS, S; CASADESÚS, M.; KARAPETROVIC, S.; COROMINA, L.; HERAS, I.; MARTÍN, I**. Is implementing multiple management system standards a hindrance to innovation?** Total Quality Management, Vol. 23, No. 9 September 2012, p. 1075-1088.

COTEC Portugal. **Guia de Boas Práticas de Gestão de Inovação**. 2.ª edição. 2010. 275p. ISBN-978-989-95583-2-8

EUROPEAN UNION. European Regulation (EU) No 1025/2012 of the European Parliament and of the Council of 25 October 2012on European standardisation, amending Council Directives 89/686/EEC and 93/15/EEC and Directives 94/9/EC, 94/25/EC, 95/16/EC, 97/23/EC, 98/34/EC, 2004/22/EC, 2007/23/EC, 2009/23/EC and 2009/105/EC of the European Parliament and of the Council and repealing Council Decision 87/95/EEC and Decision No 1673/2006/EC of the European Parliament and of the Council. **Official Journal of the European Union.** L 316, p.12-33, 14.11.2012. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:316:0012:0033:EN:PDF. Accessed 10 May 2013.

GOFFIN, K.; MITCHELL, R. **Innovation Management: Strategy and Implementation Using the Pentathlon Framework.** Palgrave Macmillan, 2005. 352p. ISBN-13: 978-1-4039-1260-2

INSTITUTO PORTUGUÊS DE QUALIDADE (IPQ). **- Gestão da Investigação Desenvolvimento e Inovação (IDI). Terminologia e definições das actividades de IDI.** NP 4456: 2007. 2007a

INSTITUTO PORTUGUÊS DE QUALIDADE (IPQ). **Gestão da Investigação, Desenvolvimento e Inovação (IDI). Requisitos do sistema de gestão da IDI.** NP 4447:2007. 2007b.

KOETZIER, W.; KRISTENSEN, S.; ALON, A. **The Innovation Death Spiral.**Accenture, 2011. Available at: <http://www.accenture.com/SiteCollectionDocuments/PDF/Accenture_The_Innovation_Death_Spiral.pdf>. Accessed 11 March 2013

KONDO, Y. **Innovation versus standardization.** The TQM Magazine, 12(1), p.6-10, 2000.

MAIER, A; BRAD, S.; FULEA, M.; NICOARÃ, D; MAIER, D. **A Proposed Innovation Management System Framework – A Solution for Organizations Aimed for Obtaining Performance.** World Academy of Science, Engineering and Technology, 71, p.1733-1737, 2012.

MÍR, M.; CASADESÚS, M. **Standardised innovation management systems: A case study of the Spanish Standard UNE 166002:2006.** Innovar, 21(40), 171-187, 2011.

NADA, N. **A framework for systematic application and measurement of the innovation management processes.** The Journal of Knowledge Management, Volume V, Fall, 2010.

THURIAUX-ALEMÁN, B.; EAGAR, R.; JOHANSSON, A. **Getting a Better Return on Your Innovation Investment**. Arthur D. Little, 2013. Available at: <http://www.adlittle.nl/uploads/tx_extthoughtleadership/TIM_2013_Innovex_Report.pdf> . Accessed 12 March 2013

WALZER, N; SALCHER, **A. Management by jazz – creating innovation from the principles of chaos and order.** Industrial and Commercial Training, Vol. 35 Iss: 2, pp.67 – 69, 2003.

WORLD ECONOMIC FORUM; INSEAD. **The Global Information Technology Report 2012**. 2012. Available at http://www3.weforum.org/docs/Global_IT_Report_2012.pdf. Accessed 10 May 2013