

**The Influence Of Team Members' Motivation And Leader's Behaviour On Scientific
Knowledge Sharing In Universities**

José Luis Ballesteros-Rodríguez

Departamento Economía y Dirección de Empresas
Universidad de Las Palmas de Gran Canaria, Las Palmas, Spain
<https://orcid.org/0000-0002-3934-2679>
email: joseluis.ballesteros@ulpgc.es

Petra De Saá-Pérez

Departamento Economía y Dirección de Empresas
Universidad de Las Palmas de Gran Canaria, Las Palmas, Spain
<https://orcid.org/0000-0002-3945-5454>
email: petra.desaaperez@ulpgc.es

Natalia García-Carbonell

Departamento de Organización de Empresas
Universidad de Cádiz, Cádiz, Spain
<https://orcid.org/0000-0003-0065-3100>
email: natalia.carbonell@uca.es

Fernando Martín-Alcázar

Departamento de Organización de Empresas
Universidad de Cádiz, Cádiz, Spain
<https://orcid.org/0000-0002-9768-4618>
email: fernando.martin@uca.es

Gonzalo Sánchez-Gardey

Departamento de Organización de Empresas
Universidad de Cádiz, Cádiz, Spain
<https://orcid.org/0000-0003-2523-5407>
email: gonzalo.sanchez@uca.es

Abstract

This article aims to analyse the influence of team member's motivation and leader's behaviour on knowledge sharing among the academics of a research project team. To that end, a study on 678 academics researchers belonging to project teams linked to several Spanish universities was conducted. Hierarchical regression analysis was used to analyse the data, and the results reveal that leaders with a knowledge-oriented style have a positive influence on the knowledge shared among the members of their research team. Nevertheless, and contrary to expectations, the results also show that academics' extrinsic motivation has a negative effect on knowledge sharing, while intrinsic motivation has no effect. The findings are similar when considering the scientific field. This paper makes an important contribution to the knowledge management literature in the particular context of academic research. It reveals the importance of a knowledge-oriented leadership style as a key determinant of knowledge sharing within research teams.

Keywords: Human resources management, Leadership, Motivation, Knowledge Sharing, Research Teams

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Introduction

Knowledge sharing becomes an essential issue in the mission of universities, as it is expected that academics share their knowledge with other colleagues and students, in order to contribute to the advancement of knowledge in society (Hernaus et al., 2019). Therefore, “[...] providing information and know-how with the purpose of helping others and collaborating with others to solve problems, develop new ideas or implement policies and processes” (Wang and Noe, 2010: 117) is crucial in today's university, where collaboration and networking are fundamental for the interchange of ideas and information (Kyvik, 2013).

The transition that has taken place in universities, from individual research toward team research, has not only highlighted collaboration among researchers but also changed the way knowledge should be managed. Given this new academic context, knowledge management cannot be seen as a one-time activity or limited to the use of technological tools but should be institutionalized as a continuous process in order to achieve the universities' goals. In this sense, participation in research teams can motivate academics to learn, articulate and share knowledge with other team members in order to create new knowledge (Nonaka and Takeuchi, 1995; Pezzoni et al., 2012). Research teams are an ideal structure for knowledge sharing because they can be considered as the *Ba* postulated by Nonaka and Toyama (2005), where knowledge is created, exchanged and used, and team members can easily access the knowledge of others and expand their cognitive abilities (Carmeli et al., 2013; Wang and Noe, 2010). The collaboration between researchers is increasingly necessary to achieve more publications, but also to access external financing (Kyvik, 2013). However, university teachers have a long tradition of working in solitude and their involvement in collaborative learning processes depends mainly on how team leaders encourage and facilitate such activities (Koeslag-Kreunen et al., 2018). Moreover, the complexity of scientific problems as well as the diversity of people has changed the way university research is organised and managed (Boardman and Ponomariov, 2014). In this

regard, López-Yáñez and Altopiedi (2015) highlight the role of research teams as our society's central resource to generate the creativity and determination that its progress requires. According to these authors, the socialization of the scientists takes place within the research team where they begin to internalize the behavioural models, values or social rules that will guide them in the development of their careers.

Knowledge sharing is not an easy task due to barriers that negatively affect the transfer of knowledge (Szulanski, 2000). In this sense, ignoring the interpersonal context, as well as the individual characteristics that may lead to the emergence of opportunistic behaviours, is one of the reasons that could explain the poor results in achieving successful knowledge sharing (Wang and Noe, 2010). Previous studies show the great difficulty involved in managing knowledge sharing processes; these cannot be imposed or arbitrarily ordered (He et al., 2014). Therefore, analysing the motivations of individuals and their willingness to share their knowledge is particularly important when such activity requires effort by the individuals involved (Bartol and Srivastava, 2002; Osterloh and Frey, 2000).

The competitive behaviours of academics to achieve superior research performance can reduce their willingness to share knowledge with colleagues (Hernaus et al., 2019). Universities are working environments where academics are subject to intense competitive pressures to achieve promotions, publications, and funds for projects, and evasive knowledge hiding behaviours could emerge among them, providing incorrect or incomplete information when other colleagues demanded help (Hernaus et al., 2019). It should be borne in mind that in recent decades, university researchers have had to face increasingly demanding jobs in each of the different roles they have to play, generating tensions in terms of the time and attention to be devoted (Kyvik, 2013). Besides, academics may also have other reasons for avoiding to share knowledge, because sharing individual's knowledge means being exposed to criticism and debate by the other team members in order to improve the original idea and generate new

knowledge (Wang et al., 2006). For this reason, “[...] it is important to admit that knowledge needs to be nourished, supported, reinforced and nurtured” (Widén-Wulff and Ginman, 2004: 449). Time and effort need to be invested in fostering the exchange of ideas among all the team members who have different specializations and characteristics (Padilla-Meléndez and Garrido-Moreno, 2012). In this context, the role of the team leader is crucial in creating a trustful environment that encourages team members to share their ideas and knowledge, which will be subject to criticism and debate by others (Liu et al., 2011). Leaders play an essential role in the knowledge exchange process by facilitating an appropriate context (*Ba*) where researchers feel motivated to share their knowledge (Lakshman, 2007; Nonaka and Toyama, 2005; Zhang and Cheng, 2015). Nevertheless, and even though considerable research has highlighted the role of leader behaviours for team performance (e.g. Day et al., 2014), only recently have researchers begun to explore the role of different leadership styles in knowledge management (e.g. Srivastava et al., 2006; Zhang et al., 2011; Zhang and Cheng, 2015). It should be considered that knowledge exchange in universities is not an automatic process but an internal process based on social interaction among people (García-Sánchez et al., 2019), where leaders should foster a higher level of interpersonal trust among the individuals to build a climate that favours knowledge sharing (Le and Lei, 2019; Park and Kim, 2018).

Based on these considerations, the main aim of this study is to analyse the influence of team members' motivation and leader's behaviour on the scientific knowledge shared among academics. With this purpose, a survey on 678 researchers belonging to project research teams was conducted. This paper contributes to the literature because it provides evidence in the university context about how team member's motivation and team leader behaviour can influence scientific knowledge sharing, as several authors suggest (e.g. Carvalho de Almeida et al., 2016; Donate and Sánchez de Pablo, 2015).

This study proceeds as follows. The next section presents the theoretical foundations and the hypothesis. The methodology is described in the third section. In the fourth section, the empirical results are presented and discussed. The final section presents the main conclusions and implications and suggests future streams of research.

Theoretical foundations

Motivation to share knowledge

Some authors believe that the most crucial phase in knowledge management is the interpersonal interaction process where ideas or problem-solving are discussed, debated and exchanged through knowledge sharing (Srivastava et al., 2006; Yang, 2007). Knowledge sharing occurs when individuals contribute to knowledge application and innovation, helping to exploit existing knowledge bases within the organization for the sake of gaining a competitive advantage (Wang and Noe, 2010). It is this flow of knowledge among individuals that enables the use of other people's knowledge in the development of new knowledge (Hong et al., 2011; Yang, 2007). Through these knowledge sharing behaviours the disposition to achieve not only group objectives but also individual one's increase (Lin, 2007). Conversely, when there is no knowledge sharing within a team, the members have no access to the cognitive resources of their colleagues, thereby undermining their ability to collaborate as well as their potential to be creative (Zhang et al., 2011). Therefore, many authors consider that it is knowledge sharing that contributes to better group performance (e.g. He et al., 2014; Lee et al., 2010).

Nevertheless, knowledge sharing is a voluntary act by individuals, which can be requested or encouraged, but not required, and is always under their control (Carvalho de Almeida et al., 2016; Hong et al., 2011; Jimenez-Jimenez and Sanz-Valle, 2013; Sandhu et al., 2011; Swart et al., 2014). Therefore, as He et al. (2014) highlight, team members may have reasons not to make their knowledge available to others, considering it a valuable and sensitive

asset that should be carefully protected. Similarly, Tian et al. (2009) claim that, within the academic context, research is motivated by individual objectives, and consequently, researchers may feel suspicious when having to share their knowledge. Team members not only choose whether they want to share their knowledge but also select whom to share it with (Hernaes et al., 2019). Although it has been suggested that individuals face many tensions when exposing their knowledge to the influence and needs of others (Swart et al., 2014), there is evidence supporting academics' positive attitudes and intentions toward knowledge sharing (Fullwood et al., 2013).

The decision to share knowledge depends on the interests and preferences of each one of the team members, who besides being different, may change over time. In this sense, Carvalho de Almeida et al. (2016) consider that for individuals, knowledge sharing offers uncertain rewards, which may undoubtedly affect their involvement in such behaviour. Moreover, academics might have a skewed perception of knowledge-sharing processes. They might think they give more knowledge than they receive, and this may undoubtedly influence their willingness to participate in these processes (Sandhu et al., 2011).

Wang and Noe (2010) review the determinants of knowledge sharing and consider motivational factors as mediating factors between such behaviours and contextual factors (interpersonal and team characteristics, cultural characteristics, and organizational context) that might affect them. In this sense, Donate and Sánchez de Pablo (2015) describe the intrinsic and extrinsic motivational rewards that are necessary for the development of behaviours that favour knowledge sharing. The extrinsic rewards are either monetary incentives, such as salary increases or bonuses, or non-monetary incentives, such as career promotions or job security, as well as reciprocity behaviours that ensure that others will also share their knowledge in the future (Lin, 2007; Osterloh and Frey, 2000). Intrinsic rewards are one's satisfaction resulting from the experience of knowledge sharing and helping others, and also the perception of self-

efficacy associated with one's knowledge and self-confidence in the ability to share valuable knowledge with others (Carvalho de Almeida et al., 2016; Lin, 2007). Therefore, it is vital to consider the psychological needs of individuals when analysing their knowledge sharing behaviours (Carvalho de Almeida et al., 2016).

The results have not been conclusive for studies that have analysed the above-mentioned motivational factors for activities oriented toward knowledge sharing (Carvalho de Almeida et al., 2016). Thus, within an academic context, Padilla-Meléndez and Garrido-Moreno (2012) reveal that extrinsic motivational factors, such as monetary rewards, career promotion and prestige, are not influential in facilitating knowledge sharing from universities to industry. By contrast, Lin (2007) found that extrinsic motivators, such as reciprocal benefits, and intrinsic motivators, such as self-efficacy and the satisfaction of helping others, did indeed affect behaviour and intention to share knowledge. It should be considered that individuals are more likely to share knowledge as a means of achieving personal satisfaction when they believe this knowledge is their property and does not belong to the organization (Wang and Noe, 2010). This argument can be directly applied to the academic research context.

Therefore, it is within the team contextual framework that individual knowledge sharing might be fostered through indirect rewards (Bartol and Srivastava, 2002) because knowledge sharing within a team results in a feeling of cooperation and reciprocity that encourages everyone to share knowledge, thereby increasing team performance. In this way, the act of individuals' knowledge sharing is associated with team rewards. In the case of research team members, this is the achievement of the project's goals and leads to the following hypothesis:

H1: Motivation of research team members has a positive influence on knowledge sharing within the team.

H1a: Extrinsic motivation of team members has a positive influence on knowledge sharing within the team.

H1b: Intrinsic motivation of team members has a positive influence on knowledge sharing within the team.

Leadership oriented toward knowledge sharing

Leadership research over the last 100 years has highlighted the importance of the role of leaders in organizational success (Behrendt et al., 2017). However, some authors recently have criticized certain widespread assumptions regarding effective leadership due to the considerable overlap among conceptual definitions (e.g., van Knippenberg and Sitkin, 2013; Yukl, 2012; Behrendt et al., 2017). In line with the suggestion of those authors who encourage the scientific community to generate more integrative leadership theories, in this paper the concept of knowledge-oriented leadership integrates the most fundamental findings of the past literature with recent meta-analyses of effective leadership behaviour (DeRue et al., 2011; Yukl, 2012).

In the current academic context, where knowledge management has become a key activity, research group leaders can be critical players in fostering this process, which affects the functioning and efficiency of the team (Zhang et al., 2011). Leaders can create a climate that favours knowledge sharing by promoting a higher level of interpersonal trust among individuals (Le and Lei, 2019; Park and Kim, 2018). In this line, Yukl (2012: 66) point out that “[...] the essence of leadership in organizations is influencing and facilitating individual and collective efforts to accomplish shared objectives”. Thus, knowledge-oriented leadership can be understood as the leader's behaviour aimed at supporting other group members in the learning processes needed to achieve group goals (Zhang and Cheng, 2015). This definition highlights that knowledge-oriented leadership tends to focus on social relations issues, and then is closely related to the traditional relationship-oriented leadership style (Behrendt et al. 2017) because this category of leadership behaviour focuses on fostering coordination, activating resources and promoting cooperation (Yukl, 2012).

Additionally, Donate and Sánchez de Pablo (2015) analyse knowledge-oriented leadership as an essential condition for the development of knowledge management practices that help to encourage innovation within technology-intensive companies. Their findings show that knowledge-oriented leadership understood as a style that combines transformational and transactional leadership, together with communicative and motivational elements, is a necessary tool for facilitating knowledge exploitation and exploration for the sake of improving innovation performance within these companies. Also, Zhang et al. (2011) believe that transformational leadership styles positively affect knowledge exchange, whereas authoritarian leadership has a negative effect. Similarly, Carmeli et al. (2013) show that within knowledge-intensive industries, leaders have a vital influence on external and internal knowledge exchange processes, which at the same time, lead to increasing levels of creativity. In this sense, research team leaders can foster knowledge sharing among team members if they encourage behaviours such as being attentive to the environment to capture new knowledge and share it within the team, challenge team members to try new approaches to solve problems or match experienced people with less experienced ones, and so on (Lee et al., 2010).

According to Bai et al. (2016: 3248), “[...] leader's behavior plays a key role in facilitating knowledge exchange and individual creativity”. Similarly, Wang and Noe (2010) consider leadership to be a matter that requires further research in order to analyse its influence on knowledge sharing. Leaders' behaviour can affect the level of knowledge shared within teams through the creation of rules that encourage members to share knowledge and by providing a work climate that facilitates knowledge exchange (Carmeli et al., 2013; Wang and Noe, 2010). Accordingly, leaders might influence knowledge sharing not only through their behaviour by becoming an example to the rest of the team, but also by verbally expressing the appropriate and expected behaviours concerning these processes (Carmeli et al., 2013). Likewise, Zhang and Cheng (2015) highlight the role of the leader as a facilitator of interactions

among social team members, as long as these interactions affect their behaviours toward knowledge exchange. According to these authors, the leader who wants to manage the existing knowledge properly within the team needs to pay particular attention to the social aspect implicit in knowledge exchange.

Carmeli et al. (2013) indicate that a leader's supporting behaviour within the team might provide an appropriate context for knowledge exchange, leading to better team performance. Leader's behaviour is the key predictor of the quality of interactions among team members, as leaders can encourage knowledge sharing through an appropriate work environment (Xue et al., 2011). When team members are valued by their contribution of ideas and knowledge to the team, this will motivate other team members to behave in the same way (Srivastava et al., 2006).

Tian et al. (2009) highlight the role of academic leaders in convincing team members about common advantages, in terms of publications and citations, linked to the exchange of ideas and open debate. There are many ways a leader can encourage knowledge sharing within the team. Yang (2007) observed how knowledge exchanged is encouraged when leaders behave as facilitators and mentors without forgetting human relationships. As facilitators, leaders might help to share knowledge by promoting a healthy work environment, a climate of good communication and trust among the team members (Yang, 2007). As mentors, leaders can help team members improve their competencies associated with work tasks (Yang, 2007). Leaders can show team members how to communicate with others and how to solve problems in a collaborative manner, which in turn facilitates knowledge exchange (Xue et al., 2011). Moreover, they can be an example to other team members by being the first ones to share their knowledge, and in doing so, the leader shows others that he or she is supporting knowledge exchange activities within the team (Xue et al., 2011).

Based on these considerations, the following hypothesis is proposed:

H2: A knowledge-oriented style of team leadership has a positive influence on knowledge sharing among team members.

Methodology

Sample

Data were collected from a survey conducted in 2017 to the academics linked to Spanish universities that were involved in research project teams financed by a grant from the Ministry of Science and Innovation. The survey was sent by mail to all researchers, and up to three reminders were emailed in order to maximize the response rate, resulting in 678 participants, who belong to 37 Spanish universities. The average age of the respondents was 30 years, and 84.5% were under the age of 40 years. Besides, 61.20% were male, 67.4% public servants, 95.5% working full-time, 56.6% with over 20 years of service and 73.3% with *sexenio* (a 6-year period of research that is officially assessed and acknowledged by the Spanish authorities based on the quality and quantity of the publications and patents, among others). According to the scientific area, 12% of the respondents belonged to Arts and Humanities, 41.9% to Sciences, 23% to Social and Legal Sciences, 6.1% to Health Sciences and 16.6% to Engineering and Architecture.

Variables

Knowledge sharing within the research teams was measured using a scale developed by Liu et al. (2011). A Likert-type scale was used with a five-point response format ranging from 1 (completely disagree) to 5 (completely agree). The validity and reliability of the construct were checked through confirmatory factor analysis. The scale demonstrated good reliability, with all factor loadings being superior to 0.86 and a Cronbach's alpha of 0.957. The scale items and test results can be found in Appendix I (Table A1).

Researchers' motivation was measured using a scale developed in a Delphi study. For this purpose, the participation of 164 research group leaders from Cadiz University (Spain) was

requested; however, only 62 leaders from different academic fields agreed to participate. After three rounds of surveys, a consensus was achieved, resulting in the initial scale. That same scale was sent again to the experts as a questionnaire requesting their opinion about their suitability.

The final scale is composed of six items ranging from 1 (completely disagree) to 5 (completely agree). The validity and reliability of the scale were checked through exploratory factor analysis and resulted in two factors corresponding to extrinsic and intrinsic motivation. All factor loadings were higher than 0.61, and Cronbach's alpha was 0.70 (see Table A2, Appendix I).

Knowledge-oriented leadership was measured using a six-item scale based on the work of Donate and Guadamillas (2011), where respondents assessed the research team leader's style. A Likert-type scale was used with a five-point response format, ranging from 1 (completely disagree) to 5 (completely agree). It should be noted that one of the original scale items had to be removed because of its low commonality. All factor loadings were greater than 0.81 with a Cronbach's alpha of 0.945, which confirmed the scale's validity and reliability (see Table A3, Appendix I).

Control variables

Additional variables were included to identify other researcher characteristics that affect knowledge sharing within research teams. *Scientific Area* used a set of five dummy variables that adopted the value of 1 if the team belonged to a specific area: Arts and Humanities, Social and Legal Sciences, Sciences, Health Sciences, and Engineering and Architecture. Researcher characteristics such as age, gender, being a public servant and having full dedication were also considered. Finally, another variable that considered if the researcher had six years of officially recognized research was also included (*Sexenios*).

Results

Table 1 shows a correlation matrix of the variables. A positive and significant correlation was observed between knowledge sharing and intrinsic motivation ($r = 0.14$; $p < 0.01$) and knowledge-oriented leadership ($r = 0.70$; $p < 0.01$). Moreover, and related to the control variables, the results showed a positive and significant correlation between knowledge sharing and researcher age ($r = 0.12$; $p < 0.001$), being a public official ($r = 0.10$; $p < 0.01$) and belonging to the Sciences field ($r = 0.13$; $p < 0.01$). However, the correlation between Arts and Humanities and Social and Legal Sciences was negative and significant ($r = -0.9$; $p < 0.05$ and $r = -0.08$; $p < 0.05$; respectively). Correlations with the remaining variables were not significant.

To check that there were no problems caused by these data being transversal and originating from a single informant (*common method variance*), which could cause a measurement error regarding the true relationships among the constructs (Podsakoff and Organ, 1986), a single factor Harman test was conducted (not reported). The test verified the existence of four different factors with eigenvalues of greater than one, which explain 75.5% of the total variance. The results show that the largest factor explained less than 50% of the total variance, suggesting that this problem would not be relevant in this study. Moreover, analysis of the variance inflation factors (VIF) confirms there was no multicollinearity among the variables considered in the model as all VIFs were less than 5 (not reported).

Table 1. Descriptive statistics and correlation matrix

Variables		Mean	S.D.	Correlations													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Knowledge sharing	0.00	0.97	1													
2	Public official	0.67	0.46	0.10***	1												
3	<i>Sexenio</i>	0.85	0.35	0.02	0.44***	1											
4	Gender	0.62	0.48	-0.22	0.12***	0.01	1										
5	Dedication	0.95	0.20	-0.00	0.30***	0.31***	0.05	1									
6	Age	30.31	9.54	0.12***	0.63***	0.29***	0.15***	0.10***	1								
7	Arts-Humanities	0.12	0.32	-0.09**	0.06	-0.01	-0.02	0.03	0.09**	1							
8	Sciences	0.41	0.49	0.13***	0.10***	0.07	0.04	0.06	0.08**	-0.31***	1						
9	Social-Legal Science	0.22	0.41	-0.08**	-0.05	-0.02	-0.13***	-0.03	-0.13***	-0.20***	-0.45***	1					
10	Health Science	0.06	0.23	0.06	-0.06	0.01	-0.04	-0.12***	0.061	-0.09**	-0.21***	-0.13	1				
11	Architecture-Engineering	0.16	0.37	-0.05	-0.06	-0.04	0.16***	0.00	-0.09**	-0.016***	-0.37***	-0.24***	-0.11***	1			
12	Extrinsic motivation	0.00	1	-0.02	0.00	0.03	-0.05	0.04	-0.10***	-0.03	-0.07	0.09**	0.02	0.014	1		
13	Intrinsic motivation	0.00	1	0.14***	0.05	0.11***	0.02	0.05	0.01	0.05	0.04	-0.03	-0.00	-0.063	0.000	1	
14	Knowledge-oriented leadership	0.00	0.97	0.70***	0.020	0.03	-0.06	-0.07	-0.01	-0.01	-0.00	0.04	0.03	-0.063	0.04	0.17***	1

*** p < 0.010; ** p < 0.05

Effect of motivation and leadership on scientific knowledge sharing in academic research teams

A hierarchical regression analysis was used to test the hypotheses. The model I analyses the effect of the control variables on knowledge sharing, and model II is estimated by adding researchers' motivation (extrinsic and intrinsic) and the knowledge-oriented style of the leader. The results for both models are shown in Table 2.

Table 2. The effect of motivation and leadership on knowledge sharing

	Model I		Model II	
	β	t	β	t
(Constant)		-0.159		-1.546
Public official	0.136*	1.819	0.065	1.258
Sexenio	-0.084	-1.288	-0.084*	-1.857
Gender	-0.076	-1.353	-0.040	-1.043
Dedication	-0.070	-1.174	0.000	-0.003
Age	0.031	0.444	0.040	0.823
Arts-Humanities	0.036	0.579	0.061	1.436
Sciences	0.183***	2.651	0.195***	4.118
Health Science	0.129**	2.205	0.097***	2.416
Architecture-Engineering	0.051	0.762	0.070	1.526
Extrinsic motivation			-0.063*	-1.615
Intrinsic motivation			0.023	0.584
Knowledge-oriented leadership			0.714***	18.518
R^2	0.064		0.568	
R^2 Adjusted	0.036		0.551	
F	2.335**		33.463***	
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$				

In Model I, the results show that being a public official ($\beta = 0.13$; $p < 0.1$) and belonging to the Sciences ($\beta = 0.18$; $p < 0.01$) and Health Sciences field ($\beta = 0.12$; $p < 0.05$), as opposed to Social and Legal Sciences, explain variation in the dependent variable. The results for Model II show that intrinsic motivation is no significant, whereas the coefficient on extrinsic motivation is significant, but negative ($\beta = -0.06$; $p < 0.1$). Thus, hypotheses H1a and H1b are not supported. However, there is a positive and significant relation between team leader style and knowledge sharing within the teams ($\beta = 0.71$; $p < 0.01$), which supports hypothesis H2. The control variables remain significant, except for being a public official, which is no longer significant and having *sexenios*, which becomes negative and significant. However, the explanatory power of the last model is very high, with $R^2 = 0.56$ and R^2 adjusted = 0.55. These

results highlight the important role of the team leader behaviour to foster knowledge sharing among research team members.

Effect of motivation and leadership on knowledge sharing by scientific area

The regression results for each of the four scientific fields are shown in Table 3. In all four regressions, the effect of team leader style on knowledge sharing is positive and significant. Motivation has no significant effect, except in the Architecture and Engineering field, where extrinsic motivation has a significant but negative effect ($\beta = -0.17$; $p < 0.1$). None of the control variables is significant. Finally, the models have high explanatory power, with R^2 values greater than 0.5. From these results, it can be affirmed that the model is robust.

Table 3. Robustness analysis: the effect of motivation and leadership on scientific knowledge sharing by scientific areas

	Arts-Humanities		Sciences		Social-Legal Science		Architecture-Engineering	
	Beta	<i>t</i>	Beta	<i>t</i>	Beta	<i>t</i>	Beta	<i>t</i>
(Constant)		-0.379		1.183		-1.976		0.832
Public official	0.184	1.080	0.065	0.674	-0.013	0.144	0.095	0.831
Sexenio	-0.182	-1.215	-0.051	-0.602	-0.149	-1.607	0.045	0.449
Gender	0.168	1.062	-0.044	-0.687	-0.018	-0.247	-0.111	-1.212
Dedication	0.058	0.360	-0.070	-0.955	0.095	1.237	-0.135	-1.383
Age	-0.094	-0.484	-0.023	-0.260	0.102	1.131	0.003	0.025
Extrinsic motivation	0.038	0.235	0.068	1.044	-0.114	-1.442	-0.179*	-1.887
Intrinsic motivation	-0.017	-0.120	0.101	1.560	0.020	0.259	-0.024	-0.260
Knowledge-oriented leadership	0.795***	5.736	0.678***	10.362	0.770***	10.496	0.685***	7.181
R^2	0.646		0.512		0.623		0.609	
R^2 Adjusted	0.517		0.482		0.582		0.548	
F	5.02***		16.56***		15.076***		10.105***	
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$								
Health Science is not analysed because of small simple size.								

Conclusion

This paper examines the influence of team members' motivation and leader's behaviour on the knowledge shared among academics belonging to project teams. The results reveal that a knowledge-oriented leader is the main factor affecting knowledge sharing among research team members. Contrary to expectations, researchers' extrinsic motivation can negatively affect knowledge sharing, whereas intrinsic motivation does not affect. Therefore, these findings show that the willingness of academic to share their scientific knowledge depends more on

group factors such as the team leader style (Bai et al., 2016; Lee et al., 2010; Tian et al., 2009; Yang, 2007) than on individual factors such as motivation (Hong et al., 2011; Jimenez-Jimenez and Sanz-Valle, 2013). In addition, the results highlight how important it is for the team leader to display a knowledge-oriented behaviour, which involves an awareness of how to capture new knowledge and share it within a team, challenging team members to try out new approaches and solve problems or matching more experienced workers with less experienced ones, and so on (Lee et al., 2010). Thus, leaders foster knowledge sharing by creating a healthy work environment, an appropriate climate for good communication and trust among the team members (Le and Lei, 2019; Park and Kim, 2018; Yang, 2007).

The results also reveal that achieving high levels of motivation to share knowledge is not an easy task (Lin, 2007; Osterloh and Frey, 2000). Moreover, researchers might consider that engaging in knowledge sharing is not beneficial to them, as they perceive it as an activity that is not adequately rewarded by the institution. According to Szulanski (2000), individuals base their actions, including knowledge sharing, on expectations such as obtaining respect, reputation or tangible economic incentives (Wang and Noe, 2010). Additionally, the use of extrinsic motivation might result in the individuals exhibiting behaviours more oriented toward satisfying personal needs as opposed to the team's common interests (Lin, 2007). This finding reinforces the idea expressed by Carvalho de Almeida et al. (2016) that one must be very careful when using extrinsic rewards concerning the promotion of knowledge sharing behaviours. Therefore, as DeTienne et al. (2004: 14) point out, “[...] without effective leaders who set appropriate examples, employees will not be motivated to freely participate in the KM programs. Consequently, organizational leadership play a critical role in a company's efforts to capture and transfer knowledge”.

In any case, the results of this research should be interpreted with caution, as it has several limitations. First, the study was conducted in Spain, which limits the generalizing of the

results. Within other contexts, for instance, the level of collectivism/individualism of society might be reflected in the research groups and eventually affect the relations between the variables studied here. Leadership does have a significant cultural component. Moreover, data were collected from a single source; therefore, it would be interesting to conduct studies using a more diverse group of teams. Another limitation relates to knowledge sharing being influenced by several variables that have not been included in this research, such as promotion systems and social capital, among others. Finally, although the respondents were asked to assess matters associated with the research teams over time, the data refer to a specific point in time; thus, it would be desirable to conduct longitudinal studies that provide broader information about the causality between variables.

This paper makes an important contribution to the knowledge management literature in the particular context of academic research. Specifically, it highlights the role of team leaders in knowledge sharing among academics belonging to a research team. This in itself represents a contribution as a large part of the literature that has analysed the effect of leadership on knowledge management is mainly concerned with companies where there are knowledge management projects or programs specifically designed to maximize the use of this resource (e.g. DeTienne et al., 2004; Lakshman, 2007). Studying the effect of leadership on knowledge sharing at universities provides a different perspective because the scientific research in the academia has undergone a significant transformation owing to globalization, technological change and multidisciplinary (Lauring and Selmer, 2011). The development of scientific knowledge is no longer based on individual work; instead, it depends significantly on collaboration and cooperation among researchers (Gonzalez-Brambila, 2014). Promoting these relationships helps academics to learn from each other and produce new scientific findings. For that reason, teamwork and collaboration have become a necessary instrument for dealing with this new environment of greater complexity and uncertainty (Lauring and Selmer, 2011).

However, according to Tan and Noor (2013), universities have not been able to gain all the advantages that could be provided by adequate knowledge management of collaborative research. Knowledge sharing is an imperative as much for the organization as it is for the academics. In that sense, universities, as knowledge-creating institutions, should encourage "[...] individuals to interact among each other to transcend their boundaries and, as a result, change the organization and surroundings, themselves and others" (Nonaka and Toyama, 2005: 421). Therefore, and in line with other authors (e.g. Carmeli et al., 2013), this research demonstrates the importance of leadership's influence on knowledge exchange. Accordingly, the selection and training of research team leaders who can facilitate environments where knowledge sharing is accepted and encouraged by all become a crucial matter. At universities, and more specifically within teams involved in research projects, the selection of leaders should be a priority. Therefore, it could be worthwhile for universities to broaden their view of leadership development by focusing on the entire leadership process, as suggested by Tafvelin et al. (2019). The importance of a knowledge-oriented leadership at universities that enhances the sharing of knowledge will become more significant as the principles of Open Science extend as a philosophy in research and collaboration policies between universities and companies (Lasthiotakis et al., 2015). Open Science could radically change the relationship between research and innovation, as well as the scientific process as a whole, where scientific knowledge should be openly shared.

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References

- Bai Y, Lin L and Li PP (2016) How to enable employee creativity in a team context: A cross-level mediating process of transformational leadership. *Journal of Business Research* 69(9): 3240–3250.
- Bartol KM and Srivastava A (2002) Encouraging knowledge sharing: The role of organizational reward systems. *Journal of Leadership & Organizational Studies* 9(1): 64–76.
- Behrendt P, Matz S and Göritz AS (2017) An integrative model of leadership behavior. *The Leadership Quarterly* 28(1): 229–244.
- Boardman C and Ponomariov B (2014) Management knowledge and the organization of team science in university research centers. *Journal of Technology Transfer* 39(1): 75–92.
- Carmeli A, Gelbard R and Reiter-Palmon R (2013) Leadership, creative problem-solving capacity and creative performance: The importance of knowledge sharing. *Human Resource Management* 52(1): 95–122.
- Carvalho de Almeida F, Lesca H and Canton AWP (2016) Intrinsic motivation for knowledge sharing – competitive intelligence process in a telecom company. *Journal of Knowledge Management* 20(6): 1282–1301.
- Day DV, Fleenor JW, Atwater LE, et al. (2014) Advances in leader and leadership development: A review of 25 years of research and theory. *Leadership Quarterly* 25(1): 63–82.
- DeRue DS, Nahrgang JD, Wellman N, et al. (2011) Trait and behavioral theories of leadership: An integration and meta-analytic test of their relative validity. *Personnel Psychology* 64(1): 7–52.
- DeTienne KB, Dyer G, Hoopes C, et al. (2004) Toward a model of effective knowledge management and directions for future research: Culture, leadership, and CKOs. *Journal of Leadership & Organizational Studies* 10(4): 26–43.
- Donate MJ and Guadamillas F (2011) Organizational factors to support knowledge management and innovation. *Journal of Knowledge Management* 15(6): 890–914.
- Donate MJ and Sánchez de Pablo JD (2015) The role of knowledge-oriented leadership in knowledge management practices and innovation. *Journal of Business Research* 68(2): 360–370.
- Fullwood R, Rowley J and Delbridge R (2013) Knowledge sharing amongst academics in UK universities. *Journal of Knowledge Management* 17(1): 123–136.
- García-Sánchez P, Díaz-Díaz NL and De Saá-Pérez P (2019) Social capital and knowledge sharing in academic research teams. *International Review of Administrative Sciences* 85(1): 191–207.
- Gonzalez-Brambila CN (2014) Social capital in academia. *Scientometrics* 101(3): 1609–1625.
- He H, Baruch Y and Lin CP (2014) Modeling team knowledge sharing and team flexibility: The role of within-team competition. *Human Relations* 67(8): 947–978.
- Hernaus T, Cerne M, Connelly C, et al. (2019) Evasive knowledge hiding in academia: When competitive individuals are asked to collaborate. *Journal of Knowledge Management* 23(4): 597–618.

- Hong D, Suh E and Koo C (2011) Developing strategies for overcoming barriers to knowledge sharing based on conversational knowledge management: A case study of a financial company. *Expert Systems with Applications* 38(12): 14417–14427.
- Jimenez-Jimenez D and Sanz-Valle R (2013) Studying the effect of HRM practices on the knowledge management process. *Personnel Review* 42(1): 28–49.
- Koeslag-Kreunen MGM, Van der Klink MR, Van den Bossche P, et al. (2018) Leadership for team learning: The case of university teacher teams. *Higher Education* 75(2): 191–207.
- Kyvik S (2013) The academic researcher role: Enhancing expectations and improved performance. *Higher Education* 65(4): 525–538.
- Lakshman C (2007) Organizational knowledge leadership: A grounded theory approach. *Leadership and Organization Development Journal* 28(1): 51–75.
- Lasthiotakis H, Kretz A and Sá C (2015) Open science strategies in research policies: A comparative exploration of Canada, the US and the UK. *Policy Futures in Education* 13(8): 968–989.
- Lauring J and Selmer J (2011) Social climate in diverse university departments: The role of internal knowledge sharing. *Educational Research* 53(3): 347–362.
- Le PB and Lei H (2019) Determinants of innovation capability: The roles of transformational leadership, knowledge sharing and perceived organizational support. *Journal of Knowledge Management* 23(3): 527–547.
- Lee P, Gillespie N, Mann L, et al. (2010) Leadership and trust: Their effect on knowledge sharing and team performance. *Management Learning* 41(4): 473–491.
- Lin HF (2007) Effects of extrinsic and intrinsic motivation on employee knowledge sharing intentions. *Journal of Information Science* 33(2): 135–149.
- Liu Y, Keller RT and Shih HA (2011) The impact of team-member exchange, differentiation, team commitment, and knowledge sharing on R&D project team performance. *R&D Management* 41(3): 274–287.
- López-Yáñez J and Altopiedi M (2015) Evolution and social dynamics of acknowledged research groups. *Higher Education* 70(4): 629–647.
- Nonaka I and Takeuchi H (1995) *The Knowledge-Creating Company. How Japanese companies create the dynamics of innovation*. New York: Oxford University Press.
- Nonaka I and Toyama R (2005) The theory of the knowledge-creating firm: Subjectivity, objectivity and synthesis. *Industrial and Corporate Change* 14(3): 419–436.
- Osterloh M and Frey BS (2000) Motivation, knowledge transfer, and organizational forms. *Organization Science* 11(5): 538–550.
- Padilla-Meléndez A and Garrido-Moreno A (2012) Open innovation in universities: What motivates researchers to engage in knowledge transfer exchanges? *International Journal of Entrepreneurial Behavior & Research* 18(4): 417–439.

- Park S and Kim EJ (2018) Fostering organizational learning through leadership and knowledge sharing. *Journal of Knowledge Management* 22(6): 1408–1423.
- Pezzoni M, Sterzi V and Lissoni F (2012) Career progress in centralized academic systems: Social capital and institutions in France and Italy. *Research Policy* 41(4): 704–719.
- Podsakoff PM and Organ DW (1986) Self-reports in organizational research: Problems and prospects. *Journal of Management* 12(4): 531–544.
- Sandhu MS, Jain KK and Ahmad IUK (2011) Knowledge sharing among public sector employees: evidence from Malaysia. *International Journal of Public Sector Management* 24(3): 206–226.
- Srivastava A, Bartol KM and Locke EA (2006) Empowering leadership in management teams: Effects on knowledge sharing, efficacy, and performance. *Academy of Management Journal* 49(6): 1239–1251.
- Swart J, Kinnie N, van Rossenberg Y, et al. (2014) Why should I share my knowledge? A multiple foci of commitment perspective. *Human Resource Management Journal* 24(3): 269–289.
- Szulanski G (2000) The process of knowledge transfer: A diachronic analysis of stickiness. *Organizational Behavior and Human Decision Processes* 82(1): 9–27.
- Tafvelin S, Hasson H, Holmström S, et al. (2019) Are formal leaders the only ones benefitting from leadership training? A shared leadership perspective. *Journal of Leadership & Organizational Studies* 26(1): 32–43.
- Tan CNL and Noor SM (2013) Knowledge management enablers, knowledge sharing and research collaboration: A study of knowledge management at research universities in Malaysia. *Asian Journal of Technology Innovation* 21(2): 251–276.
- Tian J, Nakamori Y and Wierzbicki AP (2009) Knowledge management and knowledge creation in academia: A study based on surveys in a Japanese research university. *Journal of Knowledge Management* 13(2): 76–92.
- Van Knippenberg D and Sitkin SB (2013) A critical assessment of charismatic–transformational leadership research: Back to the drawing board?. *The Academy of Management Annals* 7(1): 1–60.
- Wang J, Peters HP and Guan J (2006) Factors influencing knowledge productivity in German research groups: Lessons for developing countries. *Journal of Knowledge Management* 10(4): 113–126.
- Wang S and Noe RA (2010) Knowledge sharing: A review and directions for future research. *Human Resource Management Review* 20(2): 115–131.
- Widén-Wulff G and Ginman M (2004) Explaining knowledge sharing in organizations through the dimensions of social capital. *Journal of Information Science* 30(5): 448–458.
- Xue Y, Bradley J and Liang H (2011) Team climate, empowering leadership, and knowledge sharing. *Journal of Knowledge Management* 15(2): 299–312.
- Yang JT (2007) Knowledge sharing: Investigating appropriate leadership roles and collaborative culture. *Tourism Management* 28(2): 530–543.
- Yukl G (2012) Effective leadership behavior: What we know and what questions need more attention. *Academy*

of Management Perspectives 26(4): 66–85.

Zhang AY, Tsui AS and Wang DX (2011) Leadership behaviors and group creativity in Chinese organizations: The role of group processes. *Leadership Quarterly* 22(5): 851–862.

Zhang L and Cheng J (2015) Effect of knowledge leadership on knowledge sharing in engineering project design teams: The role of social capital. *Project Management Journal* 46(5): 111–124.

APPENDIX I

Table A1. Confirmatory factor analysis for knowledge sharing

Items	Com.	Factor load	Cronbach's alpha
My research team members always share their knowledge and experience with the rest	0.88	0.939	0.957
My research team members always give their knowledge to others	0.86	0.931	
My research team members always look for synergies in order to facilitate others' work	0.74	0.863	
My research team members always share with each other their research results (new articles, projects, etc.)	0.74	0.860	
Eigenvalue		43.424	
Total % explained variance		80.881	
Kaiser–Meyer–Olkin		0.863	
Bartlett's test of sphericity		2555.261***	

Table A2. Exploratory factor analysis for motivation

Items	Com.	Factor load 1	Factor load 2	Cronbach's alpha
I research for research merits	0.70	0.836	0.031	0.733
I research for financial rewards	0.57	0.752	-0.085	
I research for promotion	0.60	0.749	0.199	
I research for my own prestige	0.52	0.615	0.383	
I research for my own personal satisfaction	0.73	0.093	0.851	0.645
Research is part of my activity	0.66	0.053	0.834	
Eigenvalue		2.473	1.357	
Total % explained variance			81.350	
Kaiser-Meyer-Olkin			0.683	
Bartlett's test of sphericity			895.77***	

Table A3. Confirmatory factor analysis for knowledge-oriented leadership

Items	Com.	Factor load	Cronbach's alpha
The leader of the research team promotes learning from the experience, tolerating mistakes up to a certain point	0.79	0.928	0.945
The leader of the research team is accustomed to assuming the role of knowledge leader, which is mainly characterized by openness, tolerance to mistakes and mediation for the achievement of team objectives	0.86	0.890	
The leader of the research team fosters an environment for the responsible behaviour of the research team members	0.79	0.889	
The leader of the research team rewards members who share and apply their knowledge	0.66	0.881	
The leader of the research team promotes the acquisition of external knowledge	0.78	0.810	
Eigenvalue		4.10	
Total % explained variance		77.537	
Kaiser–Meyer–Olkin		0.899	
Bartlett's test of sphericity		1919.176***	