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Conference Paper · June 2017

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(How) are Brazilian firms managing knowledge for innovation?

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Structured Abstract

Purpose – This paper explores what knowledge governance mechanisms can be particularly relevant for innovation in the Brazilian context.

Design/methodology/approach – A sample of 111 firms from Southern Brazil was surveyed. Hypotheses were tested using structural equation modelling (SEM).

Originality/value – Our paper contributes to the knowledge governance and innovation literature by demonstrating that in the Brazilian context, infrastructural knowledge governance mechanisms are more important than people-focused ones.

Practical implications – This study brings valuable information to managers of Brazilian firms to allow more efficient allocation of their resources and efforts for managing knowledge, and ultimately, innovation.

Keywords – Knowledge governance mechanisms, KM practices, Innovation.

Paper type – Academic Research Paper.

1 Introduction

In the current economy, innovation is an essential characteristic for firm survival (Schumpeter, 1927; Teece, 2010). Interest in innovation, its processes and management has increased because firms need to innovate in response to changing customer demands and in order to take advantage of opportunities offered by technology and changing marketplaces (Baregheh et.al, 2009). Knowledge lies at the heart of innovation process. For example, Scarbrough (2003) defines innovation as an interactive process which integrates knowledge with action for creating value. Knowledge-based view on innovation posits that innovation performance is a function of a firm's ability to manage, maintain, and create knowledge (Cohen and Levinthal, 1990; Nonaka and Takeuchi, 1995). This approach highlights the need to manage knowledge in organisations, and brings to the forefront the question of what knowledge management practices are particularly useful to enhance innovation performance. Foss et al. (2012) propose knowledge governance as a systematic approach to managing knowledge. Different knowledge governance mechanisms were discussed in the literature (Foss and Michailova, 2009), and many of them have been demonstrated to be important to innovation performance (e.g. Kianto, Andreeva, 2014), but most of these studies are based on data from developed and Western-world countries (Inkinen et al., 2015). Yet there is a lack of understanding about how these mechanisms work in different cultural and socio-economic contexts. This is potentially problematic, as a number of recent studies suggest that knowledge processes may work differently around the globe (e.g., Andreeva and Ikhilchik, 2011; May and Stewart, 2013; Davila, 2016), and, therefore, may require different approaches to managing them.

Against this background, the purpose of this research is to explore KM governance mechanisms' effects on innovation performance in Brazilian firms. We chose Brazil as it represents an under-researched context in KM and innovation literature, has very distinct characteristics and belongs to the emerging markets that are becoming more and more prominent in the international arena. We focus on four knowledge governance mechanisms – Information and Communication Technologies (ICT), organisational design (OD) and organisational culture that are supportive of knowledge processes (OC), and rewards for knowledge behaviours or knowledge based compensation (KBC). Together they address key challenges of managing knowledge – encouraging employees to contribute to knowledge processes and providing relevant infrastructural opportunities for doing so, through both formal and informal mechanisms (Argote et al., 2003). We empirically examine the effects of these knowledge governance mechanisms on firms' innovation performance, using the data from 111 Brazilian companies. Our paper contributes to the knowledge governance and innovation literature by demonstrating that in the Brazilian context, infrastructural knowledge governance mechanisms are more important than people-focused ones.

2 Conceptual Background

2.1 Knowledge governance mechanisms: What are they?

Knowledge governance approach is based on the assumption that ‘‘to realize the competitive potential of knowledge as a strategic resource, intra-organisational knowledge processes should be influenced and directed through the deployment of governance mechanisms, in particular the formal aspects of organisation that can be manipulated by management’’ (Foss and Minbaeva, 2009, p. 16). In other words, it focuses on conscious management efforts to influence knowledge processes, for example, through application of human resource management practices, purposeful organisational design or usage of information and communication technologies, all aimed to stimulate and support knowledge processes (Andreeva and Kianto, 2012).

All of these mechanisms can be broadly divided into “people-focused” and “process-, or infrastructure-focused” mechanisms. The first group of mechanisms is based on the idea that people are the key possessors of knowledge in organisations and key agents of knowledge processes (Foss, 2007; Foss et al., 2010). Therefore, knowledge processes will run efficiently if employees are willing to engage in them. Another approach, that stands behind the second group of practices, suggests that organisations needs to have a proper infrastructure and its organisational processes need to be tuned in a way to enable and support knowledge processes. Theoretically both approaches look complementary, as ideally an organisation would want to have both employees motivated to engage in knowledge sharing and creation, and proper processes that allow employees to do so. In reality most of the organisations have limited resources to invest in managing knowledge, so the question of which interventions to prioritize becomes important. Moreover, recently some concerns have been raised that having many knowledge governance mechanisms simultaneously is now always beneficial for an organisation (e.g., Minbaeva, 2013; Andreeva, Sergeeva, 2016; Andreeva et al., 2017) as some of the additional efforts might actually be spent in vain. This paper aims to explore this issue further and to see what knowledge governance mechanisms can be particularly relevant in the Brazilian context.

2.2 Knowledge management and innovation: what do we know so far?

Empirical studies have demonstrated the relationship between knowledge management and innovative performance as a key driver for organisational competitiveness. For example, Gloet and Terziovski (2004) who studied manufacturing companies from Australia and New Zealand, concluded that KM practices make a significant contribution to innovation performance, especially the ones which are oriented to human resource management and which are supported by information technology (IT). Other studies conducted in New Zealand, have shown that an organisation with knowledge management capabilities tends to be more innovative and has better

performance (Darroch, 2005; Zack et al., 2009; Roxas et al., 2014). In their research with Taiwanese firms, Chen and Huang (2009) identified a positive mediating role of knowledge management capacity between strategic human resources practices and innovation performance. More recently, Inkinen et al. (2015) had similar results in Finnish firms, as they showed that innovation performance is supported by some KM practices related to strategy, compensation and IT. Knowledge management systems and organisational knowledge are positively linked to innovation success in the research of Moos et al. (2013). On the other hand, a study of French biotechnological SMEs conducted by Alegre et al. (2013) demonstrated an indirect and positive impact of KM practices on innovation performance, through the existence of dynamic capabilities.

Empirical studies demonstrated the importance of knowledge governance mechanisms for organisational innovations (Andreeva, Kianto, 2012; Kianto, Andreeva, 2014; Inkinen et al., 2015), providing important basis for academics and practitioners understanding better the link between KM and innovation. Unfortunately, there is not enough empirical research about how these governance mechanisms work in different cultural and socio-economic contexts, e.g. in developing countries (Inkinen et al., 2015).

2.3. Hypothesis development

Our review above suggests that among "process-focused" governance mechanisms, two have received most attention – information and communication technologies (ICT) and organisational design methods that enable knowledge processes.

Information and communication technologies can be potent enablers of knowledge processes in organisations. For example, Adams and Lamont (2003) argue that ICT facilitate communication, that is, exchange of information and knowledge, and information processing. Davenport et al. (1998) and Alavi and Leidner (2001) highlight that ICT systems can contribute to knowledge creation by assisting organisational members in getting access to others' knowledge, e.g. lessons learned, failures and best practices, and combining their knowledge in a fast manner. In other words, information technologies provide an infrastructure that enables knowledge sharing and knowledge creation, and thus may lead to innovation. Based on these considerations, we hypothesize that:

H1: Knowledge-friendly ICT has a positive effect on innovation performance.

Organisational design refers to decisions on how the work is distributed in the organisation and what mechanisms are used to coordinate efforts of different employees (Mintzberg, 1992). From knowledge-based view, organisational design decisions may provide opportunities for employees to share knowledge, exchange ideas and learn from each other (Grant, 1996; Gittel, 2000; Miles et al., 1997). This leads to enhanced knowledge processes, and ultimately, innovation. Therefore, we hypothesize that:

H2: Knowledge-friendly organisational design has a positive effect on innovation performance.

Among "people-focused" knowledge governance mechanisms, different human resource management (HRM) techniques have been widely studied. One of the cornerstones of this discussion is creating stimuli for employees to engage in knowledge behaviours. Indeed, it has been suggested that motivational aspect is the most crucial one, as while the lack of ability of an employee can be compensated by strong motivation, it does not work vice versa (Zhao and Chadwick, 2014).

One of the ways to stimulate employees to engage in knowledge sharing and creation, and ultimately innovation, is to offer rewards for these behaviours. Rewards signal to the employees what behaviours are expected and encouraged (DeNisi and Pritchard, 2006). From the knowledge-based perspective, explicitly rewarding knowledge behaviours can encourage these behaviours and steer them in alignment with organisational goals, thus supporting organisational innovation (Bock et al., 2005; Cabrera et al., 2006; Foss et al., 2015; Andreeva and Sergeeva, 2016; Andreeva et al., 2017). Based on these arguments, we hypothesize that:

H3: Rewards for knowledge behaviours have a positive effect on innovation performance.

Knowledge behaviours can also be incentivized in different ways, through developing and maintaining an organisational culture that supports such behaviours. Organisational culture can influence behaviour of employees through imposing specific values and norms, promoting certain role models and encouraging the behaviours that follow these role models. A number of authors suggest that knowledge-friendly organisational culture is a cornerstone of efficient knowledge management (Alavi et al., 2006; DeLong and Fahey, 2000; Michailova and Minbaeva, 2012). Based on these considerations, we hypothesize that:

H4: Knowledge-friendly organisational culture has a positive effect on innovation performance.

3 Research Methodology

3.1 Sample

The sample population consisted of 1548 cross-industry firms in Santa Catarina, one of the prosperous Brazilian states located in the South region. Santa Catarina is responsible for 4.8% of gross domestic product (GDP), has the fourth highest GDP per capita, and employs 7.8 % of the Brazilian workforce (IBGE, 2014). In their study with Brazilian entrepreneurs and business executives, Hofstede et al. (2010) defined the South as "European and prosperous, is more hierarchical, less formal, more individualist, and more masculine (achievement-oriented)" (p.347).

The target enterprises were selected from a database of Industry Federation of Santa Catarina (FIESC / SC). Data collection was carried out between November 2015 and March 2016, using an online cross-sectional survey. As a result of collection efforts, 146 responses were collected, representing a response rate of 9.3%. After, we excluded 35

responses for having incomplete data, achieving a usable sample of 111 responses for further analysis.

The most-represented industries were foods and beverage (35.6 %), textile (9%) metallurgic (8%) and IT services (7%). The majority of the enterprises employ between 20 and 50 employees (42.6%) and 25% of the enterprises have more than 500 employees. Most respondents belonged to top management (39%), and another significant group holds middle-management positions (27%). The remaining respondents, with minor exceptions, hold supervisory or specialist positions in key business units.

3.2 Measures

KM governance mechanisms were measured using the scale developed in the research of Kianto and Andreeva (2014). The scale contains items that are oriented to measure the four governance mechanisms analysed in this study: organisational design (OD), information and communication technologies (ICT), knowledge-based compensation (KBC) and organisational culture (OC).

The innovation performance scale used was presented in the work of Inkinen et al. (2015). It consists of five items in which respondents are requested to compare their performance to the competitors in terms of product, service, managerial, marketing and business model innovations.

We also included two control variables that may have an impact on innovation performance - firm size (number of employees) and firm age (Chandy, Tellis, 2000). For ensuring the normality of the distribution, we made a logarithm transformation of these variables.

3.3 Method of analysis

Hypotheses were tested using structural equation modelling (SEM), a technique which supports analysis of "causal paths and the identification of the collective strength of multiple variables" (Creswell, 2013, p.13). SmartPLS was the partial least square (PLS) software used for the analysis of data. According to Henseler et al. (2016), PLS path models have two types of linear equations: The measurement model (outer model), which "specifies the relations between a construct and its observed indicators" (p.4), and the structural model (inner model), composed of the endogenous and exogenous constructs, and the relationships between them.

First, a measurement model analysis was conducted to assure construct reliability, convergent validity, and discriminant validity. Construct reliability verifies that the amount of random error in construct scores is acceptable (Henseler et al., 2016).ven when Cronbach's Alpha was typically used for measuring construct reliability, recently the composite reliability test (also known as Jöreskog's rho ρc) and the rho A test proposed by Dijkstra and Henseler (2015) are widely used (Henseler et al., 2016). Normally, it is

expected that each construct has a value above 0.7 for both tests (Nunnally and Bernstein, 1994). Following Fornell and Larcker (1981), the convergent validity of indicators representing the same construct was assessed, checking that the average variance extracted (AVE) is above 0.5 for each construct. To complement, indicator loadings of each construct were also checked in order to assure they were above the recommended threshold of 0.65 proposed by Hair et al. (2006). Finally, each pair of constructs derived from theoretically different concepts should also be statistically different, known as Discriminant Validity. Discriminant validity was assessed by verifying that the AVE of each individual construct was higher than the shared variance between the given construct and others (Henseler et al., 2016).

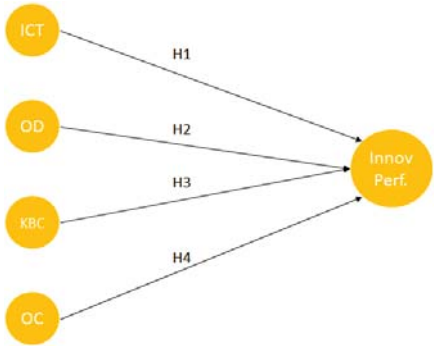
After validating the measurement model, elements in the structural model were evaluated. Two models were examined: Model 1 had firm size and firm age predicting innovation performance. Model 2 assessed, in addition to firm size and firm age, the direct impact of ICT, K-based compensation, organisational design and culture on innovation performance.

Each model was assessed using the following criteria: A good model fit assessment criterion is the Standardized Root Mean Square Residual (SRMR), which according to Henseler et al. (2016) is defined as the difference between observed correlation and the predicted correlation. An adequate SRMR value is expected to be lower than 0.10 (Henseler et al., 2016). In addition, the adjusted R^2 value was calculated in order to identify the amount of variance of innovation performance explained by knowledge governance mechanisms. After this, the statistical significance and the strength of path estimate between constructs were evaluated, for testing the research hypotheses. Even more, a bootstrapping procedure was performed (with 5000 bootstrap samples) in order to obtain and present confidence intervals about each construct and path in the model.

Finally, some conclusions, managerial implications, and suggestions for further research are discussed.

4 Results

Based on the theoretical premises, a model was drawn in order to test the hypotheses proposed in this study. The model has five latent constructs: organisational design (OD), information and communication technology (ICT), knowledge-based compensation (KBC), organisational culture (OC) and innovation performance (IP).



The following section presents the results of the analysis (supported by SmartPLS software) of both the measurement model and the structural model .

4.1 Measurement model

As shown in table 2, adequate scores (above 0.8) for Cronbach's Alpha, composite reliability, and rho A tests assured good reliability. In addition, evidence about an adequate convergent validity was provided because all AVE scores are above 0.5, and all indicators have loadings above accepted thresholds.

Table 2. Measurement test results for final indicators

Construct	Indicators		Mean	Loadings	Cronbach's Alpha	Composite Reliability	rho A	AVE
Knowledge governance mechanisms (Kianto, Andreeva, 2014)								
Information and Communication Technologies	IT1	Our organization uses technologies (e.g., Intranet, Internet, e-mail, and e-learning) to facilitate employees sharing new ideas/knowledge with each other	3.82	0.780				
	IT2	KM systems and tools in our organization are widely accepted, monitored, and updated.	3.28	0.834				
	IT3	Our organization's ICT is capable of supporting management decisions and knowledge work	3.40	0.869	0.841	0.885	0.881	0.609
	IT4	Our organization's ICT architecture is capable of sharing data and information, knowledge, and expertise with all stakeholders in the organization's extended value chain.	3.23	0.739				
	IT5	Our organization's current ICT systems are sufficient to support the daily work	3.66	0.664				
K-based compensation (Formative)	KB1	Our organization specifically rewards knowledge sharing with monetary incentives.	2.28	0.753				
	KB2	Our organization specifically rewards knowledge sharing with non-monetary incentives.	3.32	0.862	0.815	0.872	0.855	0.633
	KB3	Our organization specifically rewards knowledge creation with monetary incentives.	2.40	0.700				

	KB4	Our organization specifically rewards knowledge creation with non-monetary incentives.	3.28	0.855				
Organizational Design (Formative)	OD1	People from different parts of our organization interact informally with each other in a frequent manner	3.98	0.714				
	OD2	In our organization, open dialogs are common among/between employees and manager	4.37	0.719				
	OD3	In our projects, our organization uses teams consisting of people with skills and expertise from diverse fields	4.04	0.842	0.811	0.869	0.816	0.571
	OD4	In our organization, we frequently use cross-functional teams and projects	3.67	0.796				
	OD5	In our organization, we have purposeful overlap of functional responsibilities	3.21	0.695				
Organizational Culture	OC1	Openness and trust are valued in our organization.	4.36	0.739				
	OC2	Flexibility and a desire to innovate are valued in our organization.	4.01	0.737				
	OC3	Employees who take initiative of their own learning are highly valued in our organization.	3.82	0.812	0.885	0.912	0.900	0.635
	OC4	Willingness to share lessons learned is valued in our organization.	3.82	0.824				
	OC5	In our organization, lessons learned both successful and unsuccessful are considered valuable.	3.67	0.869				
	OC6	In our organization various units are encouraged to collaborate with each other.	4.05	0.793				
Innovation Performance (Inkinen et al., 2015)								
	IP1	Compared to its competitors, during the last year our company successfully managed to create innovations in new products or services for customers.	3.69	0.773				
	IP2	Compared to its competitors, during the last year our company successfully managed to create innovations in new production methods and processes.	3.75	0.801				
	IP3	Compared to its competitors, during the last year our company successfully managed to create innovations in new management practices.	3.73	0.863	0.872	0.907	0.890	0.663
	IP4	Compared to its competitors, during the last year our company successfully managed to create innovations in new marketing practices.	3.23	0.723				
	IP5	Compared to its competitors, during the last year our company successfully managed to create innovations in new business models.	3.61	0.896				
Controls			Mean	Std. Desv.	Median	Mode		
	CV1	Firm Age	33.67	24.100	29	10		
	CV2	Firm Size (number of employees)	1548.00	5836.000	130	30		

Furthermore, AVE values higher than shared variance between variables provides evidence of good Discriminant validity (see table 3). Consequently, it has good evidence of reliability and validity of the measurement model for representing the concepts discussed in this study. Next, the structural model is going to be assessed.

Table 3. Correlations between constructs.

		1	2	3	4	5	6	7
1	Firm Age	1.00						
2	Firm Size	0.45	1.00					
3	ICT	0.07	0.15	0.78				
4	KBC	-0.07	-0.06	0.51	0.80			
5	OD	-0.11	0.00	0.45	0.52	0.76		
6	OC	-0.33	-0.25	0.37	0.53	0.66	0.80	
7	Innovation Performance	-0.16	0.03	0.41	0.32	0.49	0.42	0.81

* Square root of AVE in diagonal

4.2 Structural model

After running the bootstrapping procedure, we obtained results for assessing the structural model. As shown in table 4, the results for model 1 and model 2 provide evidence of good SRMR index (0.081 and 0.086), below the maximum thresholds of 0.10 (and above the threshold of 0.08 in the more conservative approach).

Based on the analysis of the resultant adjusted R^2 value, model 2 is the best model because its variables acting together explain 27.1% of innovation performance (see table 4). Adjusted R^2 values indicate the percentage of variability accounted for by predictive constructs in the model, and they "take into account model complexity and sample size, and are thus to compare different models or the explanatory power of a model across different data sets" (Henseler et al., 2016).

Analysis of model 2 shows that empirical evidence supports the hypotheses H1 and H2. Thus, results obtained suggested the existence of statistically significant paths between ICT and innovation performance (β=0.241, ρ=0.03), and OD and innovation performance (β=0.298, ρ=0.01). To complement, H3 and H4 were rejected because the results do not show significant influence of KBC and OC on innovation performance.

Table 4. Comparison of models

Innovation Performance	Model 1 controls only			Model 2 direct impact		
Controls	Stand. Regr. weights (ß)	Stand. Dev. (STDEV)	ρ	Stand. Regr. weights (ß)	Stand. Dev. (STDEV)	ρ
Firm Age	-0.220	0.118	0.06	-0.148	0.091	0.10
Firm Size	0.122	0.136	0.37	0.086	0.091	0.35
Independents						
ICT				0.241	0.109	0.03*
K-Based compensation				-0.024	0.098	0.80
Organisational Design				0.298	0.121	0.01**
Organisational Culture				0.118	0.140	0.40
R2	0.039			0.311		
Adjusted R2	0.021			0.271		
Additional variance explained by the model				0.250		
Model fit (SRMR)	0.081			0.086		

5 Discussion

In the current study, we found that ICT and OD knowledge governance mechanisms are influencing the innovation performance in Brazilian firms. On the other hand, 'people focused' governance mechanisms, such as KBC and OC, are not significant.

A possible explanation for the importance of ICT governance mechanisms might be that Brazilian workers have become used to dealing with technology because of political and financial efforts in recent years oriented at promoting the development of technology and skilled workers (Nogueira et al., 2014; Sparkman, 2015). On this line, the "National Education Basis and Principles Law", a guideline for primary and higher education in

Brazil, is strongly focused in the development of capabilities for acquiring and applying technology.

The impact of OD governance mechanisms such as informal flows of information, vertical dialogs or overlap of functional responsibilities, could be stimulated by two aspects: First, the high in-group collectivism in Brazil, which is "the degree to which individuals express pride, loyalty, and cohesiveness in their organisations or families" (House et al., 2004, p.30). Secondly, Brazilian leaders tend to be charismatic, team oriented, participative and less autonomous, as highlighted by House et al. (2004).

Finally, the nonsignificance of OC and KBC governance mechanisms for innovation performance evidenced in this study, is contrary to previous studies in western countries (Kianto, Andreeva, 2014; Inkinen et al., 2015). The effects of incentives for creating and sharing knowledge on people's behaviour (KBC), can be mitigated if those incentives are implemented in countries with high in-group collectivism, such as Brazil. On the other hand, KBC does not seem to be a variable in Brazilian managerial models, because firms try to avoid incentives in order to avoid "habituality", which means incentives are automatically incorporated into the salary (Fleury and Fleury., 1997).

6 Conclusions

The aim of this research was to explore KM governance mechanisms' effects on innovation performance in southern Brazilian firms. Some contributions can be derived from this study.

In line with recent calls for deeper contextualization of the theories developed in the West (Michailova, 2011), this study contributes to knowledge governance and innovation literatures by providing a better understanding of the relationship between knowledge governance mechanisms and innovation in the particular context of an emerging economy - Brazil.

It also contributes to the discussion of the relative importance of different governance mechanisms by identifying the most influential ones and exploring what makes them so important in the Brazilian context.

On the other hand, by identifying the relative importance of different knowledge governance mechanisms which impacts the firm innovative performance, this study brings valuable information to managers regarding more efficient allocation of their resources and efforts for managing knowledge and ultimately, innovation: This applies to both Brazilian firms and foreign organisations willing to establish their operations in Brazil..

Finally, this paper opens new avenues for multidisciplinary research. It would be interesting to compare these results with similar ones from other business contexts, including other variables, e.g. national culture or sector. Another possible area of future

research would be to investigate how different innovation types (product, process, marketing) can be leveraged by governance mechanisms.

7 Acknowledgments

Authors acknowledge the Industry Federation of Santa Catarina (FIESC / SC) for supporting the data collection.

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