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# The use of organizational resources for product innovation and organizational performance: a survey of the Brazilian furniture industry

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## ABSTRACT

Innovation represents an efficient way to improve competitiveness and organisation performance. In this sense, innovation is attributed to optimize the use of resources in organisations and better market positioning. In such context, the Brazilian furniture industry constantly promotes product innovation, which looks for customer's satisfaction and comfort needs. Product innovation is an important source of competitive advantage, being responsible for increasing the financial performance of Brazilian organisations. Thus, identifying the resources that precede innovation is critical to maximize their results. The objective of this research is to measure the relation between Product Innovation, Resources and Organizational Performance, considering the premises of the literature for the furniture industry in Brazil, with the Structural Equation Modeling methodology. Therefore, a survey of 618 companies was carried out in a Furniture cluster from South Brazil. This research evaluated the intensity of the relationship between Knowledge Management Structure Resources with Knowledge Management Culture, and Human Resource Alliance and these resources with New Product and Organizational Performance. The main contributions of this study are the identification of the product innovation and organizational performance, but also the enhancement of research tools of statistical analysis.

Key-words: Product Innovation, Organizational Performance, Strategic Resources, Furniture Industry, Structural Equation Modeling.

## 1. Introduction

Since innovation comes in response of the improvement of competitive positioning and the profitability of organisations. Innovation must be studied to understand the economical ability of the organisations as a factor that enhances competitiveness (Schumpeter, 1934; Damanpour, 1991; Porter, 1991; Drucker, 2002; OCDE, 2005). In support of such assumption, the study of Li and Kuo (2016) shows that an organisation that enhances an orientation toward innovation can positively affect its performance.

In this context, the furniture industry in Brazil constantly promotes product innovation, to satisfy customer's needs, creates consumer desires, either by design or by the use of new materials. The PINTEC-IBGE (2013) survey indicates, for the period between 2009 and 2011, that the companies of the manufacturing industry have an innovation rate of 42.2%, where the companies of the furniture sector show a rate of 44.6% of innovation. It reaffirms the importance of the Brazilian furniture industry with innovations, considering the rate of 19% in product innovations compared to 17% of the manufacturing industry.

The relative importance of the furniture industry for Brazil's economy comes from its participation in the trade balance composition, where data on export furniture show results of 0.25% in 2014, and 12.27% of the total exports of Brazilian products. In 2015, the furniture industry of Rio Grande do Sul (RS) exported US $ 184 millions of products, which represents 30.5% of all Brazilian furniture exports, which makes the State of Rio Grande do Sul the most important furniture exporter of Brazil. With regard to industry concentration, the RS has 2,750 furniture companies, equivalent to 13.3% of the companies in Brazil, which account for 18.4% of all furniture manufactured in the country (MDICE, 2016).

The rational and optimal use of strategic resources and the development of innovations constitute means of advantage results in organisations, which is also perceived in the Brazilian furniture sector, through the development of new products and gains from the use of their resources. Resources are product innovation antecedents that provide environmental and technical conditions for the process of product development.

The objective of this research is to measure the relation between Product Innovation, Resources and Organizational Performance in the context of the furniture

industry in South Brazil, through the use of the Structural Equation Modeling methodology.

## 2. Research hypothesis

### *2.1 Knowledge management, Human Resource and Alliance*

The concepts of Knowledge Management (KM) are important tools for organizational effectiveness and performance, especially in the New Product Development process (NPD). Constituting a strategic resource, it directly influences the organisation's future (Decarolis & Deeds, 1999; Mehta, 2008; Prieto et al., 2009; Zack et al., 2009; Donate & Guadamillas, 2011). KM requires a framework to operationalize its use, so this feature can be classified as "Knowledge Management Structure" or "Knowledge Management Culture".

The Knowledge Management Structure (KMS) concept constitutes an infrastructure and a set of Information Systems (IS) that store and make available such knowledge as well as its hierarchical structure (leadership) endowed with decision-making power, to ease access to the accumulated knowledge. This KMS definition follows the precepts of established by Narver and Slater (1995), Gold et al. (2001), Leidner et al. (2006), Kim & Lee (2006), Zack et al. (2009), Zhang (2011) and Guimarães, (2013).

The IT organisation, who manage the IS, has a key role in KMS since it is responsible for the conservation and the management of the information. The NDP team use such data to enable New Product solutions to meet new customer demands (Nambisan, 2003; Pavlou & El Sawy, 2006). The IT organisation also has the function of providing engineering software and design that allow the technical development of the product as well as to facilitate the simulation of the use of materials and structural design calculations, streamlining the process and integrating the team of NPD (Sanchez, 1995; Lee and Choi 2003; Pavlou & El Sawy, 2006; Liu et al., 2010). In this sense the KMS tools support the development of Knowledge Management Culture (KMC).

It is important to note that KMS supports the actions of the product development teams, which work in concurrent engineering projects, by using specialized software for the NPD, showing relationship between KMS and Human Resource (HR) to obtain product innovation (Sanchez, 1995; Pavlou & El Sawy, 2006).

Another aspect related to the innovation process is the use of strategic Alliance (AL), which enables the sharing of resources that are available to partners, which

enables the development of product innovations (Morgan & Hunt,1994; Hunt & Morgan, 1995; Ritter & Gemünden, 2003; Inkpen & Pien, 2006). In this sense, the KMS process represents an important means of communication between the alliance partners in supporting, recording and disseminating the continuous flow of data as a new source of knowledge for the teams of NPD, which aims to accelerate the pace and to reduce the risks associated with innovation (Leidner et al, 2006; Kim & Lee, 2006; Sividas & Dwyer 2000; Ganotakis & Love, 2012).

Based on the published literature, we can thus make the following assumption (**H1**): Knowledge Management Structure (KMS) positively influences the constructs of Knowledge Management Culture (KMC), Human Resource (HR) and Alliance (AL). To analyze the influence of KMS on KMC, AL and HR, the H1 was distributed in H1a, H1b and H1c.

**H1a:** Knowledge Management Structure is positively related with Knowledge Management Culture.

Knowledge is the result of continuous interactions between people from inside and outside the organisation. Knowledge management can be feasible with an infrastructure with a set of information technology and especially the existence of facilitators like formal and cultural structures of the organisation (Prieto et al, 2009).

The organizational culture and the leadership practices, as a formal procedure, are among the factors that influence knowledge management, which in fact represent the Knowledge Management Culture (KMC) (Schein, 1985; Narver & Slater, 1995; Sveiby & Simons, 2002; Leidner et al., 2006; Roth, 2003; Yang, 2007; Prieto et al, 2009). The organizational culture establishes behaviour patterns for individuals and teams, which can generate advantages or disadvantages for an organisation. Therefore, companies should promote a number of values that influence the behaviour and the desire to share knowledge through the different levels of the organisation (Schein, 1985; Sveiby & Simons, 2002; Leidner et al., 2006).

KMC requires a Knowledge Management Structure (KMS) for organizational communication and Knowledge Management (KM). The KM formal structures are essential to identify the licensing opportunities for new technologies and to generate new knowledge from the existing skills already established. The processes and practices that companies use are crucial to achieving the organizational strategic objectives

through the best use of resources and existing capacities (March, 1991; Zack, 1999; Zollo & Winter, 2002; Frishammar et al, 2012).

In organizational culture environments that allow the integration of knowledge and openness toward the ideas of their employees, the generation of innovative knowledge helps in responding quickly to the environment changes and new market opportunities (Donate & Guadamillas, 2011).

The relationship between KMC and KMS is evidenced by the fact that a knowledge management structure can enhance the action of leadership and teamwork in a knowledge culture context (Schein, 1985; Narver & Slater, 1995). KMS uses hierarchical leadership as a means to manage organizational processes and to generate new knowledge, as well as for its dissemination in a context of organizational performance (Narver & Slater, 1995; Gupta & Thomas, 2001; Yang, 2007; Zack et al., 2009). Consequently, KMS contributes to a culture of Knowledge Management, enhancing the organizational processes of communication and interaction between the NPD team, as well as communication efficiency between the business partners.

**H1b:** Knowledge Management Structure is positively related with Human Resource.

Human Resource (HR) comprises a team dedicated to new development project Products/Services, which creates a shared interpretation of the realities, both through the interaction and integration of combined individuals, resulting in a multidisciplinary team (Kandemir et al., 2006). A formal KM structure. helps the companies to use and expand their HR skills.

HR is critical to differentiate an organisation from its competitors, but it is intangible. HR presents the characteristics of sustainable resources (rare, inimitable, valuable and strategically irreplaceable), with the potential to create perceived value for the customer and create competitive advantage. From its competence and human skills, it triggers the emergence of unique capabilities, however this strategic resource depends on the KMS procedures established by the company to enhance any HR results (Guest, 1987; Barney, 1991; Ulrich et al., 1991; Mabey et al, 1998; Wright et al, 1998; Ellinger et al., 2002; Khandekar & Sharma, 2005; Armstrong, 2009; Beauvallet & Houy, 2010).

To establish a relationship between the KMS and the HR concepts, a part of the assumption is that the learning process is the predecessor the KM process, where an individual is not driven by any organizational factors (Donate & Guadamillas, 2011). It is the result of the combination of environmental and self-realization factors that

generate motivation for the actors to strive to learn and to contribute to organizational knowledge. This gap is compensated by the impact from the formal KM structure and leadership in a company (Narver & Slater, 1995; Snyder, 1998; Crossan, 1999). Consequently, there is a direct relationship between the KMC and the leadership of an organisation, where KM resources may generate operational efficiency and competitive advantage, through HR management (Nonaka, 1994; Nonaka & Takeuchi, 1995; Zack et al., 2009).

**H1c:** Knowledge Management Structure is positively related with Alliance.

A strategic Alliance (AL) is established between the companies to allow such partnership to expand their individual knowledge and achieve competitive advantage (Lambe et al., 2002), through the exchange of information in social networking (Sheremata, 2004; Phelps et al., 2012). In this context, companies use KMS in a perspective that it already has sufficient infrastructure technologies and organizational structure to manage AL (Leidner et al, 2006; Kim & Lee, 2006; Lambe et al., 2002; Prieto et al., 2009).

The relation between KMS and AL can be noted as important when any KM specialized structure is in a process of establishing a strategic partnership. It is noteworthy that one form of knowledge generation is possible through partnerships, which involve the conflict management issues and the different interests of the actors in the development of innovations, to share knowledge (Carlile, 2004). Such KMS sense provides technology support and organizational structure to optimize the utilization of an Alliance feature.

In emerging economies, companies use strategic alliances to access and learn from the knowledge of their partners and thus increase their capacity for innovation, particularly when partners do have complementary sets of expertise (Fang, 2011). For example, cases of KMS use to manage Alliance can be noticed in IT function as a facilitator of relationships with business partners that constitute exchange of knowledge and innovation development strategic alliances (Lambe et al., 2002; Poulymenakou & Prasopoulou, 2004; Kale & Singh, 2007).

It is noteworthy that an alliance is a way to systematize the open innovation model, which allows organisations to use the principles of co-creation and cooperation, which are superseding a closed innovation situation (Chesbrough, 2007). To generate open innovation, it is necessary to have an organizational structure that has established

support environments favorable to flexibility and openness. In that context, Pearson (2002) considers that it is necessary to structure an organisation in order to make clear strategic focus, so that innovative ideas are subject to implementation. In this sense, Roth (2003), Yang (2007) and Prieto et al. (2009) propose that the companies must have management practices (leadership) and a formal framework for KM.

*2.3 Knowledge Management Culture and Product Innovation*

Through the analysis of the cultural factors as key elements of the Knowledge Management process, Schein (1985) defines the term culture as a set of rules, values and beliefs that are shared by the members of an organisation. Alavi et al. (2005) emphasize that culture is also associated with language, symbols, rules and organizational practices. From this view, it is observed that the establishment of knowledge of a knowledge culture facilitates the implementation of knowledge management at all levels of the organisation (Narver & Slater, 1995; Earl, 2001; Garavelli et al., 2004).

A Knowledge Management Culture (KMC) constitute a favorable environment for the collection, dissemination and development of new knowledge from the learning and interaction between individuals (March, 1991; Nonaka, 1991; Rieman, 1996; Hohl et al., 1996; Zollo & Winter, 2002; Prieto et. al, 2009; Liu et al., 2010).

The generation of natural knowledge, which can be valuable to an organisation in competitive environments, is the fundamental role of KMC in the pursuit of strategic objectives (Zack, 1999; March, 1991; Nonaka, 1991; Zollo & Winter, 2002).

A KMC contributes to the NPD through the interactions between people and the use of their knowledge; since the combination of individual skills generate dynamic capabilities and innovative routines that result in innovative products, which contribute to the improvement of organizational performance (Conant et al., 1990; 1993; Gatignon & Xuereb, 1997; Grant, 1996; Mehta, 2008; Zack et al., 2009; Donate & Guadamillas, 2011).

In a context of innovativeness, an organizational culture must value knowledge and openness, which is necessary for the development in the incentive of new ideas within the organisation (Chen & Huang, 2009; Prieto et al., 2009; Donate & Guadamillas, 2011). Such posture will contribute to competitiveness, where difference and increase in the ability to compete with contestants constitute the basic elements of

success (Narver & Slater, 1990; Subramaniam & Youndt, 2005; Zack et al., 2009; Chen & Huang, 2009; Guimarães, 2013). In this regard, the second hypothesis is:

**H2:** Knowledge Management Culture is positively related to Product Innovation

*2.3 Human Resource and Product Innovation*

Through creative processes, people develop innovations that contribute positively to the market performance of organisations (Ford, 1996). In that context, people constitute strategic resources and have a role prominent role in the differentiation of the organisations (Ulrich et al., 1991; Beauvallet & Houy, 2010).

Human resources have increased efficiency in environments with policies and procedures that encourage participatory management, such as high-performance teams systems (Huselid & Becker, 1997; Godard & Delaney, 2000). For example, the teams that are dedicated to a product development project create their own interpretation, shared through interaction and integration of all combined individuals to optimize results (Kandemir et al., 2006). A favorable climate for innovation then occur, avoiding individuals to generate resistance to change and increasing the membership and the commitment of those involved in the process (Klein & Sorra, 1996). Such specific and particular context creates a more stable and dedicated staff to develop new products contributes, which is significant to the recurrent development of innovation (Slotegraaf & Atuahene-Gima, 2011).

Another essential aspect is the support of the company's management for the development of NPD projects, since it has a direct influence on the release of funds used by the teams. To facilitate communication, the project manager often has greater autonomy function to break down barriers between departments, since information may be retained in the processes between different departments (Cooper, 1993; Kandemir et al., 2006).

People still constitute important resources for the implementation and the maintenance of NPD projects, which depend on the commitment of senior management, the involvement of a strong project leader and the use of a multidisciplinary and dedicated staff (Kandemir et al., 2006). Based on the premise that people, individually and as a team, are on a resource that can directly influence product innovation, several empirical studies suggest that independent teams are better when they participate in highly uncertain, complex and innovative projects (Patanakul et al., 2012). The third hypothesis is:

**H3:** Human Resource is positively related to Product Innovation.

*2.4 Alliance and Product Innovation*

The collaboration between two or more enterprises to achieve mutual goals, characterizes the establishment of an alliance (Lambe et al., 2002), driving companies to pool their resources and knowledge (Hunt & Morgan, 1995; Sividas & Dwyer 2000; Kale & Singh, 2007), to gain a competitive advantage, which would find it difficult to achieve by itself (Heide & John, 1990; Varadarajan & Cunningham, 1995; Lambe et al., 2002; Kale et al., 2002; Oxley & Sampson, 2004). It is also important to mention that alliances form networks of knowledge, and there is a large and growing body of empirical research showing that social relationships and networks are influent factors that explain the processes of knowledge creation, dissemination, absorption and use to generate innovation (Phelps et al., 2012).

Organisations create business alliances in order to accelerate the pace and to reduce the risks associated with innovation (Sivadas & Dwyer, 2000), as well as the interaction between a company, its customers and suppliers can result in innovations that influence its competitive ability (Lii & Kuo, 2016). It is noteworthy that the development of new products in partnership with suppliers can reduce the production cost of new products, which can also contribute to the competitiveness of a company.

Alliances between companies are a way to overcome businesses' resource constraints. However, the development of a complex collaborative business model has become a necessity (Aguilar-Savén, 2004) for the enterprises as a way to overcome their resource limitations; because by participating in partnerships and networks, these companies develop the required skills to engage in product innovation (Inkpen & Pien, 2006; Ganotakis & Love, 2012).

The logic behind the formation of alliances relies in the strategic needs and social opportunities. An Alliance extends the use of company resources for any NPD (Eisenhardt & Schoonhoven, 1996). Furthermore, joint tangible or intangible assets can be innovation-generating factors (Hunt & Morgan, 1995; Lorenzoni & Lipparini 1999; Ritter & Gemünden, 2003; Inkpen & Pien, 2006). Another successful strategy in product innovation can be through a process of internationalization, held through alliances with other companies (Hitt et al., 1994). One other strategy for product innovation may rely in the alliance of a smaller company with large companies that have advanced technology and technological resources (Stuart, 2000; Eapen, 2012). It

may impact on research cost reduction (Yan & Li, 2010). From the expansion potential of the innovative capacity of the Alliance emerges the fourth hypothesis:

**H4:** Alliance is positively related to Product Innovation

*2.5 Product Innovation and Organizational Performance*

The literature presents "new product superior performance" as a concept that directly influences the economic performance of a company, through: i) high quality NPD processes; ii) a product strategy that is well reported within a company; iii) adequate resources for new products; iv) senior management commitment to new products; v) favorable organizational climate for product innovation; vii) multifunctional and qualified teams of NPD; viii) the establishment of total quality management systems that guarantee any process, especially with NPD, and ix) the implementation of new product development functionalities (Kohli & Jaworski, 1990; Kleinschmidt & Cooper, 1991; Kohli et al., 1993; Cooper & Kleinschmidt, 1995; Han et al., 1998; Koufteros & Marcoulides, 2006; Sadikoglu & Zehir, 2010). Also, to measure the success of new product, some companies use customer satisfaction, audits and their comparison with the competition (Narver & Slater, 1990; Conant et al., 1993; Chiesa et al., 1996; Griffin & Page, 1996; Paladino, 2007).

The success of product innovation is related to the ability of a new product to gain traction on the Market (Narver & Slater, 1990; Slater & Narver, 1994; Paladino, 2007), enhancing the performance of the company, about the concept of product innovation, it is considered as a dynamic capability that add value to an organisation, as any new product requires a combination of new routines or renewal of different skills, assets and processes, which create new revenues from it (Eisenhardt & Martin, 2000; Paladino, 2007).

Organizational performance can be measured by comparing the organization's results with its competitors, considering the dimensions of quality of goods and / or services offered; the profitability with new products; the return on investment and assets; the operating costs; and the overall performance (Kohli & Jaworski, 1990; Conant et al., 1993; Paladino, 2007; Guimarães, 2013). Considering the premises of Product Innovation and Organizational Performance, the fifth hypothesis of this research is:

**H5:** Product Innovation is positively related to Organizational Performance.

Based on these assumptions, Figure 1 presents the theoretical model that composes the five research hypotheses.

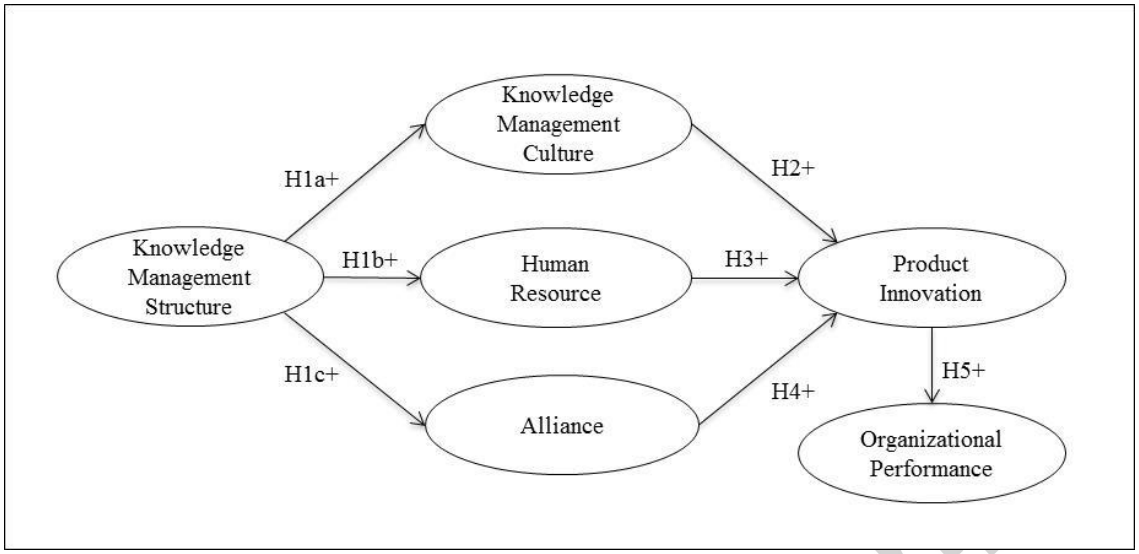


**Fig. 1.** Proposed research model.

## 3. Method

This study is a quantitative and descriptive study through a survey realized and analyzed with a Structural Equation Modeling (SEM) technique, which measures the opinion of the managers of furniture companies with respect to resources, product innovation and organizational performance.

The Structural Equation Modeling is a method that is not restricted to a single technique, but a set of methodological procedures for statistical analysis, which allows the examination of a series of simultaneous dependency relationships (Hoyle & Panter, 1995; Hair et al. 2007; Maruyama, 1998; Kline, 2005; Fabrigar et al, 2010).

The SEM method allows a large number of dependent and independent variables analysis. Through this methodology, the observed variables can be factored through an analysis that form the latent variables. The latent variables are also named "constructs", which do not allow a direct measurement. That is why the measurement of a “construct” is done through the use of observable variables. A priori, a SEM is more a confirmatory than an exploratory method, which requires the set up of a model that represents a unidirectional effects system of variable that impact on another in a path diagram to allow a relevant and effective analysis (Byrne et al, 1989, Hair et al, 2007; Maruyama, 1998; Golob, 2003). The SEM methodology was used in this study to determine the

relationship and correlations between the constructs involving innovation and other resources (Lambe et al., 2002; Paladino, 2007; and Lii and Kuo, 2016).

The sample consisted of companies from the furniture industry, located in South Brazil, and corresponds to 25% of the 2,470 state-owned enterprises of Rio Grande do Sul (Brazil), which included 19 respondents for each variable, respecting the minimum criteria of 10 respondents by variable suggested by Hair Jr. et al. (2007). Also, since Kline (2005) suggests a minimum of 200 respondents to reach sample relevance, this study used a sample of 618 valid cases, without the presence of missing data.

The sample definition was established through the use of the Register of Companies of the Rio Grande do Sul Industries Federation (FIERGS). After a pilot survey of 35 cases was done to adjust the questionnaire and later the pilot research data was incorporated into the survey data. The questionnaire, as presented in Table 2, was applied from January 2013 to September 2013. From 2,234 questionnaires sent, 228 were answered by E-Mail, 356 by phone and 48 directly, for a total of 632 respondents.

The questionnaire was developed to measure the causal relationships between the constructs of: i) Knowledge Management Structure resource (KMS); ii) Knowledge Management Culture resource (KMC); iii) Human Resource (RH); iv) Alliance (AL); v) Product Innovation (PI); vi) Organizational Performance (OP). The questionnaire was developed based on the theoretical framework presented in Table 1.

**Table 1**

Sources and definitions of the questionnaire

| Construct | Definitions |
|---|---|
| **Knowledge Management Structure (KMS)** | "Knowledge Management Structure" (KMS) consists of questions drawn from the premises, where a structure of a company should offer the conditions and an organizational climate that enhance the development of innovations. For the develop of such, it is expected that a company has an appropriate system of information to record and disseminate those innovations; that such information is permanently accessible to research & development teams through "friendly user" formal procedures for innovations that promote collaborative work policies. Those theoretical assumptions are based on Narver and Slater (1995), Sanchez (1995), Gold et al. (2001), Pavlou and El Sawy (2006), Leidner et al. (2006), Kim and Lee (2006), Prieto et al. (2009), Zack et al. (2009), Zhang (2011) and Guimarães (2013). |
| **Knowledge Management Culture (KMC)** | "Knowledge Management Culture" (KMC) is composed of both systems of beliefs and values that define knowledge and emphasize in practices that are applied in new product development activities. Such culture may rise through leadership's relationship with a research & development (R&D) team, with respect to partnership and trust among team members and the desire of its people to share knowledge. Those theoretical assumptions are based on Schein (1985), Narver and Slater (1995), Sveiby and Simons (2002), Lee and Choi (2003), Roth (2003), Leidner et al. (2006), Yang |

| | |
|---|---|
| | (2007) and Prieto et al. (2009). |
| **Human Resource (HR)** | "Human resource" (HR) is a key strategic dimension for the implementation and the maintenance of new product development (NPD) process. Such resource is composed of policies and actions from the senior management with respect to the support of R&D team and it provides the resources needed for new product development, the autonomy and the respect of the decisions of the project managers and, their involvement and commitment to the NPD process and the use of multidisciplinary teams. Those theoretical assumptions are based on Cooper (1993), Klein and Sorra, (1996), Huselid and Becker (1997), Khandekar and Sharma (2005), Kandemir et al. (2006), Armstrong (2009), Houy (2010), Slotegraaf and Atuahene-Gima (2011) and Patanakul et al. (2012). |
| **Alliance (AL)** | The construct "Alliance" (AL) refers to the relations between the business partners and constitutes a strategy generator for competitive advantages over their competitors. In that context, AL promotes access and sharing of the resources that are available to the partners to allow the development of innovations. It creates unique capabilities for the acquisition and the creation of knowledge; and shared costs between the partners for innovation development and implementation. Those theoretical assumptions are based on Morgan and Hunt (1994), Hunt and Morgan (1995), Varadarajan and Cunningham (1995), Lambe et al. (2002), Ritter and Gemünden (2003), Inkpen and Pien (2006) and (Fang, 2011). |
| **Product Innovation (PI)** | The construct "Product Innovation" (PI) was developed considering the features of new product, its quality attributes, its benefits and advantages for customers, new technologies and knowledge and competitors' differentiated products. Customers should perceive product innovations by its functionality, differentiation and tangible benefits. Those theoretical assumptions are based on Gatignon and Xuereb (1997), OCED (2005), Paladino (2007) and Guimarães (2013). |
| **Organizational Performance (OP)** | "Organizational Performance" (OP) is defined as a result based comparison between a company and its competitors, by analyzing the quality of its products and services, its new product profitability, its return on investment and company assets, by reducing its operating costs. Those theoretical assumptions are based on Conant et al. (1990), Kohli and Jaworski (1990), Narver and Slater (1990), Conant et al. (1993), Slater and Narver (1994), Paladino (2007) and Guimarães (2013). |

The research was operationalized through a five points Likert scale, since it does not originally have a continuous distribution, but when used in coupled form, it does fulfill in part the continuity requirement (Byrne, 2010). The subjects surveyed are composed of 234 directors and 384 managers. Their duties involve the development of product innovation strategies, as well as the organisation of strategies. Supplementary Law No. 139/2011 (Brazil, 2011) and Law No. 11,638 / 2007 (Brazil, 2007) which determines the size based on the annual income (in Brazilian Reals) as: i) the Microenterprise (ME) is known as the legal entity that has an annual revenue equal to or less than R$360,000; ii) Small Enterprises (SE) have an annual revenue between R$361,000 and less than or equal to R$3.6 million; iii) Medium-sized Enterprises (ME), is a corporation with annual revenues of R$3.6 million and lower than R $ 300 million; iv) the Large Enterprises have annual revenues of R$ 300 million.

**Table 2**

Latent and observed variables - Varimax Rotation (free translation from Brazilian Portuguese)

| Observable variables* | Loads | Communalities |
|---|---|---|
| **Construct – Knowledge Management Structure** | | |
| **KMS1)** The managers are open to individual proposals and creativity of the members of the New Product Development team. | 0.800 | 0.799 |
| **KMS2)** The formal procedures and systems that affect the New Product Development encourage people to seek knowledge, regardless of the organizational structure | 0.801 | 0.682 |
| **KMS3)** The formal procedures and systems that affect the New Product Development are designed to help the exchange of knowledge across departmental boundaries. | 0.867 | 0.787 |
| **KMS4)** The formal procedures and systems that affect the New Product Development are designed to promote a collective effort rather than an individualistic behaviour. | 0.877 | 0.801 |
| **KMS5)** The managers provide a climate of trust and cooperation. | 0.820 | 0.757 |
| **KMS6)** The formal procedures and systems that affect the New Product Development are generally flexible and adaptable. | 0.816 | 0.730 |
| Mean 3.901; Standard Deviation 1.001; Cronbach's Alpha 0.933; Composite Reliability 0.962 | | |
| **Construct – Knowledge Management Culture** | | |
| **KMC1)** The members of the New Product Development team have relationships based on faith and mutual trust. | 0.717 | 0.736 |
| **KMC2)** The members of the New Product Development team are generally reliable | 0.810 | 0.848 |
| **KMC3)** The members of the New Product Development team are respectful and understandable in relation to teammates. | 0.773 | 0.843 |
| **KMC4)** The members of the New Product Development team are sincere in expressing their views on the work of their colleagues. | 0.795 | 0.841 |
| Mean 4.044; Standard deviation 0.963; Cronbach's alpha 0.920; Composite Reliability 0.956 | | |
| **Construct – Human Resource** | | |
| **HR1)** The top management is involved and committed with the Product Innovation scheme. | 0.873 | 0.848 |
| **HR2)** The project manager is autonomous to handle the New Product Development (NPD) scheme. | 0.840 | 0.826 |
| **HR3)** The company uses a multidisciplinary team for NPD. | 0.882 | 0.840 |
| **HR4)** The company provides a focused and dedicated staff for NPD. | 0.873 | 0.875 |
| Mean 4.147; Standard deviation 0.968; Cronbach's Alpha 0.939; Composite Reliability 0.964 | | |
| **Construct – Alliance** | | |
| **AL1)** With our partners, we create capabilities that are unique to this alliance. | 0.748 | 0.744 |
| **AL2)** Together with our partners, we have developed a series of knowledge that is tailored to our relationship. | 0.801 | 0.794 |
| **AL3)** Together with our partners, we have invested a lot in building our business. | 0.837 | 0.830 |
| **AL4)** If this relationship with our partners gets over, we would be losing a lot of knowledge that is tailored to our relationship. | 0.821 | 0.706 |
| **AL5)** We and our partners contribute with different resources so that the relationship will help us to achieve mutual goals. | 0.862 | 0.814 |
| **AL6)** We and our partners have complementary strengths that are useful for our relationship. | 0.841 | 0.768 |
| **AL7)** Each of us has different skills, which when combined allow us to achieve goals beyond our individual reach. | 0.805 | 0.678 |
| **AL8)** We and our partners are always looking for companies that can partner for the joint development of competitive advantage. | 0.792 | 0.674 |

| | | |
|---|---|---|
| Mean 3.977; Standard deviation 1.005; Cronbach's Alpha 0.946; Composite Reliability 0.970 | | |
| **Construct – Product Innovation** | | |
| **PI1)** The quality of our new products is higher than that of our competitors. | 0.621 | 0.560 |
| **PI2)** Our product, in terms of functionality and features, is superior compared to our competitors. | 0.549 | 0.493 |
| **PI3)** We generally have an advantage over our competitors in terms of higher product offered to our customers. | 0.897 | 0.897 |
| **PI4)** Our new products have small improvements in current technology. | 0.890 | 0.862 |
| **PI5)** Our new products incorporate a large body of new technological knowledge. | 0.874 | 0.860 |
| **PI6)** The applications of our new products are totally different applications of the products of our main competitors. | 0.856 | 0.783 |
| Mean 4.068; Standard deviation 0.840; Cronbach's alpha 0.923; Composite Reliability 0.957 | | |
| **Construct – Organizational Performance** | | |
| **OP1)** The quality of goods and / or services offered are superior end our competitors. | 0.736 | 0.653 |
| **OP2)** The profitability with new products is much better compared to your competitors. | 0.930 | 0.888 |
| **OP3)** The return on investment of our company is superior over our competitors. | 0.927 | 0.885 |
| **OP4)** The return on assets of our company is superior compared to our competitors. | 0.720 | 0.627 |
| **OP5)** The total operating costs of our company is to lower total cost of our competitors. | 0.909 | 0.844 |
| **OP6)** The overall performance of our company in the previous year was higher than the main competitors. | 0.886 | 0.811 |
| Mean 3.370; Standard deviation 0.907; Cronbach's alpha 0.938; Composite Reliability 0.959 | | |
| * A 5-point Likert scale was used:<br>1 – Strongly disagree; 2 - Disagree; 3 – Neither disagree or agree; 4 – Agree; 5 – Strongly agree. | | |

A Structural Equation Modeling (SEM) was used for data analysis because it allows the examination of a number of dependency relations simultaneously (Maruyama, 1998; Kline, 2005; Hair Jr. et al., 2007; Fabrigar et al., 2010) and the relationship of cause and effect between the constructs.

Statistical analysis and data analysis were performed using the SPSS software (Statistical Package for Social Sciences), Version 21 for Windows® and for calculations of SEM were done with the AMOS® software, version 21, coupled to SPSS, as of Byrne (2010)'s recommendations.

An Exploratory Factor Analysis (EFA) was used to analyze the relationship between the variables of each construct and a Confirmatory Factor Analysis (CFA) was also used to verify the combination of observable variables, resulting in latent variables (constructs). The survey data were submitted to both the Bartlett sphericity and the Kaiser, Meyer and Olkin (KMO) measurement adequacy tests to assess the feasibility of EFA. The Cronbach's alpha (Hair Jr. et al., 2007) was calculated to verify the simple reliability of the observable variables (Mardia, 1971; Bentler, 1990).

The process of communalities was executed through a scale purification process. It refers to the total amount of variance that an original variable shares with all other variables of a study where from, according to Hair et al. (2007), all values below 0.5 should be removed from the calculation process. The Average Variance Extracted (AVE) analysis was done to evaluate the construct and explains the total variance of each observable variable (Fornell & Larcher, 1982). The AVE was used to evaluate the Convergent Validity (CV) and the Discriminant Validity (DV), which measures the variance of the observed variables, which is explained by the latent construct. The CV assesses the direct relations between Latent Variables and checks whether the indicators for each construct are consistent with each other. The DV is used to verify if the proposed model constructs measure different constructs (Raykov & Marcoulides, 2000). To assess whether the observed variables are consistent in their measurements, the Composite Reliability level should be above 0.7, according to Marôco (2010).

The analysis of the integrated model uses as a parameter the absolute adjustment measures, which determines the degree to which the measurement model predicts the covariance matrix or correlation, as advocated by Gerbing & Anderson (1988), Iriondo et al. (2003), Kline (2005), Hair et al. (2007) and Ullman (2007). Among them are the i) Chi-square value divided by the estimated model degrees of freedom (less than or equal to 5); ii) CFI – Comparative Fit Index (greater than 0.90); iii) Normed Fit index (NFI) (greater than 0.90; iv) Goodness of Fit Index (GFI) (greater than 0.90); v) Adjusted Goodness of Fit Index (AGFI) (greater than 0.90); vi) Root Mean Squared Error of Approximation (RMSEA) (between 0.05 and 0.08, and zero as perfect fit); vii) Root Mean Square Residual (RMR) is the square root of the mean square value at which the sample variance and covariance differ from their estimates; viii) Expected Cross-Validation Index (ECVI), which represents an approximation of the adjustment that the model can achieve with another sample of the same size that applied, has compared the rival models. For both the RMR and ECVI, the smaller the value found is, better the adjustments of the model are.

## 4. Results

At the beginning of the data cleaning process, 14 questionnaires considered as "outliers" were excluded as they exhibited distortions in relation to other data, since they contained only one concentrated alternative. Cases of non-answers were not detected, since the proper data collection technique did not allow the registration of the

questionnaire without all the questions being answered. The extreme scores were also observed with univariate and multivariate outliers analysis, through the calculation of Z-scores (Kline, 2005; Hair et al., 2007), and no case with values greater than 3.3 for each variable were encountered. The Mahalanobis calculation was used to identify the multivariate outliers, but no case with such a distance between the individual value and the sample means was identified.

The final sample of this research consists of 618 valid cases. The sample consists of 77% of micro enterprises, 16% of small businesses, 5% of medium-sized companies and 1.9% of large companies. Regarding the origin of the capital, 97.1% is of Brazilian origin; 1.3% is from multinationals; and 1.6% is from Mixed Capital Companies (Brazilian Capital and Foreign).

To assess whether companies use "Open Innovation strategies" Chesbrough (2003), the participation of external agents to the organisation was considered for the development of product innovations. In this sense, 79.5% of the sample companies use only internal agents for product innovation; 3.2% of them exclusively contract external agents and 17.5% of them use internal and external agents. Such results show that open innovation in new product development occurs in 20.7% of the companies surveyed, which aligns itself with the Alliance construct, reinforcing the precepts of Chesbrough (2007) and Huizingh (2011). Another aspect to note is the total of incremental innovations, which counts for 100% of the sample, with no break in the paradigms prevailing (Garcia & Calantone, 2002).

In concordance with the theoretical model (Figure 1) and to verify the relationship between the variables of each construct the EFA method with Varimax rotation was used, resulting in the combination of six factors from the variables, showing a 77.60% of variability explanation. From such data, a Cronbach's alpha of 0.931 for all factors in the minimum value was found, showing relevant results, as the minimum recommended by Hair et al. (2007) and Lee and Hooley (2005) is 0.7. Bartlett's sphericity test proved significant and the KMO adequacy measure introduced an index of 0.893, assessing the feasibility of EFA. The Mardia coefficient was used to assess the kurtosis index that showed values lower than 5 (Mardia, 1970; Bentler, 1990), which demonstrates normality. The data presented asymmetric Pearson coefficients with values near zero, indicating a moderate symmetry, according to the precepts Kline (2005) and Hair et al. (2007).

The observable variables present a mean above 3.37 and a standard deviation between 0.840 and 1.005, showing that respondents agree with the proposed statements. This implies the concordance of the company respondents that following resources exist and are used (KMS, KMC, HR, AL) for Product Innovation and Organizational Performance. The PI2 variable showed a commonality of 0.493 inferior of the recommended one (above 0.5), but was still maintained, considering its importance for the composition and the analysis of the construct "Product Innovation".

The Composite Reliability data of each construct (Table 2) showed values above the recommended level of seven (7.0). The results show also that the AVE of the constructs (Table 3), considering all the variables together (Table 8), was above the recommended level, which must be greater than 0.7. Table 3 shows that the DV presents lower values than the AVE, since the Correlations between each constructs (Discriminant Validity) must be smaller than the Convergent Validity (Average Variance Extracted – AVE). With such results, it shows that the observable variables are consistent in their measurement.

A Pearson correlation analysis showed thirteen correlations above a 0.8 level, featuring multicollinearity (KMC2 <--> KMC3; HR1 <--> HR3; HR2 <--> HR4; AL1 <--> AL2, AL2 <--> AL3; PI3 <--> PI4; PI3 <--> PI5; PI4 <--> PI5; OP1 <--> OP4; PO2 <--> OP3; PO2 <--> OP5; OP2 <--> OP6, OP5 <--> OP6). However, it was decided to keep the observable variables, considering the importance of these issues to understand the latent variable. Accordingly, an ANOVA was done to see if there were divergent behaviour from the respondents, compared by group of different sizes of companies and capital source groups. The results showed no significant difference between the groups, confirming the homogeneous nature of the sample.



**Table 3**

Convergent Validity and Discriminant Validity

| Constructs | KMS | KMC | HR | AL | PI | OP |
|---|---|---|---|---|---|---|
| Knowledge Management Structure (KMS) | 0.809[a] | | | | | |
| Knowledge Management Culture (KMC) | 0.735[b] | 0.844[a] | | | | |
| Human Resource (HR) | 0.163[b] | 0.142[b] | 0.872[a] | | | |
| Alliance (AL) | 0.152[b] | 0.166[b] | 0.480[b] | 0.802[a] | | |
| Product Innovation (PI) | 0.250[b] | 0.194[b] | 0.412[b] | 0.476[b] | 0.791[a] | |
| Organizational Performance (OP) | 0.129[b] | 0.080[b] | 0.147[b] | 0.283[b] | 0.279[b] | 0.815[a] |

[a] Average Variance Extracted (AVE) – Convergent Validity (CV)
[b] Correlation between constructs – Discriminant Validity (DV)
Source: Research Data from the AMOS report (2013)

After the scale and constructs validation process that make up the theoretical model, the analysis of the Initial Integrated Model was performed. It combines the measurement model and the structural model to evaluate the relationship between the constructs (Figure 1) from the observable variables. In the evaluation of the Initial Integrated Model, the model fit indices and statistical significance of the estimated coefficients were considered (Kline, 2005; Hair Jr. et al., 2007).

Table 4 indicates significant relationships for the standard deviation and the Critical Ratio (CR) of the Integrated Initial Model. Table 5 shows the correlation hypothesis test of the Integrated Initial Model. The analysis of the results in relation to the propositions of this research presents a positive relationship between the constructs: i) KMS --> KMC (Hypothesis 1a); ii) KMS --> RH (Hypothesis 1b); iii) KMS --> AL (Hypothesis 1c); iv) KMC --> IP (Hypothesis 2); v) HR --> IP (Hypothesis 3); vi) AL --> IP (Hypothesis 4); vii) PI --> OP (Hypothesis 5);

Table 8 describes the output indexes of the AMOS software for the Integrated Initial Model. These indices are used to analyse the absolute adjustment measures, which determine the degree to which the measurement model predicts the covariance matrix. The analysis of the index that calculates the Chi-square estimated model, divided by the degrees of freedom, shows a value of 5,950 which exceeds the 5.0 limit suggested by Tanaka (1993). However, it does not justify the elimination of the integrated model.

**Table 4**

Test of hypothesis (covariance) – Integrated Initial Model

| Constructs | | | Standardized Coefficient (SC) | Standard Deviation | C.R. | p |
|---|---|---|---|---|---|---|
| Alliance | <--- | Knowledge Management Structure | 0.168 | 0.043 | 3.874 | *** |
| Human Resource | <--- | Knowledge Management Structure | 0.220 | 0.055 | 4.031 | *** |
| Knowledge Management Culture | <--- | Knowledge Management Structure | 0.826 | 0.047 | 17.421 | *** |
| Product Innovation | <--- | Knowledge Management Culture | 0.072 | 0.024 | 2.967 | 0.002** |
| Product Innovation | <--- | Alliance | 0.253 | 0.030 | 8.398 | *** |
| Product Innovation | <--- | Human Resource | 0.134 | 0.023 | 6.204 | *** |
| Organizational Performance | <--- | Product Innovation | 0.318 | 0.052 | 6.159 | *** |

** Significance level p<0.01

*** Significance level p<0.001

Source: Research Data from the AMOS report (2013)

**Table 5**

Test of hypothesis (correlation) – Integrated Initial Model

| Constructs | | | Estimate Coefficient (EC) |
|---|---|---|---|
| Alliance | <--- | Knowledge Management Structure | 0.166 |
| Human Resource | <--- | Knowledge Management Structure | 0.171 |
| Knowledge Management Culture | <--- | Knowledge Management Structure | 0.737 |
| Product Innovation | <--- | Knowledge Management Culture | 0.115 |
| Product Innovation | <--- | Alliance | 0.368 |
| Product Innovation | <--- | Human Resource | 0.246 |
| Organizational Performance | <--- | Product Innovation | 0.273 |

*** Significance level p<0,001
Source: Research Data (2013)

The calculated indices of CFI (0.835), NFI (0.817) AGFI (0.709) and GFI (0.745) resulted in less than the recommended value of 0.9 (Hair et al, 2007; Kline, 2005), reinforcing the inadequacy of the model. The RMSEA presents a value of 0.107, which is above the suggested limit by Hair Jr. et al. (2007) and Kline (2005). The RMR indices shows a value of 0.106 and the ECVI comes with a value of 7,032, which were expected to be lower values in this research. Marôco (2010) recommends that the smaller the values, the better the adjustment of the integrated model.

The initial results of the hypotheses in this research are based on the study of the theoretical model (Figure 1) and the indices, as suggested by Hair et al. (2007), to analyze the absolute adjustment measures (Tables 4 and 5), which confirms the positive relationship between the constructs, but the H2 hypothesis presents a weak relationship with a Standardized Coefficient (SC) of 0.072.

The integrated initial model showed inadequate values of the indices used for the analysis of absolute adjustment measures, which reveals its fragility. In light of these results, an integrated model was developed for the final analysis of the empirical research data. The final integrated model was constructed, based on the Pearson correlations that most contributed to the improvement of the model fit evaluation indexes. From this process, thirteen cases showed correlations values above 0.8, as shown in Figure 2, which was developed in order to obtain an integrated model that best analyzes the empirical data.

Table 6 shows the standardized significance coefficients of the final integrated model with direct links between the constructs, showing improvement in the relationship. The results indicate the significant relationships for the standard deviation and shows the results of the Critical Ratio (CR) that presents values above two, which confirms a standard normal distribution at a 0.05 level, with a significant calculus of

probability (p), which demonstrates that there are significant differences between the observed variables for each construct. Table 7 shows the values of the Estimated Coefficient, which confirm the assumptions on the Final Integrated Model.

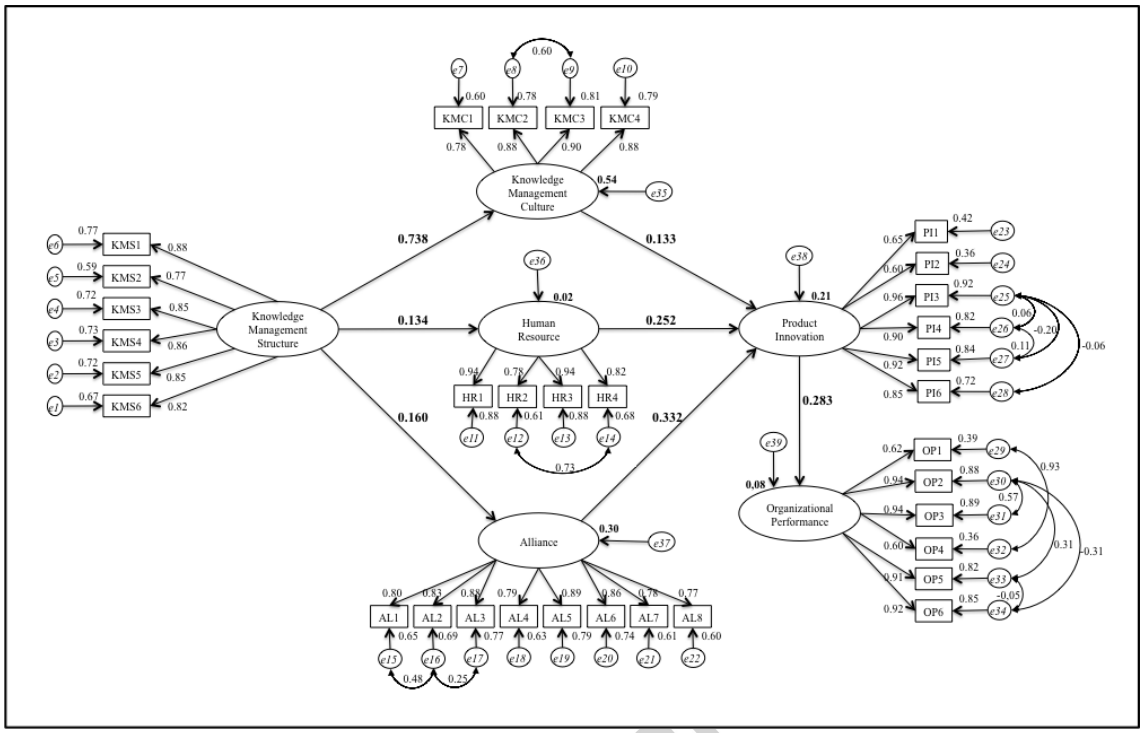


**Fig. 2.** Integrated Final Model – Standardized Regression Weights

**Table 6**

Test of hypothesis (covariance) – Integrated Final Model

| Constructs | | | Standardized Coefficient (SC) | Standard Deviation | C.R. | p |
|---|---|---|---|---|---|---|
| Alliance | <--- | Knowledge Management (Structure) | 0.164 | 0.044 | 3.717 | *** |
| Human Resource | <--- | Knowledge Management (Structure) | 0.149 | 0.048 | 3.123 | 0.002** |
| Knowledge Management (Culture) | <--- | Knowledge Management (Structure) | 0.830 | 0.048 | 17.343 | *** |
| Product Innovation | <--- | Knowledge Management (Culture) | 0.083 | 0.025 | 3.396 | *** |
| Product Innovation | <--- | Alliance | 0.227 | 0.029 | 7.705 | *** |
| Product Innovation | <--- | Human Resource | 0.159 | 0.026 | 6.172 | *** |
| Organizational Performance | <--- | Product Innovation | 0.327 | 0.052 | 6.294 | *** |

**Significance level p<0.01
***Significance level p<0.001
Source: Research Data from the AMOS report (2013)

**Table 7**

Test of hypothesis (correlation) – Integrated Final Model

| Constructs | | | Estimate Coefficient (EC) |
|---|---|---|---|
| Alliance | <--- | Knowledge Management (Structure) | 0.160 |
| Human Resource | <--- | Knowledge Management (Structure) | 0.134 |
| Knowledge Management (Culture) | <--- | Knowledge Management (Structure) | 0.738 |
| Product Innovation | <--- | Knowledge Management (Culture) | 0.133 |
| Product Innovation | <--- | Alliance | 0.332 |
| Product Innovation | <--- | Human Resource | 0.252 |
| Organizational Performance | <--- | Product Innovation | 0.282 |

*** Significance level p<0,001
Source: Research Data (2013)

The final integrated model features improvements in indices (Table 8), highlighting the index that calculates the Chi-Square divided by the estimated model degrees of freedom, which obtained the value 4.5 within the acceptable limit of 5.0 (Tanaka, 1993). The adjustments indices improved significantly, with a CFI of 0.920 and a NFI of 0.900, resulting in values as recommended by Hair et al. (2007) and Kline (2005), and the AGFI (0.793) and GFI (0.824) improved in relation to the integrated initial model. The RMSEA shows a value within the range of 0.075 (0.05 to 0.08), as suggested by Hair et al. (2007) and Kline (2005). The ECVI presents a value of 3.986, which is lower than the initial integrated model, showing model adjustment (Marôco, 2010). The figures show that the integrated final model has a better adjustment in relation to the proposed model, so the model is suitable for analysis of the empirical research data, showing statistically significant results.

**Table 8**

Adjustment index of the integrated model - initial and final.

| Adjustment index | Integrated model initial | Integrated model final |
|---|---|---|
| Chi-square | 4,188.641 | 2,283.400 |
| Level of liberty | 520 | 507 |
| Chi-square divided by the level of liberty | 8.1 | 4.5 |
| Level of probability | 0,000* | 0,000* |
| CFI – Comparative Fit Index | 0.835 | 0.920 |
| NFI – Normed Fit index | 0.817 | 0.900 |
| GFI – Goodness of Fit Index | 0.745 | 0.824 |
| AGFI – Adjusted Goodness of Fit Index | 0.709 | 0.793 |
| RMSEA – Root Mean Squared Error of Approximation | 0.107 | 0.075 |
| RMR – Root Mean Square Residual | 0.106 | 0.106 |
| ECVI – Expected Cross-Validation Index | 7.032 | 3.986 |
| KMO – Kaiser-Meyer-Olkin Measure of Sampling Adequacy | 0.893 | |
| AVE – Average Variance Extracted | 0.815 | |
| Composite Reliability | 0.993 | |
| Cronbach's Alpha | 0.931 | |

* Level of significance p<0.001

## 5. Discussion

The results show that Knowledge Management Structure (KMS) is an important antecedent of strategic resources as it offers support and organizational structure for the generation and dissemination of knowledge (Knowledge Management Culture – KMC), the quality of work of the Product Innovation process (IP) teams (Human Resource - HR) and the relationships with business partners (Alliance - AL). In Table 7, a low-level relationship between KMS --> HR (0.134) and KMS --> HR (0.160) is observed, however enough to explain the "in advance" and important relationship between the constructs. The relationship between KMS --> KMC (0.738) shows strong intensity, which was already provided in the literature. It reinforces the need for companies to invest in KMS for better results in optimizing their resources and generation of new knowledge that can be used in strategies product, service and / or market, increasing the competitive potential of the organisation.

The low intensity of the relationship of KMC --> PI (0.133), although it is low counts for an important relationship, since the processes and practices that companies use to manage knowledge are essential to achieve the organizational strategic objectives, through the better use of resources and existing capabilities as well as the generation of new knowledge (March, 1991; Zack, 1999; Zollo & Winter, 2002). The organizational culture acts on the behaviour of the control of individuals and teams, which can create an edge for an organisation, seeking to achieve its main objectives, which in this study is product innovation.

The measurement of the interface AL --> PI (0.332) has a significant value, which leads to the conclusion that the surveyed companies have great relationship with Alliance partners, reinforced by the finding that 20.7% of the companies mention that they use external agents for New Product Development process (NPD), featuring open innovation (Chesbrough, 2003; 2007; Huizingh, 2011). As a managerial implication, it stands out that companies must expand the use of their resources, considering the risks and difficulties of the Alliance. The results of this research converge with the findings from other studies (Heide & John, 1990; Hunt & Morgan, 1995; Varadarajan & Cunningham, 1995; Sividas & Dwyer 2000; Lambe et al, 2002; Kale et al., 2002; Oxley & Sampson, 2004; Kale & Singh, 2007), where companies consider making alliances of two or more partners to undertake and achieve mutually desired goals, by pooling their resources and expertise to gain competitive advantage.

The results also show that the HR --> PI (0.252) relationship has a high intensity, reinforcing the importance of academic studies for employees, which stress that people can guide talent management and the employees behaviour to achieve the goals, creating value to their product, productivity, quality and profitability (Ulrich et al., 1991; Mabey et. al, 1998; Wright et al., 1998; Ellinger et al., 2002; Khandekar & Sharma, 2005; Sadikoglu and Zehir, 2010).

The measurement of the interface Product Innovation (PI) and Organizational Performance (OP) resulted in PI --> OP 0.282, establishes an important meaning for managers of companies, as it is expected that product innovation has a great influence on organizational performance. However, this influence is already statistically significant to state that product innovation is critical for companies to obtain a superior performance. The results of the relationship between IP --> OP corroborates with the studies that demonstrate that innovative products add to the performance and gain market through the quality, functions and novelty of the product (Kleinschmidt & Cooper, 1991; Kohli et al., 1993; Narver & Slater, 1994; Koufteros & Marcoulides, 2006; Paladino, 2007).

## 6. Conclusion

This research showed that strategic resources are important incentives for product innovation, in the perspective that innovative activities result from the production of new knowledge and is subject to psychological and economic forces, considering the stakeholders involved (internal and external), the conditions cultural organization and others linked to market conditions.

The main contributions of this study are the identification of the product innovation and organizational performance, but also the enhancement of research tools of statistical analysis, based on the structural equation modeling methodology. It will allow other researchers to use it as a framework and other managers to use it as a source of data for decision making in the process of prioritizing the investments and the resources that improve the performance of their company.

Table 9 presents the final evaluation of the hypotheses tested in the research.

**Table 9**

Hypotheses of the research

| Hypothesis | Description | Confirmation |
|---|---|---|
| **H1a** | Knowledge Management Structure is positively related with Knowledge | Confirmed |

| | | |
|---|---|---|
| | Management Culture | |
| **H1b** | Knowledge Management Structure is positively related with Human Resource | Confirmed |
| **H1c** | Knowledge Management Structure is positively related with Alliance | Confirmed |
| **H2** | Knowledge Management Culture is positively related to Product Innovation | Confirmed |
| **H3** | Human Resource is positively related to Product Innovation | Confirmed |
| **H4** | Alliance is positively related to Product Innovation | Confirmed |
| **H5** | Product Innovation is positively related to Organizational Performance | Confirmed |

This research allows us to state that the Knowledge Management (KMC and KMS), Human Resource (HR) and Alliance (AL) contribute positively to Product Innovation (PI) and Organizational Performance (OP). This evidence will assist the managers of the organisations to target with greater assertiveness strategic resources to develop product innovations. Therefore, this research shows that the managers of the furniture industry of Brazil can get better results (Organizational Performance) on product innovation, when the KMS, KMC, HR and AL resources are properly used. In this sense, the questions in Table 2 may serve as a list of optimization opportunities for strategic resources.

It is noteworthy that 46.4% of the surveyed companies effectively use the KMS feature, which already constitute a base for leading and organizing other resources. However, it is still recommended that those furniture companies strongly invest in the management structure and encourage receptive leadership and new ideas. The generation of more incentives for people to interact, to use creativity and to work in teams will generate new flexible and adaptable procedures, which will transform the organizational climate of trust and cooperation. The survey results show that 14.4% of companies obtained a higher Organizational Performance (OP), in relation to the other, due to the high rate (52.4%) of use of KMS in their processes and routines.

The results show that the feature that has the most influence on product innovation is Alliance (SC = 0.227; EC = 0.332). It suggests that the companies do invest in solid relationships with their partners, to generate an increase of innovations. Data show that 49.8% of the surveyed companies maintain a strong strategic alliance with other companies, so it is recommended that those companies invest in partnerships to generate new skills and get better results with product innovation.

The results of the study also identified that Product Innovation is the result of the use of strategic resources and their interaction, but the results also show that 49.7% of the companies intensively use HR in the New Product Development processes (NPD). It

is recommended that those companies improve their HR procedures in the NPD, through the following actions: i) to report the involvement and the commitment of senior management to product innovation; ii) to allow autonomy to the NPD project manager; iii) to use multidisciplinary teams in the NPD; iv) to provide time for the team members to devote time for the NPD.

The research results will also contribute to scientific studies in the field of innovation, revisiting the causal effects of resources on product innovation, since this empirical study shows that Knowledge Management Structure has a more intense relationship than Knowledge Management Culture (SC=0.830; EC=0.738). Those results partially contradict some studies from the literature such as the ones from Narver & Slater (1995), Earl (2001), Zack et al. (2009), Prieto et al. (2009) and Donate & Guadamillas (2011).

In this sense, it can be concluded that the companies surveyed in southern Brazil need and use more organizational structure than the proposed Knowledge Management on organizational culture. It demonstrates an inference to develop Knowledge Management Culture and increase the innovative capacity of firms. To enlarge the innovativeness is advisable to invest in Knowledge Management Culture, which takes time and a change in the strategic positioning of a company.

As an addition to this research, it is observed that although the results found in this study support the hypothesis H5 and indicates a high ratio between the constructs (Product Innovation is positively related to Organizational Performance), it is noted that there is a gap that should be investigated on other elements that were not covered by this study, as the strategic orientation of a company in relation to its market, customers, and entrepreneurship, as the strategic drivers that determine the cultural aspects and processes of an organisation.



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**Highlights**

Relation between Product Innovation, Resources and Organizational Performance.

A survey on product innovation in Brazilian furniture industry.

Knowledge management, Human Resource and Alliance applied the Product Innovation.

A survey analyzed with a Structural Equation Modeling.