Systems & Management 11 (2016), pp 72-81

SYSTEMS & MANAGEMENT
Electronic magazine

REQUIREMENTS IDENTIFICATION FOR AN OPEN INNOVATION PORTAL

Lindomar Subtil de Oliveira[a]; Jonatas O. Scherer[b]; Manoel Nascimento[b]; Márcia Elisa Soares Echeveste[b]

[a] Federal Technological University of Paraná/Federal University of Rio Grande do Sul
[b] Federal University of Rio Grande do Sul

Abstract

The development of regional innovation systems (RIS), aimed at the growth of a region, can be fostered by the use of a portal of *open innovation* (OI). The purpose of the article is to identify the requirements for a portal of OI to RIS. The work was conducted in two stages. Were initially identified the requirements for a portal SRI through analysis of the literature, interviews with experts in RIS, and analysis of portals of OI. The following are the requirements identified were prioritized using the QFD (*Quality Function Deployment*), and analyzed the perceptions of *stakeholders* using cluster analysis. 14 have been identified, seven of these requirements specific to an RIS. Cluster analysis indicated the existence of two groups of *stakeholders* to prioritize different requirements in a portal of OI for a RIS. The results make it possible to build a portal of OI that meets the specific needs of an RIS, in addition to indicate that the portal can be customized to meet the priorities of different *stakeholders*.

Keywords: Open innovation; regional innovation system (RIS); Innovation Portal; requirements.

1. INTRODUCTION

Expand the channels of relationship and strengthen external partnerships for acquisition and development of innovation, has become a primary factor of competitiveness in the current market environment (Belussi *et al*., 2010). The frontiers of innovation are no longer limited to the internal environment of the companies, but in the organizational environment, especially in the formation of networks, clusters and innovation systems, forming a kind of ecosystem of innovation, collaboration and partnerships, in which all contribute and support systemically to grow and prosper (Silva *et* Dacorso, 2013).

From this perspective, the economic advancement of a particular region is based on intellectual assets and the innovative capacity of firms. Therefore, the importance of the actions, partnership work and efforts made by the various regional actors (referred to in this work of *stakeholders*) for the promotion and development of innovation habitats, such as the Regional Innovation System (RIS). For a RIS achieve their goal of boosting economically a geographical area, in addition to the efforts of the actors is crucial to create technology platforms, integration mechanisms and networks of relationships aimed at the dissemination and exchange of knowledge, so that the actors meet the needs of each other (Cooke, 1992; Çubukcu Gümüs, 2015; SEBRAE, 2013; Lee *et al.*, 2010).

In this scenario, an emerging approach and irreversible in the development of innovation is the *Open Innovation* (OI). OI is a break from the conventional way of thinking and perform innovation, especially, this concept emphasizes that for companies to achieve greater business growth is necessary to be able and prepared to open the market, taking advantage of the ideas from external sources (Chesbrough, 2003). In other words, OI is based on a heavy flow of knowledge and relationships between companies and individuals. For Rubach (2013), this process of relationship aims to discover, promote and explore innovative opportunities, adding economic value and anticipating the development of new products

PROPPI / LATEC
DOI: 10.20985/1980-5160.2016.v11n1.827

Electronic Journal of Management & System
Volume 11, Number 1, 2016, pp. 72-81
DOI: 10.20985/1980-5160.2016.v11n1.827

to the market. In addition, a collaborative strategy tends to increase the internal capacity of innovation to connect with a network of knowledge that transcends the boundaries of the company. Therefore, the opening of innovation makes it possible to find external solvers for problems, reducing the risks, investments and efforts of enterprises (Carbone *et al*., 2012; Terwiesch *et* Xu, 2008).

On the assumption that the RIS development-friendly features of HI, the proposition of a Portal of *Open Innovation* (POI) to an environment of RIS can be an alternative to facilitate the promotion of innovation through the approach of researchers and integration with companies, customers and research institutions. In addition, the portal is a quick, easy and dynamic way to capture ideas from the external environment and transfer to companies. In this way, companies can access the external knowledge and attract talents and innovative solutions, which creates a win-win situation between innovative organization (Chang *et* Wang, 2010; Çubukcu Gümüs, 2015). Also, a POI aims to provide a more efficient communication with the market, impacting since the generation of ideas to the marketing of a new product or process (Awazu *et al.*, 2009; Sawhney *et al*., 2005; Frey *et al.*, 2011; *et* Hüsig Kohn, 2011).

Despite the importance of this topic, it was noted that academic research directed to POI are still quite sparse in literature, being one of the most recent search (Çubukcu *et* Gümüs, 2015). Front of this gap, the present study aims to present a proposal for development of a POI, based on application of the early stages of requirements management. For the identification and prioritization of requirements, the theoretical reference, quantitative and qualitative techniques and methods support *Quality Function Deployment (QFD)* and *Cluster Analysis (CA).*

The article is structured in five sections, including this introduction to the topic. The second section is developed the theoretical foundation. The third presents the method used, which are detailed in the stages of development and implementation of the research. In the fourth section of the article are presented and discussed the results. Finally, in the fifth section, we present the final considerations, as well as the limitations and suggestions for future research.

2. THEORETICAL FRAMEWORK

2.1 Open Innovation (OI)

The OI is one of the main topics of study in innovation management in recent decades, attracting attention to academic research and business practice (Huizingh, 2010). In order to explore the principles of OI, many companies have defined strategies to identify, capture and adapt foreign technologies that can meet the internal needs of the Organization, as well as take internal technologies to provide new business outside of the organizational environment (Chesbrough, 2003; Chesbrough *et al.*, 2006; Enkel *et al.*, 2009).

This strategy requires the manager's new attitude with regard to the development and treatment of innovation activities. Conceptually, the OI refers to the internal use of the knowledge that is produced in the external environment of the company, or the external knowledge sharing and enjoyment that is generated within the organization. These two combined processes result in partnerships, collaborations, alliances, *joint ventures* and expansion of the network of relationships (Grimaldi *et al*. 2013; Huizingh, 2010).

According to Chesbrough *et* Appleyard (2007), OI is a business strategy based on collective creativity, and through her companies can accommodate various experts working together on solutions to problems, since the knowledge capacity expands OI organizations. However, the change of concept of individuality to an approach of openness and participation, requires the evaluation of the processes of creation and capture of value of business (Chesbrough *et* Appleyard, 2007).

Based on the principles of OI, collaboration, partnerships, creation and sharing of knowledge, it is believed that RIS is a viable and favorable environment for the implementation of practices of OI. In the next topic are some characteristics and objectives of RIS that highlight the importance of alignment of the system with the assumptions of the OI.

2.2 Regional Innovation System (RIS)

The geographical proximity between actors promotes interaction and innovation. Thus, the strengthening of a RIS depends on the attitude of the participants. Although are still underperforming the collaborative initiatives between the processes of innovation and organizational intraorganizacional, engagement and commitment of the actors is a preponderant factor to adding value and learning in the chain of relationships (Mothe *et* Paquet, 1998; Rubach, 2013).

RIS seeks to improve regional competitiveness through coordination and acceleration of the process of innovation, aligning the University research with business demand, so that innovative products and services reach faster to the market (Amato Neto *et* Garcia, 2003). This is a set of interrelationships and mutual influences between different regional public and private actors who seek to practice actions in their territories in order to promote innovation in enterpri-

Electronic Journal of Management & System
Volume 11, Number 1, 2016, pp. 72-81
DOI: 10.20985/1980-5160.2016.v11n1.827

ses and contribute to the development of the regional economy (Lundvall *et al*., 2002; SEBRAE, 2013).

Other conceptions corroborate that RIS has a strategic role to create cohesive relationships for the generation, use and dissemination of knowledge and information, in addition to establishing goals, communication, engagement and mutual trust between the actors (Hajek *et al.*, 2014; Cooke *et al*., 1997; Amato Neto *et* Garcia, 2003).

Labiak (2012) and Todtling *et* Kaufmann (2001) explains that a *habitat* of innovation as the RIS, aims to apply a policy of integration between regional actors gathered in the same geographical area, formed by: businesses, workers, institutes of science and technology (IST), public and private organizations, which must have affiliate links to promote the development of innovative projects. The proximity of the synergistic relationships and seeks assets conducive to the flow of knowledge. In addition, providing greater confidence among the actors, who can explore new ideas and different ways of doing things, aided by the facilitation of researchers and resources generated by the regional innovation projects (Labiak, 2012; Rubach, 2013).

Still in the context of RIS, another important factor that can contribute to the relationship and development of collaborative projects, as well as facilitate the connection and the actors approach, is to use technology platforms, for example, portals of OI. Following the article is discussed about the importance of innovation and enterprise portals in particular the POI.

2.3 Corporate Information portals and portals of Open Innovation

More and more companies are recognizing the potential of integrating customers, employees, partners and *stakeholders* as sources of information that enable the acceleration of the process of innovation through collaborative projects (Battistella *et* Nonino, 2012; Çubukcu *et* Gümüs, 2015).

In addition to contributing to the relationship and approach companies, some factors that motivate the realization of collaborative projects are reducing the life-cycle of products, innovation, customization and development of information systems. Enterprise information portals, or innovation platforms as they are often known, support the operations teams of collaborative projects and make it possible to transcend the geographical limitations, sharing ideas, information, knowledge and interaction with innovative external solvers (Terra *et* Bax, 2003; Frey, *et al*., 2011).

In addition, under business, enterprise information portals assume increasing importance in business, turning the vast informational content from varied sources of useful information for decision-making (Terra *et* Bax, 2003). Portals enable more and better results in terms of developing new products and services, since they extend the relationship with the external community of innovation, attract innovators and allow collaborative projects are developed with the contribution of external partners such as universities (Ebner *et al*, 2009).

With respect to POI, Çubukcu *et* Gümüs (2015) claim that a OI platform offers the opportunity to the company reduce risk, improve the process and the speed of work and increase the scarce resources related to innovation. For Battistella *et* Nonino (2012), OI based on a Web platform is a new instrument to aggregate and integrate different members (individuals and businesses) in a community of innovation. That same bias, Chang *et* Wang (2010) explains that the portal provides different functionality and can help small and large groups of people to cooperate and work together more efficiently.

One of the POI, the portal of the Ministry of Science, Technology and Innovation (MCTI), which aims to map skills, integrate actors and facilitate the search for content using specific search filters. Is an environment in which businesses, research institutions and government bodies interact to promote innovation? Operationally the portal is a database companies exhibit their personal training and technological demands. The information made available represent opportunities that become public who have an interest in scientific and technological cooperation. As shown on the portal page, one of the main goals is to promote cooperation between the various actors, uniting businesses, experts, support organizations and the general public (MCTI, 2013).

To support the development project of a POI, it is essential the use of methods and tools to identify and manage the needs and requirements of customers. In this sense, the Requirements Management (RM) presents itself as a viable tool for applying this type of POI project. In the next section are discussed some concepts, objectives and stages of process-related requirements.

2.4 Requirements management

The RM is a problem-solving approach that seeks to understand and control the requirements throughout a project. Encompasses a number of activities that contribute to the production of a requirements document and its maintenance. In other words, it is a tool able to track and document the requirements management during the development period of a project. Therefore, understand the changes, manage the relationship of existing requirements and dependencies

Electronic Journal of Management & System
Volume 11, Number 1, 2016, pp. 72-81
DOI: 10.20985/1980-5160.2016.v11n1.827

between the requirements document and other parts of the project (Bray, 2002; Macaulay, 1996; Sommerville, 2007).

The process of changing the requirements need to be controlled in order to guarantee the quality of the project. To accomplish this efficiently control each phase of the project should require specific practices, because they involve different clients, objectives and types of requirements (Bray, 2002; Kotonya *et* Sommerville, 2000; Sommerville, 2007; Wiegers, 2003). According to Pegoraro (2010), the process of requirements can be described in four stages: (i) identification, analysis and prioritization (ii), (iii) and (iv) validation. It is important to note that the POI project proposed in this work is centered only on the first two stages of requirements (i and ii), which are demonstrated its operation on section 3. So, as a result, are better explained these two phases.

On stage (i), the identification of the requirements, you must listen to all clients of the project for the survey of the demands. The tools used in this phase can be interviews, *brainstorming*, documentary analysis, *workshops* and joint analysis (Bray, 2002). Specifically, it is the phase of recognition of *stakeholders,* i.e. persons who have some influence or are involved in the project and with the information-gathering activity (Sommerville, 2003).

Weiss (1998) by referring to the definition of *stakeholders* suggested by Freeman (1984, p. 25), States that: "*stakeholders* are individuals or groups who can influence or be influenced by the actions, decisions, policies, practices or objectives of the Organization" Second Frooman (1999), an analysis of *stakeholders* must answer three main questions: Who are they? What do they want? How they're going to try to get what they want? Respectively dealing with the attributes, of the purposes and the methods used by them. Customers, suppliers, competitors, product managers and engineers are some of the *stakeholders* more cited to integrate, for example, a product development project and, traditionally, are seen as sources of generation of requirements for products (Kotonya *et* Sommerville, 2000). Therefore, the company must be informed, understand what is expected from the project and identify the requirements to consider.

(Ii) phase, analysis and prioritization, are considered the evaluation, organization and negotiation of requirements. As this stage occur differences, it is essential to find a set of requirements that results in a final product with the highest possible information aggregation (Miron, 2002; Sommerville, 2007).

To achieve the goals of phases (i) and (ii), and support the strategic development project of POI, a tool that can be used is the QFD. This tool is characterized by the search for top quality, and is a management technique and action-oriented planning, providing creativity, innovation and accessibility of information (Ribeiro *et al*., 2001).

The purpose of QFD is incorporate the preferences of customers-phase (i) as determined through research and interviews, to the various stages of the development cycle (Moore, 2006). The main virtue is to show the character of multifunctionality of those involved and the items that must be prioritized-phase (ii) during the planning and development of products or services, focusing on the fields of improvements.

3. METHOD

This paper seeks to generate practical knowledge to be employed in the process of innovation management, through a proposal for the development of a POI, particularly in implementing the early stages of requirements management, consisting of applied research as Silva *et* Menezes (2001).

On stage (i), to identify the quality requirements associated with the POI was used a qualitative approach, through review of the literature, Visual mapping and interviews with three experts who know the RIS. The RIS which handles this job is located in the southwest region of Paraná. It is observed in this environment a shared network of technological assets, local and regional actors, partners and supporters, as well as a legal environment with regional innovation-friendly policies (Gonçalves, 2007). In Figure 1, demonstrates a representation of *stakeholders* that form the RIS.

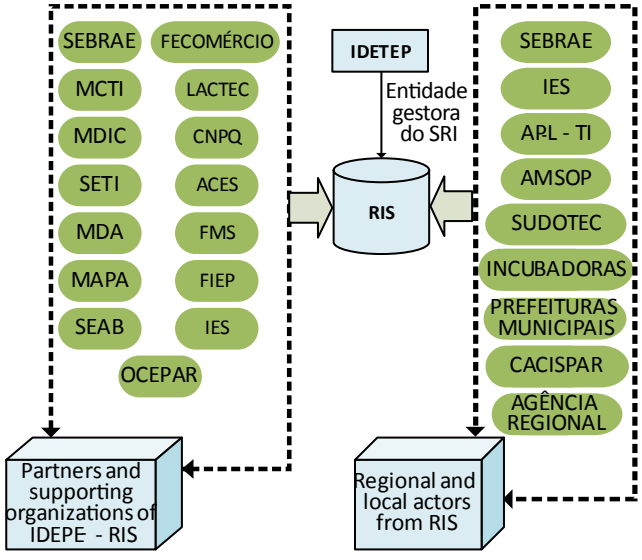

Figure 1 - Stakeholders of RIS

Source: Elaborated from the portal RIS Southwest (2013)

CAPTION:

IDETEP – Institute of Technological Development, Research and Innovation in the Southwest of Paraná; SEBRAE-Brazilian Service of Support to Small

Electronic Journal of Management & System
Volume 11, Number 1, 2016, pp. 72-81
DOI: 10.20985/1980-5160.2016.v11n1.827

Business; FECOMERCIO- Trade Federation of the State of Paraná; MCTI--Ministry of Science, Technology and Innovation; LACTEC-Institute of Technology for Development-Center for Technological Research; MDIC-Ministry of Development, Industry and Foreign Trade; CNPQ- National Council for Scientific and Technological Development; SETI-Secretariat of Science, Technology and Higher Education; ACES-Shopping and Business Associations; MDA-Ministry of Agrarian Development; FMS-Municipal Funds of Innovation; MAP-Ministry of Agriculture, Livestock and Food Supply; FIEP--Federation of Industries of Paraná State; SEAB-Department of Agriculture and the Supply of Paraná; OCEPAR - Organization of the Cooperatives of Paraná; HEI-higher education institutions; SUDOTEC-Association for the Industrial and Technological Development in the Southwest of Paraná; AMSOP--Association of Counties in the Southwest of Paraná; APL-Local Productive Arrangements; CACISPAR-Trade Associations and Business Area in the Southwest of Paraná; INCUBADORAS – Incubators.; PREFEITURAS MUNICIPAIS - Municipal Administrations; AGÊNCIA REGIONAL – Regional Agency.

As the article aims to explore the role of each of the actors, sought only illustrate, through the figure 1, RIS integrates a considerable group of *stakeholders,* which are involved and committed to the development of innovation. Given this potential relationship that exists between them, sustains and justifies the proposal of this work for the construction of a POI.

(Ii) phase, analysis and prioritization, the quantitative method for considering the importance of the identified quality requirements, as well as to characterize the characteristics relevant to the different *stakeholders*.

According to Cameron *et* Molina-Azorin (2011), the use of quantitative and qualitative methods is a growing trend in research in the area of management and business, as well as allow deeper studies of the systems. Maxwell (2009) and Saunders *et al*. (2012), suggest that this approach is appropriate for exploratory studies like this that was conducted. Phases, methods and procedures adopted in this research are summarized in Table 1.

4. RESULTS

4.1 Phase (i)- requirements identification

First, were raised six major groups of *stakeholders,* which are: (1) IST, (2) Prefectures, (3) companies, (4) Regional Development Agency, (5) systems (among them, Brazilian Micro and Small Business Support Service – Sistema Brasileiro de Apoio às Micro e Pequenas Empresas - SEBRAE and Institute of Technological Development and Innovation of Paraná Southwest - Instituto de Desenvolvimento Tecnológico e Inovação do Sudoeste do Paraná IDETEP) and (6) regional innovation Clusters. Later, from these groups were selected and extracted 12 actors to be part of the quantitative re-

Table 1 - Phases, methods and procedures of the research

Faze	Method	Procedure
(I) ID OF THE REQUIREMENTS	QUALITATIVE	1) Literature review: OI, SRI, POI e GR.
		2) Identification of stakeholders: Based on Figure 1, 12 were chosen to constitute the sample for the quantitative phase execution of work.
		3) Semi-structured Interviews: interviews were conducted with 3 experts in SRI, based on the discussion and completion of the requirements suggested by Scherer et Ribeiro (2015), and the peculiarities regarding construction of a POI to SRI in the southwest region of Paraná.
		4) Analysis of POI: 15 sites examined and POI available on the internet, based on the requirements suggested by Scherer et Ribeiro (2015) as well as consolidated common and essential requirements between them. The sites and portals listed below, were chosen by the authors of this study based on their experiences in the theme. Selected were: (a) battleofconcepts.com.br, (b) inovacaobrf.com, (c) naturacampus.com.br, (d) tecnisaideias.com.br, (e) aigrugby.challengepost.com, (f) sca.com/en/About SCA/Innovation-at-SCA, (g) innocentive.com, (h) yet2.com, (i) ideaconnection.com/, (j) ninesigma.com, (k) innovation-community.de, (l) innovationexchange.com, (m) openideo.com, (n) challenge.gov e (o) kaggle.com/competitions.
(II) ANALYSIS AND PRIORITIZATION OF REQUIREMENTS	QUANTITATIVE	5) Application of QFD: based on proposal of Ribeiro et al. (2001), only the value of the IDi *, since the analysis of IQj is not the scope of this study. The IDi has been used as an index to the prioritization of the requirements of the secondary level, and this included the contribution of stakeholders 12 and 3 experts, which helped in the composition and prioritization of such requirements. The evaluation on factors Hey (strategic evaluation of quality items defendant) was carried out by consensus between authors and experts of SRI. Already the evaluation Mi (competitive evaluation of quality items defendant), was considered for all requirements as 1, because there was no competition for the POI of SRI.
		6) Analysis of clusters for identification of groups of stakeholders with similar vision: This is a method that seeks to combine similar observations in different clusters, separating the groups of distinct observations (Rencher, 2002). To this end, we used the software SPSS adopting Ward procedure for definition of clusters.

Source: Elaborated from research data (2013) and Scherer *et* Ribeiro (2015)

Electronic Journal of Management & System
Volume 11, Number 1, 2016, pp. 72-81
DOI: 10.20985/1980-5160.2016.v11n1.827

search. Figure 2 illustrates the information flow between *stakeholder* groups of RIS and the approximate amount of representative actors of each.

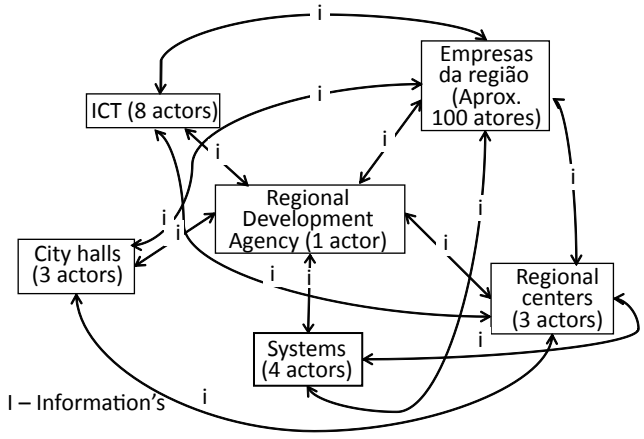

Figure 2 - Flow of information from RIS and actors representing
Source: the authors themselves

Scherer *et* Ribeiro (2015) identified in the literature seven requirements that a POI should have: 1) set a target audience; 2) specify whether is open to specific or general themes; 3) if the period for inclusion of ideas is for a specific period or is always open; 4) the way that will reward the inclusion of the ideas adopted; 5) the evaluation process of the ideas; 6) who will own the intellectual property rights; and 7) if the portal will own the company or outsourced.

Given the presentation of the requirements found in the literature, the experts interviewed took a position of compliance with such requirements and might highlight points of interest, as well as pointed to new requirements. The experts stressed, for example, the importance of the portal disseminate skills and areas of work of the *stakeholders* belonging to RIS. That same bias, the dissemination of skills and integration of actors was seconded by experts as well as reinforced in the literature (Labiak, 2012; Rubach, 2013).

Another aspect pointed out was about the structure of the gate, when it comes to features and functionality. The POI must be of easy navigation and understanding to users with different levels of technology. In addition, agents with distinct objectives involved, the POI must have flexibility for different types of users to access the desired information quickly and reliably. According to the experts, so that a POI directed a RIS succeeds, it is necessary that this POI enable training of *stakeholders* on issues related to innovation, offering courses, teaching materials and setting one of the *stakeholders* as the leader and Manager of the portal.

In addition to the considerations of the experts, the analysis of the POI selected by the authors, as cited in table 1. Was observed in the presence of the seven portals mentioned above requirements, allowing to trace similarities between them, for example, the portals (k) *innovation-community.de*_and (l) *innovationexchange.com.* In addition, identified levels of completeness of the portals, as the portal (c) naturacampus.com.br which has all the requirements. Furthermore, it was found that other portals specify in detail the evaluation process and reward new ideas that are generated, it is important to motivate and attract the participation of external actors.

In summary, from the 7 requirements identified in the literature, plus 7 new that emerged from the opinion of the experts, more elaborate portals 15 analysis by the authors, the Table 2, which brings a list of requirements that were analyzed in the study.

4.2 Phase (ii)-analysis and requirements prioritization

The requirements analyzed in 15 portals were deployed in 8 primary requirements and 24 secondary level, based on interviews with the specialists of RIS. The importance of the requirements of the secondary level was identified through QFD method proposed by Ribeiro *et al*. (2001). In this way, the response of the 12 *stakeholders* through a questionnaire with closed issues, applying a *likert* scale of 10 points for the secondary items, and also with the management of primary requirements. Based on the indexes presented by Ribeiro *et al*. (2001), the results of the analysis of the questionnaires were organized in table 1.

Analyzing the results of the weights (%) it is possible to verify that the integration of the actors, the structure and accessibility of the website and the encouraging participation would be the three most important primary-level requirements for the *stakeholders* surveyed. On the other hand, observing the results obtained for the IDI* (index of importance fixed the quality demanded), also present in the table 1, note that the *stakeholders* also considered important secondary requirements which relate to provide information related to innovation in the areas of operation, and specify who will get the property rights of projects, in addition to those associated with the Group of three primary requirements most relevant already mentioned. This arises because of the *stakeholders* to view the POI as a source to seek ideas to innovate, while have fears and doubts about the ownership and sharing of resources and dividends from the products generated.

The eight primary requirements identified correspond to the quality demanded by customers, namely, the requirements of the client. From these, the product requirements are identified, which should be measurable and have a specified value. For example, to the requirement of integration, possi-

Electronic Journal of Management & System
Volume 11, Number 1, 2016, pp. 72-81
DOI: 10.20985/1980-5160.2016.v11n1.827

Table 2 - Requirements Listing and analysis of portals

Theme	Requirement	Literature - Scherer et Ribeiro (2015)	New requirements - experts	Analysis of portals														
				A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Property	Define whether the company uses a portal himself or others.	X			X	X	X		X							X	X	
Target audience	Set whether to open to a specific target audience participation or the participation of all.	X		X	X	X			X	X	X							X
Definition of business	Define whether the search portal ideas related to a specific topic.	X		X	X	X	X1	X	X	X	X	X		X	X	X	X	X
Reward	Define whether the reward is monetary, not monetary, or both.	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Deadline	Set if the deadline for inclusion of ideas will be open continuously or for a specific period.	X		X		X	X1	X		X	X	X	X	X	X	X	X	X
Evaluation system	Define how, by whom, and what are the criteria for the evaluation of ideas.	X		X	X	X		X		X						X		
Intellectual propriety	Specify issues relating to Intellectual Property in collaborative projects inserted in the portal, and empower the actors in these matters.	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Support the implementation of idea	Provide planning support to the implementation of idea.		X		X	X	X2		X			X					X	
Disclosure	Promote the skills, research and stakeholder demands.		X															
Integration of actors	Allow the actors to identify synergies and interact through the portal.		X															
Structure and accessibility	The portal should allow easy access to the specific demands according to the different needs of stakeholders.		X															
Encouraging participation	Encourage and facilitate the participation of stakeholders via collaborative projects.		X															
Management of the portal	Respond in an agile and participatory demands of actors.		X															
Training	Enabling E-LEARNING trainings and information regarding relevant activities innovation.		X															

Source: Elaborated from research data (2013) and Scherer *et* Ribeiro (2015)

(Caption: 1-occasionally; 2-allows third parties to sponsor)

Electronic Journal of Management & System
Volume 11, Number 1, 2016, pp. 72-81
DOI: 10.20985/1980-5160.2016.v11n1.827

ble product requirements would be the monthly number of collaborative projects generated and the number of interactions between the actors inside the gate, and the goals established as points of interest related to the system in question. Therefore, from the identification of customer requirements it is possible to relate the product requirements that meet the needs of customers in the design phase of the POI.

After the splitting of the quality requirements for the POI, most prominent requirements had been raised for the *stakeholders* involved in the project. However, different groups of *stakeholders* may have divergent views as to the most important requirements of the portal. As the cluster analysis allowed complete (checked in the Dendrogram in Figure 3), the *stakeholders* 2, 5, 8 and 11 formed a cluster and the other formed another cluster. The cluster formed by 2 comments, 5, 8 and 11, have attributed minor relevance to the requirements associated with the structure and accessibility of the website, and considered more important aspects of the requirements associated with the training and encouraging participation, the latter being also corroborated by Ebner *et al*. (2009). These *stakeholders* belong to the Group of regional centers of innovation and regional development agency.

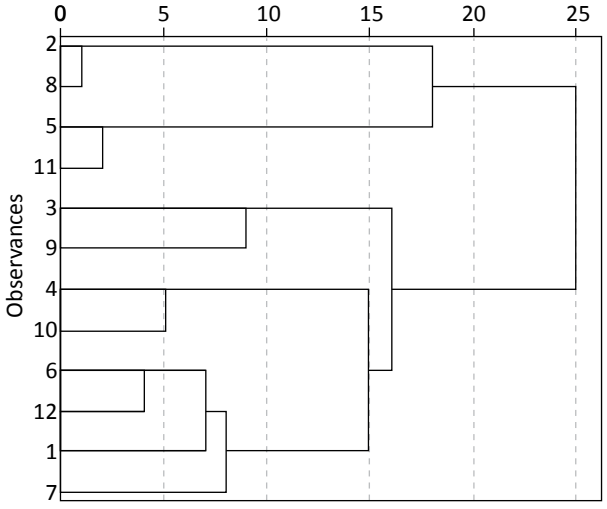

Figure 3 - Identifying the two cluster dendrogram
Source: Elaborated from research data (2013)

The observation of different degrees of importance attributed to the various requirements as the *stakeholder,* results in some possibilities to be explored. In this sense, the intrinsic characteristics of a POI provide customization of the site according to the type of *stakeholder*, i.e. identified the needs of a group, the POI may be adjusted to facilitate access to various information according to users' demand. Soon, can be generated and presented to the group specific content of interest.

5. FINAL CONSIDERATIONS

OI has contributed much as a new strategy for companies to raise the competitiveness. In particular, in the context of a regional economic environment, formed by companies, IST and other support institutions and research, an alternative to foster relationships and actions of hi is the technological structure and creating a portal targeted to this type of practice. In this way, from the point of view of OI, it can be concluded that this type of tool allows to stimulate the partners in the search and use of external sources of knowledge.

In fact, a POI is a technological tool capable of providing companies with the capture of external ideas and interaction with other external actors more quickly and dynamic. This is a potential platform for organizations, innovators and customers, in the solution of problems and needs of companies through the generation of new ideas and innovative (Çubukcu *et* Gümüs, 2015).

Given the importance of this topic, this article aims to present a proposal for development of a POI to be implemented in an RIS. The proposition of portal was based on the implementation of the first two steps of the management of requirements.

Consolidating on literature review, interviews and research in existing portals, defined the requirements then were prioritized through QFD method, and subsequently held the cluster analysis. According to the study, eight primary requirements were identified to the POI, which are: (i) definition of the target audience; (ii) dissemination of skills and needs of *stakeholders;* (iii) promotion of integration between the actors; (iv) capacity building; (v) encourage participation; (vi) intellectual property management; (vii) requirements associated with the management; and (viii) the gate structure.

The use of cluster analysis pointed out the existence of *stakeholders* that have assigned different degrees of importance to the requirements found. In this regard, it was noted, for example, that aspects related to the structure and accessibility of the website were less relevant items indicated by a group of *stakeholders*. However, this same group judged as more important the requirements linked to incentives for participation and empowerment. This result assumes that the actors think is easier to deal with the technological adaptation, than with the issues of training and use of the portal. So, note that it is possible to take advantage of the flexibility afforded by a POI and tailor it to the needs of *stakeholders*.

It is believed that for obtaining satisfactory results at a POI should invest in the motivation of employees. Thus, the motivation is a key element to stimulate users and companies to participate in POI, and, therefore, the need to have incentives to participate (Ebner *et al*, 2009). In collaborative contexts of innovation, intrinsic motivations must be accompanied by extrinsic motiva-

Electronic Journal of Management & System
Volume 11, Number 1, 2016, pp. 72-81
DOI: 10.20985/1980-5160.2016.v11n1.827

tions, such as incentives and financial rewards that make it possible and advantageous collaboration (Battistella *et* Nonino, 2012).

Although the article has contributed to expand the research on POI, some limitations are placed in this study. First, because the work was restricted to a specific, focusing the analysis of RIS of the particular characteristics of a region and a particular group of institutions. In this case, a limiting point was the fact that they have not been interviewed all the actors of the system. In this way, it would be important to replicate and evaluate the method with a larger number of *stakeholder's* respondents. The second aspect of this research was limiting in the study didn't have explored all the stages of the QFD method, not all stages of RM, focusing only on the objective of preliminary identification of requirements for the construction of the gate.

Finally, on the basis of the limitations presented, it is suggested that future research will investigate and propose other cases on the use of POI, as well as to involve a larger number of actors of RIS, providing more comprehensive and comparative studies to assess also the effect of a POI to the participating businesses of RIS. In addition, it is proposed that further research will perform completely the stages of QFD tool for the development of a POI, as well as all phases of the management of requirements proposed by Pegoraro (2010).

6. THANKS

The authors thank the CAPES and FUNDAÇÃO ARAUCARIA (Parana State Government/SETI), for the financial support granted for carrying out such research.

REFERENCES

Amato Neto, J. *et* Garcia, R. C. (2003), "Aglomerações de pequenas e médias empresas (PME's) e os sistemas locais de produção: contribuições para um referencial teórico", artigo apresentado no ENEGEP 2003: XXIII Encontro Nacional de Engenharia de Produção, Ouro Preto, MG.

Awazu, Y., Baloh, P., Souza, K. C., Wecht, C. H., Kim, J. Y. e Jha, S. (2009), "Information-Communication Technologies Open Up Innovation", *Research-Technology Management*, Vol. 52, No. 1, pp. 51-58.

Battistella, C. *et* Nonino, F. (2012), "Open Innovation web-based platforms: The impact of different forms of motivation on collaboration", *Innovation: Management, Policy and Practice,* Vol. 14, No.4, pp. 557-575.

Belussi, F., Sammarra, A. e Sedita, S.R. (2010), "Learning at the boundaries in an "Open Regional Innovation System": A focus on firms' innovation strategies in the Emilia Romagna life science industry", *Research Policy***,** Vol. 39, No.6, p.710-721.

Bray, I. K. (2002), An Introduction to Requirements Engineering, Pearson Education Limited, UK.

Cameron, R. *et* Molina-Azorin, J. F. (2011), "The acceptance of mixed methods in business and management research", *International Journal of Organizational Analysis*, Vol.19, No.2, pp. 256-271.

Carbone, F., Contreras, J., Hernandez, J. Z. e Manuel Gomez-Perez, J. (2012), "Open Innovation in an Enterprise 3.0 framework: Three case studies", *Expert Systems with Applications,* Vol. 39, No. 10, pp. 8929-8939.

Chang, H. H. *et* Wang, I. C. (2010), "Enterprise Information Portals in support of business process, design teams and collaborative commerce performance", *International Journal of Information Management*, Vol. 31, No. 2, pp.171-182.

Chesbrough, H. W. (2003), "The Era of Open Innovation", *Sloan Management Review*, Apr. 15.

Chesbrough, H. W., Vanhaverbeke, W. e West, J. (2006), Open Innovation: Researching a New Paradigm, Oxford University Press, Oxford.

Chesbrough, H. W. *et* Appleyard, M. (2007), "Open innovation and strategy", *Califórnia Management Review*, Vol. 50, No. 1, pp.57-76.

Cooke, P. (1992), "Regional innovation systems: competitive regulation in the new Europe", *Geoforum*, Vol. 23, No. 4, pp. 365-382.

Cooke, P., Uranga, M.G. e Etxebarria, G. (1997), "Regional innovation systems: Institutional and organizational dimensions", *Research Policy*, Vol. 26, No. 4-5, pp.475-491.

Çubukcu, A. *et* Gümüs, B. (2015), "Systematic Design of an Open Innovation Tool", *Procedia Social and Behavioral Sciences,* Vol. 195, pp.2859-2867.

Ebner, W., Leimeister, J. M. e Krcmar, H. (2009), "Community engineering for innovations: the ideas competition as a method to nurture a virtual community for innovations", *R&D Management*, Vol. 39, No. 4, pp. 342-356.

Enkel, E., Gassmann, O. e Chesbrough, H. W. (2009), "Open R&D and open innovation: exploring the phenomenon", *R&D Management*, Vol. 39, No. 4, pp. 311-316.

Freeman, R. E. (1984), Strategic Management: A Stakeholder Approach, Boston, Pitmann.

Frey, K., Lüthje, C. e Haag, S. (2011), "Whom Should Firms Attract to Open Innovation Platforms? The Role of Knowledge Diversity and Motivation", *Long Range Planning*, Vol. 44, No. 5-6, pp. 397-420.

Frooman, J. (1999), "Stakeholder influence strategies", *Academy of Management Review,* Vol. 24, No. 2, pp.191-205.

Gonçalves, C. G. C. (2007), Projeto SRI - Sistema Regional de Inovação do Sudoeste do Paraná, 1 ed., Sebrae, Pato Branco, PR.

Grimaldi, M., Quinto, I. e Rippa, P. (2013), "Enabling open innovation in small and medium enterprises: A dynamic capabilities

Electronic Journal of Management & System
Volume 11, Number 1, 2016, pp. 72-81
DOI: 10.20985/1980-5160.2016.v11n1.827

approach", *Knowledge and Process Management*, Vol. 20, No. 4, pp. 199-210.

Hajek, P., Henriques, R. e Hajkova, V. (2014), "Visualising components of regional innovation systems using self-organizing maps-Evidence from European regions", *Technological Forecasting & Social Science*, Vol. 84, May, pp.197-214.

Huizingh, E. K. R. E. (2010), "Open Innovation: State of the art and future perspectives", *Technovation*, Vol. 31, No. 1, pp.2-9.

Hüsig, S. *et* Kohn, S. (2011), "Open CAI 2.0" – Computer Aided Innovation in the era of open innovation and Web 2.0", *Computers in Industry*, Vol. 62, No. 4, pp. 407-413.

Kotonya, G. *et* Sommerville, I. (2000), Requirements Engineering Processes and Techniques, Chichester, John Wiley and Sons, UK.

Labiak, JR. S. (2012), Método de análise dos fluxos de conhecimento em sistemas regionais de inovação, Tese de Doutorado em Engenharia e Gestão do Conhecimento, Universidade Federal de Santa Catarina, Florianópolis, SC.

Lee, S. et al. (2010), "Open innovation in SMEs-An intermediated network model", *Research Policy*, Vol. 39, No.2, pp. 290-300.

Lundvall, B., Johnson, B., Andersen, E.S. e Dalum, B. (2002), "National systems of production, innovation and competence building", *Research Policy*, Vol. 31, No 2, pp. 213-231.

Macaulay, L. A. (1996), Requirements engineering. Great Britain: Springer-Verlag, London.

Maxwell J. A. (2009), Designing a Qualitative Study. The SAGE Handbook of Applied Social Research Methods, 2 ed., SAGE Publications, USA.

Ministério da Ciência e Tecnologia (MCTI). (2013), *Portal da Inovação*, disponível em: http://www.portalinovacao.mct.gov.br/pi/#/pi (Acesso em 12 de dezembro de 2013).

Miron, L. I. (2002), Proposta de Diretrizes para o Gerenciamento dos Requisitos do Cliente em Empreendimentos da Construção. Dissertação de Mestrado em Engenharia da Produção, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS.

Moore. B. M. (2006), "Radiation safety management in health care – the application of quality function deployment", *The Society and College of Radiographers*, Vol. 12, No.4, pp. 291–304.

Mothe, J. *et* Paquet, G. (1998), Local and Regional Systems of Innovation, New York: Springer Science+Business, US.

Pegoraro, C. (2010), Diretrizes para a Gestão de Requisitos no Processo de Projeto de Ambientes Construídos: Um Estudo de caso com enfoque nos Requisitos Ambientais. Dissertação de Mestrado em Engenharia da Produção, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS.

Portal Sudoeste Inovativo. (2013), *Sistema Regional de Inovação,* Pato Branco, PR, disponível em: http://www.sudoesteinovativo.com.br (Acesso em 15 de Outubro de 2013).

Rencher, A. A. (2002), Methods of Multivariate Analysis, 2 ed., John Wiley & Sons, New York.

Ribeiro, J. L. D., Echeveste, M. E. e Danilevicz, A. M. F. (2001), A utilização do QFD na otimização de produtos, processos e serviços, FEENG, Porto Alegre, RS.

Rubach, S. (2013), "Collaborative Regional Innovation Initiatives: A Booster for Local Company Innovation Processes?", *Systemic Practice and Action Research*, Vol. 26, No.1, pp.3-21.

Saunders, M., Lewis, P., Thornhill, A. (2012), Research Methods for Business Students. Pearson.

Sawhney, M., Verona, G. e Prandelli, E. (2005) "Collaborating to create: The Internet as a platform for customer engagement in product innovation", *Journal of Interactive Marketing*, Vol. 19, No. 4, pp. 4-17.

Scherer, J. O. *et* Ribeiro, J. L. D. (2015), "Identifying important features in the scope of an open innovation project via a web portal", *International Journal of Business Innovation and Research*, Vol. 9, No. 2, pp. 133-147.

Sebrae. (2013), *Serviço Brasileiro de Apoio à Pequena empresa*, disponível em: http://www.sebraepr.com.br (Acesso em 30 de Julho de 2013).

Silva, E. L. *et* Menezes, E. M. (2001), Metodologia de pesquisa e elaboração de dissertação, Universidade Federal de Santa Catarina, Florianópolis, SC.

Silva, G. *et* Dacorso, A. L. R. (2013), "Inovação aberta como uma vantagem competitiva para a micro e pequena empresa", *Revista de Administração e Inovação*, Vol. 10, No. 3, p. 251-268.

Sommerville, I. (2003), Engenharia de Software, 6 ed., Pearson - Addison Wesley, São Paulo, SP.

Sommerville, I. (2007), Engenharia de Software, 8 ed., Pearson - Addison Wesley, São Paulo, SP.

Terra, J. C., Bax, M. P. (2003), Portais corporativos: instrumento de gestão de informação e de conhecimento. In: Isis Paim. (Org.). A Gestão da Informação e do Conhecimento. 1 ed., pp. 33-53, Belo Horizonte, MG.

Terwiesch, C. *et* Xu, Y. (2008), "Innovation contests, open innovation, and multiagent problem solving", *Management Science*, Vol. 54, No. 9, pp. 1529-1543.

Todtling, F. *et* Kaufmann, A. (2001), "The role of the region for innovation activities of SMEs", *European Urban and Regional Studies*, Vol. 8, No. 3, pp. 203-215.

Weiss, J.W. (1998), Business Ethics: a Stakeholder and Issues Management Approach, 2 ed., Dryden Press, Texas.

Wiegers, K.E. (2003), Software Requirements: Practical techniques for gathering and managing requirements throughout the product development cycle. 2 ed., Microsoft Press, Washington.