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Organizational knowledge management and sharing

A study in the Federal Direct Administration

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Abstract

Purpose – This paper aims to identify empirically the influence of learning mechanisms provided by organizations on knowledge sharing in the organizational environment.

Design/methodology/approach – A quantitative study was developed in which a sample of 268 individuals from civil and military organizations of the Federal Direct Administration was researched. The questionnaire used was composed of the Organizational Learning Mechanism Scale, which was adapted at the time of the present study, in addition to a scale on knowledge sharing, which was developed within the scope of this research. After performing the factorial analysis for both scales, a canonical correlation analysis was performed between the group of variables associated with the learning mechanisms (independent variables) and the group of variables on knowledge sharing (dependent variables).

Findings – The results found in the canonical correlation analysis indicate that the learning mechanisms are responsible for explaining 35 per cent of the variance ($R^2 = 0.352$) of the group of variables on knowledge sharing.

Practical implications – The findings of this research can help the researched organizations to increase the knowledge management actions, mainly in relation to the actions that favor social interaction among the individuals in the work environment, making possible the exchange of knowledge and experiences in the internal organizational context, and exploring in a positive way actions related to internal acquisition.

Social implications – The deeper knowledge about the relationship between organizational actions promoted by top management and knowledge support decision-making in the organizational environment regarding contextual factors that influence social interaction between individuals. In relation to the sharing of knowledge, a high correlation of knowledge absorption and reproduction aspects with the knowledge sharing phenomenon was perceived, so that the possibility of organizations thinking in ways that provide the individual with formal and informal environments can be foreseen.

Originality/value – The main contributions of this research are to measure the intensity of the relationship between learning mechanisms and knowledge sharing; and to test the predictive effect of learning mechanisms on knowledge sharing. Regarding the methodological aspects, it was opportune to approach the phenomenon through a little used lens in the context of administration research: the analysis of canonical correlation, which represents another look at the influence of the actions of the top management and the interaction of individuals. The discussions and the data analysis carried out in this research allow us to

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envisage significant contributions of this work to the analysis and theoretical refinement of the study of the variables treated.

Keywords Knowledge management, Sharing knowledge, Learning mechanisms

Paper type Research paper

1. Introduction

The task of unraveling the phenomena that occur in the dynamic organizational context emerges as a great challenge to researchers, pointing out a viable path for understanding actors' actions in their work environment and the way these same actors negotiate their tensions in the daily organizational context (Hatch, 1997).

In the context of this discussion, Spender (1996) argues that the change witnessed in the organizational field provided the transition from the industrial age to the information age, where there is no longer room for the manager's conception as the rule-maker and the employee only follows his determinations. From a new perspective, it is necessary that the organization be considered as a tangle of subgroups in which knowledge is created and shared, arising individually or in teams, passing through all levels of the organization.

Argote and Miron-Spektor (2011) argue that the debate about organizational issues has knowledge as the protagonist. These authors emphasize that organizational knowledge is constituted by a constant mix of contextualized experiences, values and information that, when they are mixed with the interpretation, judgment and creativity of the subject, provide the manifestation of cognitive or behavioral changes. These changes may encompass tacit and explicit components rooted in a variety of repositories, including routines, individuals and various other organizational memory systems.

However, Bartol and Srivastava (2002) and Tonet and Paz (2006) emphasize that the great availability of organizational knowledge does not guarantee its use by the organization. The way many organizations are dispersed and arranged provides a great chance that the knowledge needed to carry out the activities is not perceived and identified by individuals.

Based on these considerations, Faoro and Oliveira (2014), He *et al.* (2014), Oliveira *et al.* (2012), Ramayah *et al.* (2014) and Yi (2009) emphasize that knowledge sharing must be located at the center of the discussion that involves understanding knowledge management as an organizational action that provides the use of knowledge in support of organizational objectives.

From the context of such discussions, there is increased debate about the environmental nuances that affect organizational knowledge, based on the premise that the organization is an open system that interacts with the environment at the same time that it suffers influence in the development of organizational learning processes (Sirmon *et al.*, 2007).

The debate produced by these authors opens the way for analysis of the importance of establishing procedures and administrative routines that foster the flow of knowledge, which are essential antecedents for the organization to create a propitious and facilitating environment for knowledge sharing.

Amayah (2013), Faoro and Oliveira (2014) and Ragab and Arisha (2013) point out that the management of organizations can occur through management actions that contemplate the identification, creation, acquisition, sharing and updating of organizational knowledge, making it available when it is necessary and required.

These authors' arguments are based on Isidro-Filho (2009), Lipshitz and Popper (1996), Lipshitz *et al.* (2002), López *et al.* (2005) and Pokharel and Choi (2015), which authors point out that to share knowledge, it is essential to foster some routine learning situations. These

learning situations are designated learning mechanisms by the authors and are defined as the institutionalized arrangements and procedures used by the organization to collect, analyze, store, disseminate and use knowledge essential to its performance and its members (Isidro-Filho, 2009).

Isidro-Filho (2009), Lipshitz and Popper (1996), Lipshitz *et al.* (2002) and López *et al.* (2005) focus the concept of knowledge management to that of learning mechanisms, reaffirming the importance of the process of knowledge sharing being fostered by a set of actions offered by the support provided by top management to individuals.

From this analytical perspective, the objective of this research emerges, namely, to identify empirically the influence of the learning mechanisms provided by organizations on knowledge sharing in the organizational environment.

The relevance of this research is supported by the contribution to the deepening of knowledge about the relationship between organizational actions promoted by top management and knowledge sharing (Argote and Miron-Spektor, 2011), supporting decision-making in the organizational environment regarding contextual factors that influence social interaction between individuals.

The present study is divided into sections that examine the contextualized aspects of this introduction. Later, the theoretical framework will be approached in Section 2, which offers some reflections on organizational knowledge, knowledge sharing and the relationship between actions of knowledge management (learning mechanisms) and knowledge sharing. After that, the methodological procedures that support the conduct of the research and the data analysis performed are presented in Sections 3 and 4. Finally, some limitations are listed in Section 5, and conclusions and a proposed research agenda will be addressed in Section 6.

2. Theoretical framework

Styhre *et al.* (2008) point out that research on knowledge sharing has emerged as a prominent field in knowledge management. When discussing the complexity of research on the topic, Styhre *et al.* (2008) highlight three well-defined trends in the literature. The first concerns studies that focus on analyzing the sectors of the organization that engage in knowledge sharing, such as communities of practice (Wenger *et al.*, 2002) and project teams (Boh, 2007); a second line emphasizes the identification of mechanisms that favor knowledge sharing in the organizational environment (Isidro-Filho, 2009); finally, there is a chain that focuses on analysis of the knowledge underlying the practices of individuals and the characteristics of knowledge (Tonet and Paz, 2006).

This work is supported by the cognitive perspective, which supports the influence of learning mechanisms as a knowledge management action on knowledge sharing, in view of knowledge being seen as an asset that can transcend organizational sections and departments (Antonello and Godoy, 2011).

In the context of this discussion, Nonaka and Konno (1998) and Nonaka *et al.* (2000) argue for the importance of the organizational context and social factors that affect the knowledge creation and sharing process, stating that the organization is a set of environments that are conducive to interaction between individuals, and these environments can be physical (offices, business meetings) or virtual (e-mail, intranet and teleconference), which may influence the occurrence of the phenomenon.

Supporting this perspective, Bartol and Srivastava (2002) point out that organizational knowledge is the result of the exchange of knowledge and experiences of individuals in the work environment, while the complexity of the phenomenon lies in the difficulty of creating a harmonious environment in which predictors (such as sources of knowledge, transmission

channel, message, receiver and context) flow efficiently to enhance the interaction between individuals (Szulanski, 2000; Tonet and Paz, 2006).

With the argument that the management of organizations can provide conditions that favor the management of knowledge in the organizational environment, authors such as Amayah (2013), Batista (2012) and Hartung and Oliveira (2013) affirm that knowledge management is constituted in the elaboration of the organizational strategy, with respect to the structure, processes and systems, to provide administrators with the conditions for the treatment of knowledge, stimulating actions and practices that enable the recognition of intellectual assets, and providing solutions to organizational problems.

In line with this conceptual debate, Isidro-Filho (2009), Lipshitz *et al.* (2002) and López *et al.* (2005) propose the conciliation between knowledge management actions and learning mechanisms, noting that both actions are characterized by the establishment of institutionalized arrangements and procedures, representing the structural facet of the organization, in which are constituted the subsystems wherein individuals interact with each other for the purpose of sharing knowledge and experiences and, consequently, learning in the work environment.

The authors maintain that top management initiatives in reducing physical and social distances within the organization foster conditions of social interaction among individuals, boosting learning through observation, follow-up on task execution and identification of experts in specific knowledge in the organization.

In the context of this discussion, some theoretical arguments re-emphasize the importance of analyzing the relationship between knowledge sharing and the following variables: the conditions provided by the organization (Yang and Chen, 2007; Nonaka and von Krogh, 2009); the organizational aspects that can influence the creation and maintenance of the organization's enabling contexts (Tsoukas, 2009); the interaction of individuals within a enabling context provided by the organization, considering its active and latent components (Argote and Miron-Spektor, 2011); and the conditions provided by the organization for the proliferation and legitimation of practices within the organizational context, and how individuals interact and carry out their activities under the influence of those practices (Gherardi, 2009).

The consolidation of the theoretical framework presented in this research allows us to consider that the influence of learning mechanisms, such as knowledge management actions provided by the organization, on the knowledge sharing among individuals in the organizational environment is measured by means of a predictive relationship, as described in the next section.

3. Method

In this section, we will first discuss the processes used for scale development. Subsequently, the canonical correlation analysis procedure will be discussed.

3.1 Development of scales

The methodological approach used in this research allows an approximation of the phenomenon through an empirical test of the influence of learning mechanisms (independent variable) on organizational knowledge sharing (dependent variable). The use of such a method is based on the previous definition of the instrument to be used, as well as on the intention to portray quantitatively the possible relationships between the variables.

The research was conducted online and the sample composed of individuals from civil and military organizations, so that the diversity of training of the participants and the structure of the organizations allowed variability of the context and characteristics of the

sample members, aiming to contribute to the reduction of bias in the results (Donaldson and Grant-Valone, 2002).

The four participating military organizations were chosen using accessibility criteria. Two organizations are responsible for managing the procurement process of complex defense systems. The third organization is responsible for coordinating educational actions through the administration of activities involving the continuing education schools of the organization. The fourth organization is responsible for human resources actions, in terms of assessing the need for such resources, as well as their subsequent allocation according to the specific competencies.

The group of civil organizations was composed of organizations with competencies and activities associated with social policies, in accordance with Decree No. 7,191 of May 31, 2010, such as the Ministry of Culture, Ministry of Education, Ministry of Justice, Ministry of Fisheries and Aquaculture, Ministry of Social Security, Ministry of Health, Ministry of Cities, Ministry of Agrarian Development, Ministry of Social Development and Fight Against Hunger, Ministry of Labor and Employment, Secretariat of Human Rights, Secretariat for Policies for the Promotion of Racial Equality, and Secretariat of Policies for Women.

The delimitation of the population in military organizations has included managers and directors, as well as persons who perform and comply with the regulations and guidelines established by their superiors. In relation to civil organizations, the intention was to use the same method of population selection. However, due to difficulties authorizing the application of the research instrument in all functional levels of organizations, it was decided to delimit the population to the technical analysts for social policies (ATPS[1]) in view of the possibility of accessing this population of servers. Overall, the sample consisted of 268 respondents: 207 soldiers and 61 civilians.

Achievement of the study objective indicated the need to adopt two measurement scales: a scale to measure individuals' perception of the knowledge management actions provided by the organization (learning mechanisms), and a scale that measured the knowledge sharing that occurs as a result of interaction between the individuals themselves.

In both cases, the scales were elaborated based on a systematic review of the literature on the subject, their items passing through a process of semantic and theoretical validation through the action of specialists, besides the application of a pilot test of the questionnaire with a small sample so that any semantic issues could be raised (Pasquali, 1997). All these procedures addressed in the literature have the objective of ensuring that the adaptation performed in one scale and the development of the other provide instruments with good parameters of validity and reliability (Pasquali, 1997).

In line with Isidro-Filho (2009) and Lipshitz *et al.* (2002), this research adopts the definition of learning mechanisms as "institutionalized arrangements and procedures used by the organization to collect, analyze, store, disseminate and use knowledge essential to its performance and of its members" (Isidro-Filho, 2009, p. 41).

The scale of learning mechanisms was developed based on the Organizational Learning Mechanism Scale elaborated by López *et al.* (2005) and adapted by Isidro-Filho (2009) into the Portuguese language. The decision to take the adapted scale of Isidro-Filho (2009) as a starting point was due to the fact that it was conceived according to a methodological rigor recommended by the literature, as well as the scale items having been rewritten and submitted to a new process of semantic validation. Furthermore, new items could be elaborated based on the relevant theory, this process having been carried out in this research, resulting in improved factorial loads and trustworthiness of the instrument (Isidro-Filho, 2009).

The data collected from 268 respondents were submitted to factorial analysis. Tabachnick and Fidell (2007) point out that the factor analysis technique allows us to find the underlying structure of a data matrix to determine the number and nature of its latent variables (factors), which allows better representation of the set of observed variables. Before the factorial analysis, data cleaning and treatment, analyses of missing data, sample size, normality of distributions, linearity and extreme cases were performed (Tabachnick and Fidell, 2007).

Due to the fact that multivariate outliers can impact the correlation matrix, as they decrease or amplify the magnitude associations between the variables (Hair *et al.*, 2010; Pasquali, 2005), it was decided to exclude such cases from subsequent analyses, considering that such action would not affect the rate of ten respondents per item. Thus, the adjusted sample totaled 262 respondents for the scale of learning mechanisms.

The factorial analysis was processed through analysis of the main components, together with factorial analysis of the data using the Kaiser–Meyer–Olkin index, the Bartlett sphericity test and the percentage of correlations above 0.30 (Tabachnick and Fidell, 2007).

It is worth noting that, unlike the analysis conducted by Isidro-Filho (2009) in which rotation of the orthogonal form factors (varimax) was performed, suggesting that the correlation between the factors ($r = 0$) is null, generating independent factors (Damásio, 2012), data from this research were processed using oblique rotation, allowing the factors to be correlated with one another (Schmitt and Sass, 2011). According to Schmitt and Sass (2011), this technique is better suited to research in the social sciences, given the difficulty of dealing with human behaviors in a sealed way, by fractionating them into independent subunits of each other.

As for the quality of the items obtained, according to Comrey and Lee (1992), excellent items have a load greater than 0.71, very good items have loads greater than 0.63, good items have loads greater than 0.55, reasonable items have loads greater than 0.45 and poor items have a load greater than 0.32. Regarding factor reliability, Pasquali (2005) states that Cronbach's alphas (α) above 0.70 are considered reliable, whereas values above 0.80 are very reliable.

Tables I, II and III represent the results of the factorial analysis, which consolidated the scale of the learning mechanism consisting of 22 items, distributed among internal acquisition mechanism ($\alpha = 0.924$), codification and control mechanism ($\alpha = 0.899$) and external acquisition mechanism ($\alpha = 0.726$) factors, which explained a total variance of 62.20 per cent.

With regard to the dependent variable, knowledge sharing is defined in the context of this research as the exchange of knowledge through social interactions in physical or virtual environments, or access to the organization's repositories, so that understanding of knowledge sharing occurs (Bartol and Srivastava, 2002; Hartung and Oliveira, 2013; Nonaka and Konno, 1998; Nonaka *et al.*, 2000; Szulanski, 2000; Tonet and Paz, 2006).

The knowledge sharing scale involved the elaboration of 15 items on the knowledge sharing construct, which underwent a process of semantic and theoretical revision and validation through experts' action (Pasquali, 1997). This process consisted of a systematic review of the grammatical and semantic structure of sentences, as well as their relationship with the theoretical basis. Participating in this stage were four professors, a doctorate student and Master's students, all part of the Postgraduate Program in Administration (PPGA[2]) of a federal university with recognized knowledge in the construct dealt with and in the practice of building psychological instruments.

Development of the scale on knowledge sharing was initiated through a bibliographical review that enabled the knowledge sharing to be contextualized within the knowledge

Item	Description	Factorial load	Quality	H^2
10	The organization encourages individuals to share ideas in the workplace	0.907	Excellent	0.692
11	The organization encourages teamwork	0.824	Excellent	0.674
4	The organization encourages individuals to come up with new ideas about work issues	0.814	Excellent	0.608
12	The organization encourages new ideas and approaches to work performance to be applied on a daily basis	0.803	Excellent	0.639
16	The organization informs its members about the responsibilities of other co-workers and departments	0.757	Excellent	0.643
9	The organization provides informal environments for individuals to share knowledge and experiences among co-workers	0.704	Very Good	0.502
13	The organization provides meetings to inform individuals about innovations in their activities	0.684	Very Good	0.544
14	The organization makes changes in professionals between departments and functions, allowing participation of the individual in other teams	0.612	Good	0.627
6	The organization identifies individuals within the organization with expertise in specific subjects, through catalogs or any other forms of registration	0.566	Good	0.536
15	The organization encourages the rotation of tasks among professionals in the organization	0.560	Good	0.679
17	The organization encourages the sharing of work practices among its various sectors through formal mechanisms (e.g., scheduled meetings, space in the internal network for registration of procedures, among others)	0.461	Reasonable	0.607
Reliability – Cronbach's Alpha			0.924	
Eigenvalue			9.967	
Total variance			45.305	

Note: *Internal acquisition mechanisms*: Set of actions provided by the organization that favor social interaction among individuals in the work environment, so that knowledge and experiences are shared among members of the internal organizational context
Source: Research data

Table I.
Synthesis of internal acquisition mechanisms

management system, so that it was possible to delimit the constitutive and operational definitions of the phenomenon (Pasquali, 2010).

According to Pasquali (2010), the constitutive definition in dictionaries and theories is the consolidated concept based on the constitution established in other concepts. On the other hand, the operational definition must be literally operational, that is, the variable must be defined in terms of concrete operations and physical behaviors through which it can be concretized and translated (Pasquali, 2010).

Thus, although the research does not pretend to carry out a detailed conceptual review, it is worth highlighting the concepts that support the conduct of this work, as in Table IV.

Subsequently, 15 items on knowledge sharing were elaborated, which went through the same procedure of semantic and theoretical validation and of factorial analysis as previously described for the scale of learning mechanisms.

After the factorial analysis, the knowledge sharing scale was consolidated with 12 items distributed in knowledge absorption (α = 0.883), access to knowledge (α = 0.724) and personal interactions (α = 0.753) factors, with a total explained variance of 62.60 per cent, as explained in Tables V, VI and VII.

Item	Description	Factorial load	Quality	H^2
22	The organization uses methods for locating knowledge stored in databases	0.968	Excellent	0.746
23	The organization uses methods to update the available databases	0,.957	Excellent	0.739
21	The organization defines policies for the storage of information and knowledge in databases of some type of internal network (e.g. intranet and physical repository of documents)	0.858	Excellent	0.657
18	The organization provides a database that allows the recovery of knowledge about activities and processes developed	0.723	Excellent	0.700
19	The organization establishes in which databases (physical or virtual) the specific knowledge of individuals must be stored	0.652	Very Good	0.677
20	The organization has a database of other organizations with which it maintains interaction	0.640	Very Good	0.465
24	The organization encourages lessons learned from organizational project results to be documented as a result of major successes or the reason for failures	0.533	Reasonable	0.591
8	The organization provides the internal public with the consultation of databases or the repository of documents through some type of internal network (e.g. intranet)	0.457	Reasonable	0.394
Reliability – Cronbach's alpha			0.899	
Eigenvalue			2.255	
Total variance			10.249	

Note: *Codification and control mechanisms*: Set of actions provided by the organization that favor the storage, location, access, use and management of databases and individuals' experiences in support of the activities of the organization
Source: Research data

Table II.
Synthesis of mechanisms of codification and control factors

Item	Description	Factorial load	Quality	H^2
2	The organization promotes partnerships with other organizations such as universities, private companies and NGOs	0.882	Excellent	0.458
3	The organization maintains contacts with external professionals and specialists	0.622	Good	0.400
7	The organization provides means for its members to participate in external events (e.g. congresses, fairs and symposia)	0.415	Reasonable	0.491
Reliability – Cronbach's alpha			0.726	
Eigenvalue			1.463	
Total variance			6.649	

Note: *External acquisition mechanisms*: Set of actions provided by the organization that favor the interaction of individuals with individuals and/or groups of individuals in other organizations whose activities have affinity with the organization activities that promote the action
Source: Research data

Table III.
Synthesis of the external acquisition mechanisms

The consolidation of both factorial structures allowed the establishment of the hypothetical model to be tested through the canonical correlation to be performed in the next section, according to Figure 1.

3.2 Canonical correlation analysis

Alpert and Peterson (1972) and Hair *et al.* (2010) classify canonical correlation as a regression-derived technique whose main objective is to quantify the intensity of the relationship between the vectors formed by the group of independent variables and the group of dependent variables, providing a linear combination associated with each group of variables that potentiates the correlation between the two groups of variables (Hair *et al.*, 2010; Tabachnick and Fidell, 2007).

Therefore, the option to use canonical correlation was shown to be the most appropriate analysis technique considering the scale of mechanisms of learning and knowledge sharing in three factors – three independent variables and three dependent variables, respectively.

Constitutive definition	Exchange of knowledge through social interactions in physical or virtual environments, or access to the organization's repositories, so that an understanding of knowledge sharing occurs Authors: Bartol and Srivastava (2002); Hartung and Oliveira (2013); Nonaka and Konno (1998); Nonaka *et al.* (2000); Probst *et al.* (2002); Szulanski (2000); Tonet and Paz (2006)
Operational definition	The individual has access to people who have knowledge The individual shares knowledge with others in the organization through activities fostered by the organization The knowledge receiver is capable of explaining, schematizing, using and reproducing shared knowledge for the benefit of the organization

Source: Prepared by the author

Table IV.
Constitutive and operational definitions of knowledge sharing

Item	Description	Factorial load	Quality	H^2
2	I assimilate knowledge through observation, imitation, or practices of co-workers	0.799	Excellent	0.511
3	During daily activities, I expose my knowledge through analogies and examples	0.782	Excellent	0.579
8	I use the knowledge derived from conversations with my colleagues in the organization to solve problems at work	0.770	Excellent	0.696
1	I develop new ideas and concepts through dialogues with co-workers	0.731	Excellent	0.595
9	I share knowledge related to the activities I do in work meetings	0.730	Excellent	0.568
7	Conversation with other colleagues on issues related to working in casual encounters (e.g. coffee breaks and organization gatherings)	0.617	Good	0.536
Reliability – Cronbach's alpha			0.883	
Eigenvalue			6.583	
Total variance			47.022	

Note: *Knowledge absorption*: The knowledge made available by an individual can be explained, schematized and reused by the recipient in support of his/her activities in the organization
Source: Research data

Table V.
Synthesis of the knowledge absorption factor

Item	Description	Factorial load	Quality	H^2
6	I develop my activities in the team organization	0.785	Excellent	0.548
5	I use the knowledge stored in the organization's physical and virtual databases	0.614	Good	0.371
5	I use the knowledge gained in internal activities (e.g. internal training actions and work meetings) to achieve organizational objectives	0.570	Good	0.570
Reliability – Cronbach's alpha			0.724	
Eigenvalue			1.193	
Total variance			8.519	

Note: *Access to knowledge*: The individual shares knowledge with other people in the organization through formal activities fostered by the organization
Source: Research data

Table VI.
Synthesis of the access to knowledge factor

Item	Description	Factorial load	Quality	H^2
2	I participate in groups or networks of people, external to the organization, who have an affinity with my professional activity	0.769	Excellent	0.440
1	I maintain interaction with groups or networks of people in the organization	0.634	Very Good	0.426
3	I maintain contact with specialists in the organization with recognized knowledge in specific subjects	0.528	Reasonable	0.527
Reliability – Cronbach's alpha			0.753	
Eigenvalue			0.984	
Total variance			7.029	

Notes: *Personal interactions*: The individual has access to knowledge through interactions with people and/or groups of individuals with knowledge related to their professional activity
Source: Research data

Table VII.
Synthesis of the personal interactions factor

However, the canonical correlation is preceded by fulfillment of some criteria regarding sample size, the theoretical connection between variables, lost data and outliers, as well as aspects of linearity, multicollinearity and normality (Hair *et al.*, 2010). Considering that all these criteria had already been analyzed during the factorial analysis, the Wilks significance test was carried out to verify the collective significance of the canonical functions. Subsequently, the actual canonical correlation was performed.

Considering that the dependent variables show a high level of correlation (above 0.50) (Hair *et al.*, 2010), an analysis of variance (ANOVA) was performed in the group of dependent variables with the aim of capturing the dimensions underlying this group of variables, providing a more accurate analysis of the measurement performed based on social and psychological constructs (Field, 2009; Lambert and Durand, 1975).

Subsequently, the results of the canonical functions were interpreted according to the following criteria:

- the canonical correlation coefficient (*Rc*), which represents the relationship between the two groups of variables, measuring the existing correlation;

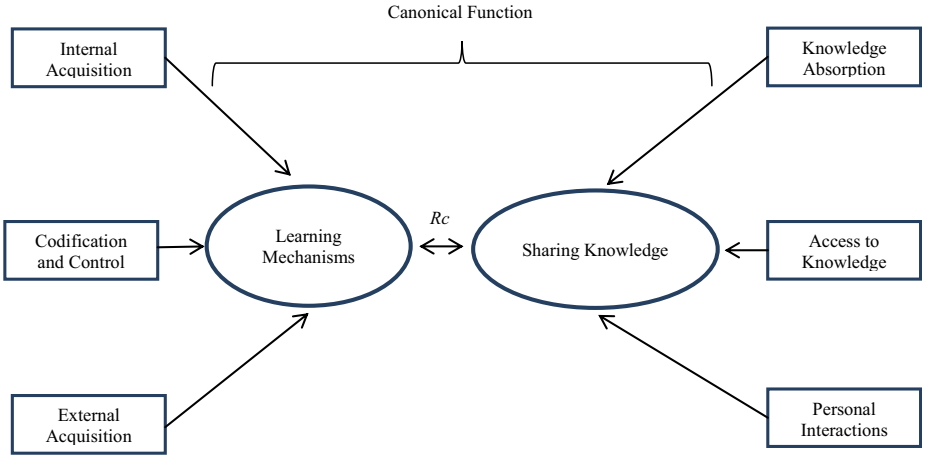

Figure 1.
Scheme of canonical correlation between the learning mechanisms and knowledge sharing variables

Source: Prepared by the author

- the amount of variance shared between the two groups of canonical variables (Rc^2);
- standardized canonical correlation coefficients (canonical weights), by examining the signal and magnitude of each variable associated with the respective canonical group, in which variables with a higher weight contribute more significantly than those with lower weight;
- the correlation structure (canonical charges), which reflects the variance that the observed variable shares with the canonical variable, and which can be interpreted as a load factor in the relative contribution of each variable in each canonical function; and
- the redundancy index, which can be considered as an estimate of R^2 resulting from a regression had the option been chosen for the isolated regression of each dependent variable as a function of all the independent variables, being, therefore, an estimate of the average of each R^2 found (Alpert and Peterson, 1972; Dillon and Goldstein, 1984; Hair *et al.*, 2010; Lambert and Durand, 1975).

With the objective of operationalizing canonical correlation analysis, the syntax of Syntax used in SPSS was used in a similar way to Fávero (2005) in the SPSS statistical software.

```
Syntax used in SPSS
MANOVA ABSORPTION OF KNOWLEDGE ACCESS TO KNOWLEDGE PERSONAL
INTERACTIONS with INTERNAL ACQUISITION MECHANISM CODIFICATION
MECHANISMS EXTERNAL AND EXTERNAL ACQUISITION MECHANISM CONTROL
/print-error (SSCP COV COR) signif With the objective of operational-
izing canonical correlation analysis, the syntax of Figure 2 was used
in a similar way to Fávero (2005) in the SPSS statistical software
(hypoth eigen dimenr)
/discrim = raw stan estim cor alpha (1.0)
/residuals = casewise plot
/design
Source: Research data
```

4. Canonical correlation data analysis

The data in Table VIII attest to the collective significance of the set of canonical functions generated based on the multivariate significance test.

Table IX presents the canonical roots of each function, at the same time as the relevance of each is verified. Considering that canonical roots are the squares of each of the canonical correlations (Hair *et al.*, 2010), the equations present results that attest to the low significance of each of the correlations.

Based on the data in Table IX, it can be seen that the first canonical function is generated to obtain the maximum correlation between the two groups of variables (Lambert and Durand, 1975; Tabachnick and Fidell, 2007). The successive pairs of canonical statistical variables are based on the existing residual variance with orthogonal characteristics and independent of the other existing variables (Tabachnick and Fidell, 2007). That is, the first canonical function represents the maximum variance in the set of variables (Alpert and Peterson, 1972; Hair *et al.*, 2010).

However, Field (2009) stresses the importance of this type of multivariate correlation being followed by a univariate ANOVA analysis in the group of dependent variables, with the objective that the canonical function to be established is better represented, in view of the occurrence of a high correlation between the dependent variables.

The univariate analysis ANOVA ratified the multivariate statistical significance of the analysis (Table X); however, it pointed to the constitution of only one canonical function for the relationship between the variables (Table XI).

Test	Value	Approx. F	Error DF	Sig. F
Pillais	0.07877	2.06727	690.00	0.030
Hotellings	0.08512	2.14369	680.00	0.024
Wilks	0.92140	2.10960	555.04	0.027
Roys	0.7655			

Source: Research data

Table VIII. Multivariate test of significance for canonical functions

Root	Eigenvalue	Canonical correlation	Square correlation
1	0.08289	0.277	0.077
2	0.00177	0.042	0.002
3	0.00045	0.021	0.0004

Source: Research data

Table IX. Canonical correlations and eigenvalues of canonical functions

Test	Value	Exact. F	Error DF	Sig. F
Pillais	0.54476	90.94480	228.00	0.000
Hotellings	1.19664	90.94480	228.00	0.000
Wilks	0.45524	90.94480	228.00	0.000
Roys	0.54476			

Source: Research data

Table X. Multivariate test of significance for canonical functions

The canonical function of Table XI indicates that the strength of the association between the group of dependent and independent variables (*Rc*) is reasonable (0.738), while the shared variance (Rc^2) between the group of variable learning mechanisms (independent variable) and knowledge sharing (dependent variable) is 0.545.

Regarding the dependent variables, the standardized coefficients are represented by the canonical weights of the first canonical function, similar to the standardized coefficients obtained in a regression analysis.

The data in Table XII indicate that the hierarchy of the canonical weights of the dependent variables for the first function consists of the following sequence: absorption of knowledge, access to knowledge and personal interactions. These results suggest the greater weight of knowledge sharing among individuals through actions of absorption of knowledge compared to other forms of sharing.

In relation to the independent variables, Table XIII presents the hierarchy of influence of the variables based on their respective weights, indicating the sequence composed by coding and control mechanisms, external acquisition mechanisms and internal acquisition mechanisms.

In relation to the canonical weights described in Tables XII and XIII, Hair *et al.* (2010) point out that variables with larger weights contribute more to the group of variables, being able to maximize the canonical correlations.

All canonical weights in Tables XII and XIII show a negative sign, indicating an inverse relationship between each variable and the group of canonical variables to which it belongs. For example, a possible increase in the capacity to absorb knowledge would imply a decrease in knowledge sharing.

Table XI.
Canonical correlations and eigenvalues of the canonical function

Root	Eigenvalue	Canonical correlation	Square correlation
1	1.19664	0.738	0.545

Source: Research data

Table XII.
Standardized canonical weights of the dependent variables for the first canonical function

Variable	Function 1
Absorption of knowledge	−0.860
Access to knowledge	−0.143
Personal interactions	−0.070

Source: Research data

Table XIII.
Standardized canonical weights of the independent variables for the first canonical function

Variable	Function 1
Internal acquisition mechanisms	−0.108
Codification and control Mechanisms	−0.634
External acquisition mechanisms	−0.415

Source: Research data

Analysis of these data contradicts the theoretical precepts dealt with in this research, and at the same time ratifies the considerations of Alpert and Peterson (1972), Hair *et al.* (2010) and Lambert and Durand (1975), in which the difficulties of supporting analysis in only such indices are discussed, considering the instability characteristic from one sample to another, it being necessary to analyze the canonical correlations of each variable within its group of variables, as will be done next.

Table XIV presents the correlations between the dependent variables and the group of knowledge sharing canonical variables, making it possible to measure the variance shared by such variables in the first canonical function, by means of the following operation:

$$[(-0.990)^2 + (-0.719)^2 + (-0.662)^2]/3 = 0.645$$

As shown in Table XIV, there is a high correlation between the dependent variables and the particular group of variables, especially the knowledge absorption variable. These results suggest that all variables are good for the delimited group of dependent variables, accounting for 64.50 per cent of the explained variance of the group of dependent variables.

Analogously, Table XV shows the correlations between the independent variables and the canonical variables in the first canonical function. The following operation explicitly explains the shared variance of the independent variables in the first canonical function:

$$[(-0.789)^2 + (-0.918)^2 + (-0.803)^2]/3 = 0.703$$

In relation to the correlations in Table XV, it can be seen that all the variables were presented as well independent, considering the high correlations found for the first canonical function, which explained 70.30 per cent of the shared variance in that canonical group.

Briefly, the correlations shown in Tables XIV and XV represent the measurement of the simple linear correlation between an original observed variable in the dependent or independent set and the canonical statistical variable of the set, and can be analyzed as a

Table XIV.
Correlations between dependent variables and the group of knowledge sharing canonical variables: first function

Variable	Function 1
Absorption of knowledge	−0.990
Access to knowledge	−0.719
Personal interactions	−0.662

Source: Research data

Table XV.
Correlations between independent variables and the group of learning mechanisms canonical variables: first function

Variable	Function 1
Internal acquisition mechanisms	−0.789
Codification and control Mechanisms	−0.918
External acquisition mechanisms	−0.803

Source: Research data

factorial load in the evaluation of the relative contribution of each variable observed in each canonical function (Alpert and Peterson, 1972; Hair *et al.*, 2010; Lambert and Durand, 1975).

Thus, when the data on canonical weights (Tables XII and XIII) and the correlations between the variables (Tables XIV and XV) were compared, it was found that not all variables had a high canonical weight, but all variables demonstrated a high correlation with their respective canonical group, proving to be good variables to explain the constructs assumed in the research (Hair *et al.*, 2010).

Finally, the shared variance between the two groups of canonical variables (Rc^2) is related to the proportion of the variance explained by the canonical set itself (shared variance). In this operation, we obtain the redundancy index, which consists of the proportion of the variance of each set that is explained by the opposite canonical set, according to Table XIV (Stewart and Love, 1968). In other words, the redundancy index can be considered as an estimate of R^2, if the option had been made for the isolated regression of each dependent variable in function of all the independent variables, being, therefore, an estimate of the average of each R^2 found (Tabachnick and Fidell, 2007; Hair *et al.*, 2010).

Alpert and Peterson (1972) and Lambert and Durand (1975) affirm the importance of the forces of canonical correlations being higher than 0.30 when estimating and selecting canonical functions. The data in Tables XIV and XV show that the intensities of all correlations were higher than 0.30, confirming the possibility of calculating the redundancy indices for both groups of variables, according to Table XVI.

According to data from Table XVI, it is important to note that the calculation of the redundancy index is performed for both dependent and independent statistical variables, although there is greater concern with the variance extracted from the set of dependent variables, which provide a measure prediction of canonical relations (Alpert and Peterson, 1972; Lambert and Durand, 1975; Stewart and Love, 1968).

The data found in the canonical correlation point out that the independent variables (learning mechanisms) make up a significant group in the adopted canonical correlation model, adequately explaining a proportion of the variance of the group of dependent variables (R^2 = 0.352), being therefore, related to the group of dependent variables (knowledge sharing), and should be contemplated in eventual knowledge management practices in the researched organizations.

This result is in line with the reflections of Hamel (2009) and Tseng (2010) inasmuch as the establishment of processes and mechanisms of learning, whose objectives are to maximize the efficiency of the interaction of individuals, is not able to predict the phenomenon in its total, 64.80 per cent of the variance of the knowledge sharing construct being explained by other variables.

In a final analysis, the amount of variance explained (R^2 = 0.352) by the set of predictor variables (learning mechanisms) helps to elucidate and make more tangible the discussions and affirmations brought by authors such as Isidro-Filho (2009), López *et al.* (2005) and Pokharel and Choi (2015), which confirm the importance of the influence of the top management of the organization on knowledge sharing among individuals.

Table XVI.
Calculation of redundancy index

Set of variables	Average shared variance	Square Corr. (Rc^2)	Redundancy index
Dependent	0.645	0.545	0.352
Independent	0.703		0.383

Source: Research data

Although the context and characteristics of the studied sample were considered, the magnitude of the correlation (Rc = 0.738) between learning and knowledge sharing mechanisms, and the predictive force of the independent variable over the dependent variable (R^2 = 0.352), deepens and details the influence and power that the conditions provided by the top management have over the individual ability to share knowledge, and over the very intensity of the phenomenon.

The analysis carried out looks to approach the phenomenon under another methodological lens in addition to those already used in previous studies (Faoro and Oliveira, 2014; Hartung and Oliveira, 2013; Lipshitz *et al.*, 2002; Szulanski, 2000; Tonet and Paz, 2006; Xavier *et al.*, 2012), showing that discussion about the importance of the mechanisms of knowledge management used by top management has its importance and influence in the occurrence of the phenomenon, in that understanding of the nuances that involve the process of knowledge sharing permeates the identification and recognition of the importance of several other possible variables, such as the cultural aspects of the organization, the admitted organizational structure, the affection between individuals and the people's commitment to the causes of the organization, among others (Lipshitz *et al.*, 2002; López *et al.*, 2005).

5. Limitations and search schedule

The main limitation of this research concerns the composition of the sample. Even if we have sought diversity in the environment of the Federal Direct Administration, a greater participation of military servants may have influenced to some degree the inference of the results obtained. Had more civil servants from the ministries been able to participate, more generalizable results could have been obtained, covering individuals from different hierarchical levels, instead of concentrating on the ATPS positions.

In relation to the research agenda, there is a possibility for future studies to be expanded in complexity through empirical research that allows the questioning of theories in their completeness. This proposition is timely, as the research results themselves indicate a certain capacity to predict the mechanisms of learning about knowledge sharing (R^2 = 0.352), but the question persists: what other variables influence the phenomenon of knowledge sharing?

Based on this question, a number of possible researches are suggested beyond the cognitive way the phenomenon was treated in this research. Some situations involving individual motivation for knowledge sharing still need to be better clarified. For example:

- it is possible for a given person to share knowledge only to be recognized as an expert in the subject;
- perhaps some subjects share knowledge for the sake of altruism – that is, for the simple pleasure of helping others;
- on the other hand, it is possible for a subject to help another person in anticipation of something in return, perhaps possible help in a future situation;
- in another bias, individuals may share knowledge because of the rewards system provided by the organization's people management policy; or
- people simply share knowledge because it is advocated by the organization as a norm to follow.

In other words, it is possible to carry out studies that analyze the relationship between knowledge sharing and other variables such as the characteristics of the knowledge itself, the absorptive capacity of individuals, the situational leadership in the work environment,

the relationship network's hierarchy, affection or commitment, or even the use of these variables as moderators of the relationship between learning mechanisms and knowledge sharing.

These possibilities in the treatment of the variable represent a way of widening the scope of evidence and the validity of the propositions about the relationship between knowledge sharing and other variables in the organizational environment, at the same time producing new considerations that can influence understanding and consolidation of the field.

6. Conclusion

From a clearly cognitive perspective, research has acknowledged the premise that individuals interpret and understand organizational reality according to the particularities of their cognitive system (Antonello and Godoy, 2011), and this process can be fostered by the use of learning mechanisms, which are essential knowledge management actions for the individual and organizational performance.

The results achieved in the present research satisfy the established general objective, which is to test the predictive effect of the learning mechanisms on knowledge sharing among individuals in the organizational environment, enhancing the method of analyzing the phenomenon, considering that use of canonical correlation had not been identified in the literature, as presented in this research.

Regarding the methodological aspects, it was opportune to approach the phenomenon through a little used lens in the context of administration research: the analysis of canonical correlation, which represents another look at the influence of the actions of the top management and the interaction of individuals, as argued by Amayah (2013), Isidro-Filho (2009), Lipshitz and Popper (1996) and Lipshitz *et al.* (2002). The discussions and the data analysis carried out in this research allow us to envisage significant contributions of this work to the analysis and theoretical refinement of the study of the variables treated.

In general terms, the findings of this research will allow the researched organizations to increase the knowledge management actions constituted in the three factors of the scale of learning mechanisms, mainly in relation to the actions that favor social interaction among the individuals in the work environment, making possible the exchange of knowledge and experiences in the internal organizational context, and exploring in a positive way actions related to internal acquisition.

In addition, senior management can more effectively disseminate the use of tools and means for storing, locating, accessing, using and managing databases and individuals' experiences in support of the organization's activities, as well as fostering the interaction of individuals with individuals from other organizations whose activities have an affinity with the actions developed by the organization promoting the action.

In relation to the sharing of knowledge, a high correlation of knowledge absorption and reproduction aspects with the knowledge sharing phenomenon was perceived, so that the possibility of organizations thinking in ways that provide the individual with formal and informal environments can be foreseen. The same can explain and outline the knowledge for other individuals in the organizational environment.

With respect to other organizations with activities, structures and designs different from those that were researched, it is recommended to analyze the results obtained here with some caution. The analysis indicated that learning mechanisms can predict to a certain extent knowledge sharing among individuals; therefore, it is recommended that the learning mechanisms be considered and developed by any organization. However, the importance is emphasized of the contextualization of aspects that involve knowledge sharing according to the type of link of the individuals with the organization, the cultural aspects, organizational

structure and any other features that distinguish a particular organization or group of organizations to be surveyed.

Finally, regardless of the perspective and inclination that the discussion assumes, it is expected that the theoretical discussion provided by this research contributes to advancement in understanding the process of sharing organizational knowledge beyond a technical and prescriptive character, contributing to the interests of organizations.

Notes

1. Analistas Técnicos de Políticas Sociais.
2. Programa de Pós-Graduação em Administração.

References

Alpert, M.I. and Peterson, R.A. (1972), "On the interpretation of canonical analysis", *Journal of Marketing Research*, Vol. 9 No. 2, pp. 187-192.

Amayah, A.T. (2013), "Determinants of knowledge sharing in a public sector organization", *Journal of Knowledge Management*, Vol. 17 No. 3, pp. 454-471.

Antonello, C.S. and Godoy, A.S. (2011), *Aprendizagem Organizacional No Brasil*, Bookman, Porto Alegre.

Argote, L. and Miron-Spektor, E. (2011), "Organizational learning: from experience to knowledge", *Organization Science*, Vol. 22 No. 5, pp. 1123-1137.

Bartol, K. and Srivastava, A. (2002), "Encouraging knowledge sharing: the role of organizational reward systems", *Journal of Leadership & Organizational Studies*, Vol. 9 No. 1, pp. 64-76.

Batista, F.F. (2012), *Modelo De Gestão Do Conhecimento Para a Administração Pública Brasileira: como Implementar a Gestão Do Conhecimento Para Produzir Resultados Em Benefício Do Cidadão*, Ipea, Brasília.

Boh, W.F. (2007), "Mechanisms for sharing knowledge in project-based organizations", *Information and Organization*, Vol. 17 No. 1, pp. 27-58.

Comrey, A.L. and Lee, H.B. (1992), *A First Course in Factor Analysis*, 2nd ed., Lawrence Erlbaum Associates, Hillsdale, NJ.

Damásio, B.F. (2012), "Uso da análise fatorial exploratória em psicologia", *Avaliação Psicológica*, Vol. 11 No. 2, pp. 213-228.

Dillon, W.R. and Goldstein, M. (1984), *Multivariate Analysis: Methods and Applications*, Wiley, New York, NY.

Donaldson, S.I. and Grant-Valone, E.J. (2002), "Understanding self-report in organizational behavior research", *Journal of Business and Psychology*, Vol. 17 No. 2, pp. 245-260.

Faoro, R.R. and Oliveira, M. (2014), "Compartilhamento do conhecimento intraorganizacional e interorganizacional: empresas do setor de fruticultura", *Perspectiva Em Gestão & Conhecimento*, Vol. 4 No. 1, pp. 98-18.

Fávero, L.P.L. (2005), "O mercado imobiliário residencial da região metropolitana de São Paulo: uma aplicação de modelos de comercialização hedônica de regressão e correlação canônica", Tese de Doutoramento, Universidade de São Paulo, São Paulo.

Field, A. (2009), *Discovering Statistics Using SPSS*, 3rd ed., Sage Publications, London.

Gherardi, S. (2009), "Introduction: the critical power of the 'practice lens", *Management Learning*, Vol. 40 No. 2, pp. 115-128.

Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. and Tatham, R.L. (2010), *Análise Multivariada De Dados*, 7th ed., Bookman, Porto Alegre.

Hamel, G. (2009), *Moon Shots for Management*, Harvard Business Review, Reprint R0902H, pp. 1-10.

Hartung, K. and Oliveira, M. (2013), "Communities of practice: creating and sharing knowledge", *Revista De Gestão*, Vol. 20 No. 3, pp. 407-422.

Hatch, M.J. (1997), *Organization Theory*, Oxford University Press, Oxford.

He, H., Baruch, Y. and Lin, C.P. (2014), "Modeling team knowledge sharing and team flexibility: the role of within-team competition", *Human Relations*, Vol. 67 No. 8, pp. 947-978.

Isidro-Filho, A.I. (2009), "Mecanismos de aprendizagem em organizações: desenvolvimento e validação de uma escala de medida", *Ram. Revista De Administração Mackenzie*, Vol. 10 No. 1, pp. 37-57.

Lambert, Z.V. and Durand, R.M. (1975), "Some precautions in using canonical analysis", *Journal of Marketing Research*, Vol. 12 No. 4, pp. 468-475.

Lipshitz, R. and Popper, M. (1996), "Building learning organizations: the design and implementation of organizational learning mechanism", *The Journal of Applied Behavioral Science*, Vol. 32 No. 3, pp. 292-305.

Lipshitz, R., Popper, M. and Friedman, V.J. (2002), "A multifaceted model of organizational learning", *The Journal of Applied Behavioral Science*, Vol. 38 No. 1, pp. 78-98.

López, S.P., Léon, J.M.M. and Ordás, C.J.V. (2005), "Organizational learning as a determining factor in business performance", *The Learning Organization*, Vol. 12 No. 3, pp. 227-245.

Nonaka, I. and Konno, N. (1998), "The concept of 'ba': building a foundation for knowledge creation", *California Management Review*, Vol. 40 No. 3, pp. 40-54.

Nonaka, I., Toyama, R. and Konno, N. (2000), "SECI, ba and leadership: a unified model of dynamic knowledge creation", *Long Range Planning*, Vol. 33 No. 1, pp. 5-34.

Nonaka, I. and von Krogh, G. (2009), "Tacit knowledge and knowledge conversion: controversy and advancement in organizational knowledge creation theory", *Organization Science*, Vol. 20 No. 3, pp. 635-652.

Oliveira, M., Caldeira, M. and Romão, M. (2012), "Knowledge management implementation: an evolutionary process in organizations", *Knowledge and Process Management*, Vol. 19 No. 1, pp. 17-26.

Pasquali, L. (1997), *Psicometria: Teorias e Aplicações*, Universidade de Brasília, Brasília.

Pasquali, L. (2005), *Análise Fatorial Para Pesquisadores*, LabPAM, Brasília.

Pasquali, L. (2010), *Instrumentos Psicológicos: Fundamentos e Práticas*, Artmed, Porto Alegre.

Pokharel, M.P. and Choi, S.A. (2015), "Exploring the relationships between the learning organization and organizational performance", *Management Research Review*, Vol. 38 No. 2, pp. 126-148.

Probst, G., Raub, S. and Romhardt, K. (2002), *Gestão Do Conhecimento: Os Elementos Constitutivos Do Sucesso*, Bookman, Porto Alegre.

Ragab, M.A.F. and Arisha, A. (2013), "Knowledge management and measurement: a critical review", *Journal of Knowledge Management*, Vol. 17 No. 6, pp. 873-901.

Ramayah, T., Yeap, J.A.L. and Ignatius, J. (2014), "Assessing knowledge sharing among academics: a validation of the knowledge sharing behavior scale (KSBS)", *Evaluation Review*, Vol. 38 No. 2, pp. 160-187.

Schmitt, T.A. and Sass, D.A. (2011), "Rotation criteria and hypothesis testing for exploratory factor analysis: implications for factor pattern loadings and interfactor correlations", *Educational and Psychological Measurement*, Vol. 71 No. 1, pp. 95-113.

Sirmon, D.G., Hitt, M.A. and Ireland, R.D. (2007), "Managing firm resources in dynamic environments to create value: looking inside the black box", *Academy of Management Review*, Vol. 32 No. 1, pp. 273-292.

Spender, J.C. (1996), "Making knowledge the basis of a dynamic theory of the firm", *Strategic Management Journal*, Vol. 17 No. S2, pp. 45-62.

Stewart, D.K. and Love, W.A.J. (1968), "A general canonical correlation index", *Psychological Bulletin*, Vol. 70 No. 3, Pt. 1, pp. 160-163.

Styhre, A., Ollila, S., Roth, J., Williamson, D. and Berg, L. (2008), "Heedful interrelating, knowledge sharing, and new drug development", *Journal of Knowledge Management*, Vol. 12 No. 3, pp. 127-140.

Szulanski, G. (2000), "The process of knowledge transfer: a diachronic analysis of stickiness", *Organizational Behavior and Human Decision Processes*, Vol. 82 No. 1, pp. 9-27.

Tabachnick, B.G. and Fidell, L.S. (2007), *Using Multivariate Statistics*, 5th ed., Harper & Row Collins College Publishers, New York, NY.

Tonet, H.C. and Paz, M.G.T. (2006), "Um modelo Para o compartilhamento do conhecimento no trabalho", *Revista De Administração Contemporânea*, Vol. 10 No. 2, pp. 75-94.

Tseng, S.M. (2010), "The effects of hierarchical culture on knowledge management processes", *Management Research Review*, Vol. 33 No. 8, pp. 827-839.

Tsoukas, H. (2009), "A dialogical approach to the creation of new knowledge in organizations", *Organization Science*, Vol. 20 No. 6, pp. 941-957.

Wenger, E.C., McDermott, R. and Snyder, W.C. (2002), *Cultivating Communities of Practice: A Guide to Managing Knowledge*, Harvard Business, Boston, MA.

Xavier, L.A.O.P., Oliveira, M. and Teixeira, E.K. (2012), "Teorias utilizadas nas investigações sobre gestão do conhecimento", *Iberian Journal of Information Systems and Technologies*, No. 10, pp. 1-17.

Yang, C. and Chen, L.C. (2007), "Can organizational knowledge capabilities affect knowledge sharing behavior?", *Journal of Information Science*, Vol. 33 No. 1, pp. 95-109.

Yi, J. (2009), "A measure of knowledge sharing behavior: scale development and validation", *Knowledge Management Research & Practice*, Vol. 7 No. 1, pp. 65-81.

Further reading

Hotelling, H. (1936), "Relations between two sets of variates", *Biometrika*, Vol. 28 Nos 3/4, pp. 321-377.

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