

# Knowledge Sharing: Brazilian x Portuguese Companies

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**Abstract:** Companies working in the field of information technology are considered knowledge intensive. Knowledge sharing is one of the most important processes in knowledge management and is related, for example, to increased innovation. Hence, the main aim of this research is to investigate whether country and team tenure are moderators in the relationship between knowledge sharing, absorptive capacity and innovation in information technology companies. For this purpose, this research adopted survey method in which data were collected using a questionnaire sent by e-mail with a link to the instrument. The 121 responses were divided into three groups: 43 respondents - Brazilian companies operating in Brazil; 41 respondents - Portuguese companies operating in Brazil; and 37 respondents - Portuguese companies operating in Portugal. The countries were selected because they share the same language, and because one is a member of the BRICS group of countries (Brazil, Russia, India, China and South Africa). The data were analysed using Descriptive measures, Exploratory Factor Analysis and Partial Least Squares structural equation modelling. This study confirms the relationship between knowledge sharing and innovation with partial mediation by absorptive capacity and the role of moderators in this relationship. The country of origin of the company was not confirmed as a moderator in the relationship between knowledge sharing, absorptive capacity and innovation, whether the company is located in its home country or not. However, the two countries analysed here are classified as collectivist. Team tenure was identified as a moderator in the relationship (knowledge sharing, absorptive capacity and innovation), in this case, teams with members with up to 12 months on the same team display greater relational intensity. This may occur because when working together for longer, the group's knowledge may become homogeneous, leading to reduced sharing. The results of this paper will be of use to both corporate managers and scholars.

**Keywords:** knowledge sharing, innovation, absorptive capacity, Brazil, Portugal

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## 1. Introduction

Knowledge management is a set of processes for creating, sharing and using knowledge in order to achieve the company's goals (Lee and Yang, 2000). Knowledge sharing (KS) is one of the core processes in knowledge management (Yu, 2010; Guinea et al., 2012; Zhang et al., 2014), since it has an important role in generating ideas (Grant, 1996). Knowledge sharing behaviour is defined as "the degree to which employees share their acquired knowledge with their colleagues" (Teh and Yong 2011, p.11).

The benefits associated with KS are the quality of customer service and reduced product cycle (Xue et al., 2011; Ma et al., 2008), innovation (Liao et al., 2007; Lin, 2007), among others. Innovation (IN) is important for companies because it is considered essential for achieving sustainable competitive advantage (Knudsen and Roman, 2004; Liao et al., 2007). Lin (2007) noted the relationship between KS behaviour and innovation with data collected in Taiwan. Liao et al. (2007) found that the relationship between the constructs (KS and IN) is mediated by absorptive capacity (AC), also with data collected in Taiwan. Lin (2007) suggests that future research should investigate the influence of the country on the relationship between KS and IN. The role of country as a moderator in the relationship between motivation and KS behaviour has been identified (Chow et al., 1999), that is, it has been tested in relation to KS antecedents, but not in relation to the results.

Companies in the information technology (IT) sector, irrespective of the country of origin, usually organize their employees into teams (Lu et al., 2011), which are "a set of two or more individuals that adaptively and dynamically interacts through the specified roles as they work toward shared and valued goals" (Salas et al., 2009, p. 40). Bakker et al. (2006) found that team tenure has a positive influence on KS behaviour. However, the role of team tenure as a moderator in the relationship between KS, IN and AC has not been tested.

The main aim of this research is to investigate whether country and team tenure are moderators in the relationship between knowledge sharing, absorptive capacity and innovation in information technology

companies. It is hoped the results of this research help managers to identify the best team compositions to achieve innovation, and help scholars to test the relationship between KS, IN, AC in two countries (Brazil and Portugal) that have been largely unexplored regarding this topic and using two moderators with this research model.

The remainder of this paper is structured as follows: in section 2, the literature on KS, AC and IN is presented; in section 3, the methodological procedure adopted in this research is described; in section 4 the data are analysed and the results discussed; and section 5 shows the research conclusions, limitations and ideas for future research.

## **2. Moderators and the relationship between KS, AC and IN**

The main purpose of KS is to facilitate the flow of knowledge between people (Chen et al., 2012). New knowledge is created from the dissemination of knowledge (Nonaka, 1994), thus facilitating innovation (Krizman, 2009; Majchrzak et al., 2004). However, the use given to the shared knowledge depends on the ability of the receiver to recognize the value of the knowledge. Thus, for some authors the relationship between KS and IN is mediated by absorptive capacity (Roberts et al., 2012; Liao et al., 2007). Absorptive capacity corresponds to the ability to recognize value in knowledge as well as absorb and use knowledge (Cohen and Levinthal, 1990), “the ability to acquire, assimilate, transform and utilize knowledge” (Pavlou and Sawy, 2006, p. 208). Given this lack of consensus regarding whether KS directly influences IN or whether AC mediates that influence, the following hypotheses are presented: H1 - knowledge sharing directly influences innovation; H2 - knowledge sharing influences the absorptive capacity; H3 - absorptive capacity influences innovation.

The relationship between KS and IN, whether mediated or not by AC has been found based on data from countries such as Taiwan (Lin, 2007), USA (Majchrzak et al., 2004) and Slovenia (Krizman, 2009), among others. Each of these studies considered data from only one country. Siau et al. (2010) found that national culture has an influence on KS in the context of virtual communities. Witherspoon et al. (2013) identified country as a moderator in the analysis of antecedents (communication, social trust, social network, etc.) and KS behaviour. According to the authors, KS is easier in those countries considered to have a collectivist culture (e.g. Japan) rather than in individualist countries (e.g. Canada).

The dichotomy collectivism/individualism is one of the five dimensions proposed by Hofstede (2001) to compose culture, and is the most widely used criterion in research with different cultures (Ardichvili et al., 2006). Individualism refers to the degree to which a person prefers to act as an individual, prioritizing their personal goals in relation to the objectives of the group. By contrast, collectivism is the degree to which a person prefers to act as a member of a group and not as an individual, prioritizing group goals (Siau et al., 2010; Ardichvili et al., 2006). According to Hofstede (2001), China and USA are at the extremes of the individualism-collectivism continuum.

In collectivist countries, people prefer to share knowledge with the people they know, as one of the characteristics of such a culture is that people cultivate relationships (Siau et al., 2010). This encourages KS in teams. Whereas, countries classified as individualist do not have this feature because they do not form closed groups. Greeve et al. (2009, p. 25) proposed that “the lower the level of individualism, the more likely is the organisation to adopt a high level of absorptive capacity”. Thus, in countries classified as collectivist, country should not be a moderator in the relationship between KS, AC and IN, and, thus, the following hypothesis is proposed: H4 - country is not a moderator in the relationship between knowledge sharing, innovation and absorptive capacity in countries classified as collectivist.

Companies are increasingly adopting team-based work structures (He et al., 2007). Knowledge sharing in information systems development teams is important for the success of a project (Lu et al., 2011). The individuals who work in teams exchange knowledge in their activities, and this acquired knowledge may be used in the future (Faraj and Sproull, 2000; Balijepally et al., 2006). New knowledge that emerges from the interaction among the team members is the most relevant to IT projects (He et al., 2007).

According to Bakker et al. (2006), when working together for longer periods, team members get to know each other better and so know where to find the knowledge they need. These authors found that team tenure

positively influences KS in new product development teams. Thus, the following hypothesis is presented: H5 - team tenure is a moderator in the relationship between knowledge sharing, absorptive capacity and innovation.

### 3. Method

This is a quantitative research based on a cross-sectional survey. Structural Equation Modelling (SEM) was used to specify and estimate models of linear relationships between KS behaviour, AC and IN, considering country and team tenure as moderator.

The final instrument has two sections: 1) items designed to measure the constructs, for which a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) was used; 2) questions designed to characterize the respondents - gender (male, female), individual age (years), education (university degree incomplete, university degree complete, post-graduate degree completed), work experience (year), team tenure (months). The three constructs included in this research were operationalized with scales published in earlier studies. This research adapted the measurement items for KS behaviour from Xue et al. (2011), and for IN and AC from Yoo et al. (2011).

The questionnaire was refined using reverse translation (English-Portuguese-English), content validation (interviews with experts) and face validity (the instrument was applied to potential respondents). Table 1 presents the final version of the items used in this research.

**Table 1:** Questionnaire items

Construct	Questionnaire Items	Adapted from
Knowledge sharing behaviour (KS)	KS1. I often participate in knowledge sharing activities in my team. KS2. I usually spend a lot of time conducting knowledge sharing activities in my team. KS3. I usually share my knowledge with the other members of my team.	Xue et al. (2011)
Innovation (IN)	IN1. My team creates new and useful systems, processes, products or services. IN2. My team produces useful new systems, processes, products or services. IN3. My team successfully implements systems, processes, products or services.	Yoo et al. (2011)
Absorptive Capacity (AC)	AC1. The members of my team have the ability to use existing knowledge. AC2. The members of my team have the ability to recognize the value of new knowledge. AC3. The members of my team have the ability to combine their knowledge with the specialties of others. AC4. The members of my team have the ability to integrate various opinions from the team members.	Yoo et al. (2011)

In general, studies compare individualistic countries with collectivist countries, for example, Li (2009) who used data from China and the USA. The present study compares data from Brazil and Portugal, two countries that can be classified as collectivist (Hofstede, 2001). This allows one to check whether countries considered similar in terms of the dimension individualism/collectivism behaviour similarly with regard the relationship between the constructs KS, AC and IN. In addition to being classified as collectivists, the countries selected herein share the same language, thus limiting the effect of this indicator of cultural difference on the results. Hofstede (2001) considers language an important indicator of cultural differences. One of the countries studied here is a member of the BRICS (Brazil, Russia, India, China and South Africa), which reinforces the importance of investigating IT companies.

Respondents received an e-mail message containing an invitation to participate in the study. The instrument was made available through the Qualtrics®. The 121 responses were divided into three groups: 43 respondents - Brazilian companies operating in Brazil; 41 respondents - Portuguese companies operating in Brazil; and 37 respondents - Portuguese companies operating in Portugal. The respondents in this survey were employees who work in information technology teams. The respondents' profiles are shown in Table 2.

**Table 2:** The profile of respondents

Measure	Brazilian firms operating in Brazil Frequency (%)	Portuguese firms operating in Brazil Frequency (%)	Portuguese firms operating in Portugal Frequency (%)
Gender			
Male	36 (83.7 %)	31 (75.6 %)	27 (73.0 %)
Female	7 (16.3 %)	10 (24.4 %)	10 (27.0 %)
Age (years)			
Minimum	22	20	21
Maximum	56	60	54
Mean	31.5	33.6	32.8
Education			
University degree incomplete	12 (27.9 %)	11 (26.8 %)	4 (10.8 %)
University degree complete	16 (37.2 %)	15 (36.6 %)	19 (51.4 %)
Post-graduate degree complete	15 (34.9 %)	15 (36.6 %)	14 (37.8 %)
Work Experience (years)			
Up to 10 years	24	18	22
More than 10 years	19	23	15
Mean	11.8	13.2	9.4
Team tenure (months)			
Up to 12 months	21	12	20
More than 12 months	22	29	17
Mean	26.6	30.6	16.2

#### 4. Data analysis and discussion

The data were analysed using descriptive measures and exploratory factor analysis (section 4.1) and partial least squares structural equation modelling (section 4.2). The data were analysed with the aid of SPSS 17.0<sup>®</sup> and SmartPLS 2.0<sup>®</sup>.

##### 4.1 Descriptive measures and exploratory factor analysis

The means and standard deviations of the variables can be found in Table 3. The means values found for the variables of the construct KS behaviour indicate the existence of sharing. However, the means obtained for KS1 (I Often participate in knowledge sharing activities in my team) and KS2 (I usually spend a lot of time conducting knowledge sharing activities in my team) show that the respondents participate in KS activities more than they conduct such activities. This result is consistent with the research from Liu and Phillips (2011) and Seba et al. (2013), which shows the need for leaders to leverage KS. The averages for the variables in the AC and IN constructs are similar, indicating the existence of absorptive capacity and innovation.

**Table 3:** Means, standard deviations and factor loadings

Constructs	Variables	Mean	Standard deviation	Factor loading
KS	KS1	5.37	1.37	0.822
	KS2	4.26	1.58	0.865
	KS3	5.71	1.39	0.737
AC	AC1	5.92	1.10	0.832
	AC2	5.74	1.26	0.915
	AC3	5.55	1.28	0.833
	AC4	5.45	1.32	0.839
IN	IN1	5.24	1.48	0.834
	IN2	5.35	1.37	0.860
	IN3	5.55	1.24	0.818
	IN4	5.12	1.53	0.820

The exploratory factor analysis used the Principal Component Analysis (PCA) in association with the varimax rotation method (Hair et al., 2005) and found: 1) the factor loading of each item was greater than the recommended 0.70; 2) the variance explained by the factors found in the analysis corresponds to 79% of the variance of the instrument, which is above the recommended value of 60%. The data show no multicollinearity, whereas the variance inflation factor (VIF) for the variables is less than 5.0 as recommended by Hair et al. (2005).

## 4.2 Structural equation modelling

The Cronbach's Alpha of the model constructs ranges from 0.7866 to 0.9302, which exceeded 0.7 in each construct as recommended by Hair et al. (2005). The Composite Reliability (CR) was over 0.8 for the three constructs, indicating the reliability of the scales, as recommended by Koufteros (1999). Convergent validity was tested using the Average Variance Expected (AVE), which, as recommended by Bagozzi and Yi (1988), exceeded 0.5 in each construct. Table 4 presents the CR, AVE and the Cronbach's Alpha.

**Table 4:** CR, AVE and Cronbach's Alpha

Construct	CR	AVE	Cronbach's Alpha
Knowledge sharing	0.8736	0.6980	0.7866
Absorptive Capacity	0.9501	0.8265	0.9302
Innovation	0.9381	0.7915	0.9117

Discriminant validity was assessed via: 1) the cross loadings criterion - the loading of each variable is expected to be greater than all of its cross loadings (Hair et al, 2014); 2) AVE – the square root of the AVE is greater than the correlations between the constructs (Hair et al., 2014; Bock et al., 2005). The cross loading criterion was observed as shown in Table 5.

**Table 5:** Cross loadings

Variables	Knowledge sharing	Absorptive capacity	Innovation
KS1	<i>0.772184</i>	0.221132	0.293544
KS2	<i>0.880431</i>	0.277723	0.377880
KS3	<i>0.850082</i>	0.415751	0.363495
AC1	0.319531	<i>0.870950</i>	0.520714
AC2	0.298308	<i>0.897286</i>	0.414285
AC3	0.360331	<i>0.933610</i>	0.596002
AC4	0.384301	<i>0.933036</i>	0.580015
IN1	0.453288	0.521511	<i>0.906915</i>
IN2	0.417036	0.517823	<i>0.927190</i>
IN3	0.301949	0.585612	<i>0.893309</i>
IN4	0.302042	0.464480	<i>0.828144</i>

The AVE criterion was checked as shown in Table 6. These results suggest that the model demonstrates discriminant validity.

**Table 6:** AVE and correlation

Construct	Knowledge sharing	Absorptive Capacity	Innovation
Knowledge sharing	<b>0.8355</b>		
Absorptive Capacity	0.3782**	<b>0.9091</b>	
Innovation	0.4166**	0.5889**	<b>0.8897</b>

Square root of AVE reported along diagonal in bold type.

\*\* Significant at the 0.01 level.

This paper tested for the mediating effects of the proposed model as shown in Table 7, following the procedure suggested by Baron and Kenny (1986) and Cheng (2011). The Sobel test and the Aroian test were also performed to check for any mediation (Baron and Kenny, 1986): Sobel test = 3.152, p value = 0.0016, Aroian test = 3.119, p value= 0.0018. The three tests confirm the influence of KS on IN is partially mediated by AC.

**Table 7:** Mediating effect test results

IC	M	DC	IC→DC	IC→M	IC+M→DC		Mediating
					IC→DC	M→DC	
KS	AC	IN	0.424***	0.418***	0.226**	0.503***	Partial

IC = independent construct; M = mediator; DC = dependent construct

\* p<0.05; \*\* p<0.01; \*\*\* p<0.001

Figure 1 presents the structural model with the coefficients for each path. Knowledge sharing has as significant positive effect on absorptive capacity (path coefficient = 0.378,  $p < 0.01$ ), and absorptive capacity has a significant positive effect on innovation (path coefficient = 0.503,  $p < 0.001$ ), supporting H2 and H3. Knowledge sharing also has a significant positive effect on innovation (path coefficient = 0.226,  $p < 0.05$ ) supporting H3. Knowledge sharing and absorptive capacity explains 39% of the variance in innovation, and 14% of the variance in absorptive capacity is explained by knowledge sharing.

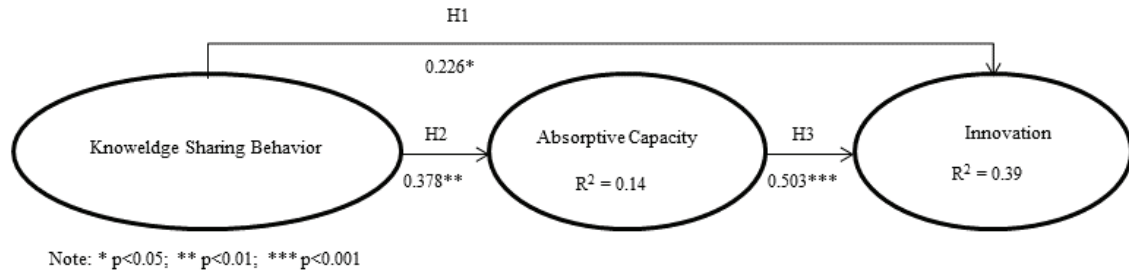


Figure 1: Results of the PLS analysis

Table 8 presents parameter estimates and t-values for the hypothesized relationships. All the hypothesized paths are statistically significant.

Table 8: PLS structural model results

Hypotheses	Paths	Estimates (t-value)	Result
H1	Knowledge sharing → Innovation	0.226* (2.6347)	Supported
H2	Knowledge sharing → Absorptive Capacity	0.378** (3.5486)	Supported
H3	Absorptive Capacity → Innovation	0.503*** (6.0520)	Supported

\*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$

The moderating effect of the two variables (country and team tenure) was tested. Tables 9 and 10 show the results for the groups associated with the potential moderators ‘country’ and ‘team tenure’, respectively.

Table 9: Country as a moderator

	Portuguese firms operating in Portugal Group 1	Portuguese firms operating in Brazil Group 2	Brazilian firms operating in Brazil Group 3
Sample size	37	41	43
Regression weight	0.3906	0.4435	0.3699
Standard error	0.0285	0.0498	0.0534
t statistics (Group 1-2)	0.908		
p value (Group 1-2)	0.367 (not significant)		
t statistics (Group 2-3)		1.018	
p value (Group 2-3)		0.312 (not significant)	
t statistics (Group 1-3)			0.331
p value (Group 1-3)			0.742 (not significant)

The country of origin of the company was not confirmed as a moderator in the relationship between knowledge sharing, absorptive capacity and innovation, whether the company is located in its home country or not. Previous studies have suggested that such influence is greater in collectivist than in individualist countries. However, the two countries analysed here are classified as collectivist.

Table 10: Team tenure as a moderator

	Team tenure to 12 months	Team tenure more than 12 months
Sample size	53	68
Regression weight	0.6122	0.2445
Standard error	0.0336	0.0434
t statistics	6.453	
p value	0.000 (significance difference)	

The result obtained in this study in relation to team tenure diverges, in part, from that obtained by Bakker et al. (2006). In the present study, the relationship between KS, IN and AC was only significant in relation to team tenure of up to 12 months, while Bakker et al. (2006) found the longer the team tenure, the greater KS.

Team tenure was identified as a moderator in the relationship between KS, AC and IN, in this case, members with up to 12 months on the same team display greater relational intensity (Figure 2). This may occur because by working together over time, the group's knowledge may become homogeneous, leading to reduced sharing. This result is consistent with March (1991), who suggested that the contribution to knowledge came from newcomers that altered the common knowledge in a constructive manner.

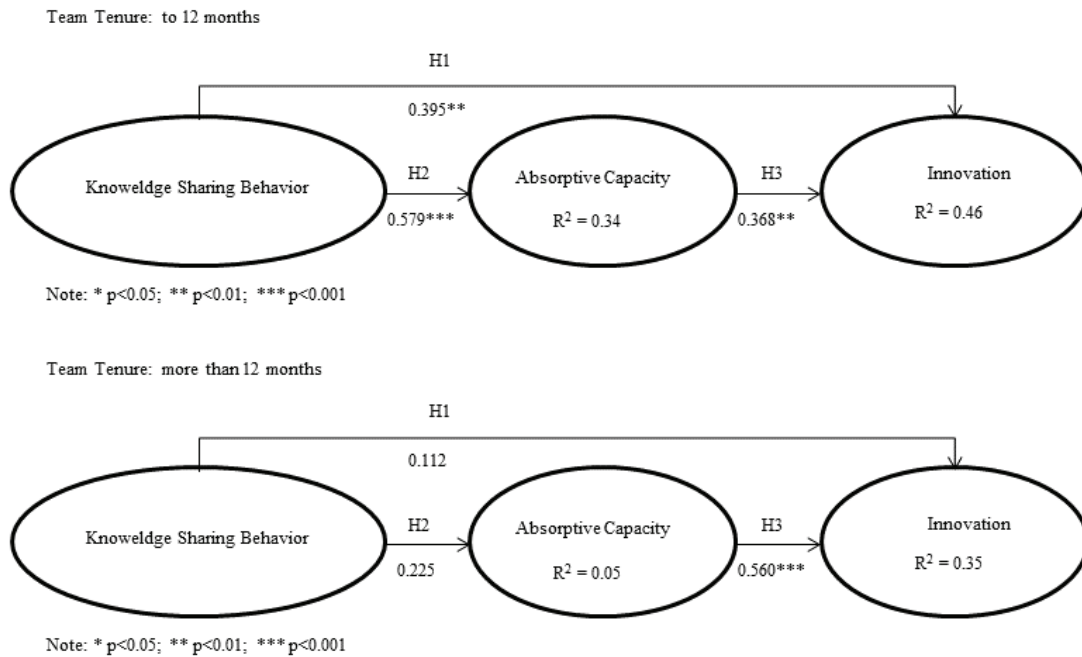


Figure 2: Results of PLS analysis

## 5. Conclusion

This study used empirical data to investigate the direct and AC-mediated relationship between KS and IN as well as country and team tenure as moderators of that relationship. All the hypotheses were confirmed. The main academic contributions of this research are:

- It tests the relationship between KS and IN in two countries that have been underexplored in the literature, i.e. Brazil and Portugal, and confirms that AC partially mediates the relationship between KS and IN. Brazil is relevant to IT as it is one of the BRICS countries;
- It confirms that countries classified as collectivist that share the same language have the same behaviour with respect to the relationship between KS, AC and IN, that is, country is not confirmed as a moderator. It could be explained by the fact that in a collectivist culture the close relationship among group members is emphasized;
- It identifies team tenure as a moderator of the relationship between KS, AC and IN. KS does not influence the AC or the IN when the team tenure is greater than 12 months. This study provides a stepping-stone to further research on the relationship between team tenure and knowledge sharing. These research results suggest that the team tenure favour KS by strengthen ties between members, but the extended team tenure is unfavourable to KS because it reduces the asymmetry of knowledge in the group.

Cross-cultural research helps to reveal the differences or similarities between countries with regard to knowledge sharing, which allows actions that best suit the specificities of each country. The survey shows there are no differences between Brazil and Portugal in terms of the relationship between knowledge sharing, absorptive capacity and innovation in IT companies. Given the results obtained, when defining team membership, managers of IT companies in the two countries may consider team tenure in order to optimize the relationship, partially mediated by absorptive capacity, between KS and IN.

In future research, we intend to compare collectivistic countries with different languages as well as collectivist and individualist countries. To follow up the present study it would be useful to identify the antecedents of KS for team tenure of up to 12 months and investigate forms of leveraging AC in IN when the team tenure needs to be greater than 12 months. This study considered only one dimension of Hofstede's culture (collectivism). Future study will test the other dimensions proposed by Hofstede (2001).

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