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Impact of knowledge-based organizational support on organizational performance through project management

Claudia-Inés Sepúlveda-Rivillas, Joaquin Alegre and Victor Oltra

Abstract

Purpose – *The purpose of this study is to empirically investigate how knowledge-based organizational support (KOS) influences organizational performance through project management.*

Design/methodology/approach – *Data were obtained from a survey and from archival sources with a time lag for the dependent variable; structural equation modeling was used to analyze the data. The sample was made up of 106 organizations in Colombia, considering two key respondents from each organization: general manager and project manager.*

Findings – *Results show that KOS is an antecedent of project management and project performance. Furthermore, project management and project performance play a mediating role between KOS and organizational performance.*

Research limitations/implications – *Research limitations are the following: use of cross-sectional data with a time lag, one single unit of analysis, organizational performance analyzed only from a financial perspective. Despite these limitations, the paper puts forward relevant implications that bridge knowledge management and project management literature by clarifying the conditions under which knowledge organizational support generates a significant impact on organizational performance. Intellectual capital and knowledge management dynamic capabilities play a relevant role in this connection.*

Practical implications – *The findings have important practical implications: decision-makers are to allocate effectively hard and soft resources to configure a knowledge-based infrastructure, through the development of intellectual capital and knowledge management dynamic capabilities.*

Social implications – *The findings are generalizable to projects management in the context of non-government organizations or other social-oriented initiatives.*

Originality/value – *This study assumes and operationalizes organizational support from a knowledge-based perspective, represented by intellectual capital and knowledge management dynamic capabilities, providing empirical evidence of the way KOS influences organizational performance through project management and project performance.*

Keywords *Organizational performance, Project performance, Knowledge management, Intellectual capital, Dynamic capabilities, Knowledge-based organizational support*

Paper type *Research paper*

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1. Introduction

Projects allow organizations to create or adapt to environmental changes and are, therefore, a core activity for most of them. For this reason, project management (PM) is increasingly regarded as a relevant determining factor in achieving organizational objectives and competitive advantage. Within the context of projects, organizational support refers to the backing provided by an organization for the execution of its projects to boost performance (Fossum *et al.*, 2020; Jugdev *et al.*, 2020; Irfan *et al.*, 2019; Aarseth *et al.*, 2011).

Organizational support is considered one of the most important factors for project success. Organizational support involves tangible aspects such as physical and technological

infrastructure and intangible aspects including organizational culture, knowledge management or incentive schemes. However, the intangible characteristics of organizational support have not been studied in depth. Knowledge management stands out consistently as a key factor for project success (Fossum *et al.*, 2020; Doskočil and Lacko, 2018; Gunasekera and Chong, 2018; Liu, 2015; Young and Jordan, 2008).

Notwithstanding, organizational support has not been addressed from a knowledge-based perspective. More research is needed to conceptualize and operationalize organizational support from a knowledge-based perspective, as well as to analyze its influence on project performance (PP) and organizational performance (OP). In previous studies, organizational support has generally been limited to support for employees, but many additional knowledge-based issues should also be taken into account (Fuentes-Ardeo *et al.*, 2017; Gasik, 2011; Gelbard and Carmeli, 2009).

Knowledge-based organizational support (KOS) is, therefore, a relevant topic in both the context of PM and in the topic of knowledge management. KOS refers to the infrastructure that, supported by knowledge management and arranged by the organization, optimizes PM with the aim of improving performance (Fossum *et al.*, 2020; Han *et al.*, 2019).

KOS infrastructure is represented by two key facets: intellectual capital (IC) and knowledge management dynamic capabilities (KMDC). IC is justified as a source for the development, management and use of knowledge-based resources (Garcia-Perez *et al.*, 2020). KMDC becomes relevant once these capabilities emerge from knowledge-creation and sharing practices within organizations and projects (Faccin *et al.*, 2019).

It is worth noting that the organization will display reasonable KOS traits insofar as it guarantees an infrastructure supported by IC and KMDC, which will be likely to improve PM, PP and OP. In this vein, there is evidence in previous literature that IC and KMDC have a positive impact on some OP variables such as new knowledge acquisition, innovative performance and financial performance (Garcia-Perez *et al.*, 2020; Ansari *et al.*, 2016; Hsu and Wang, 2012; Bollinger and Smith, 2001).

Consequently, the present study explores the link between KOS and OP based on the following research question: *How does KOS influence OP, taking into consideration the* role *of PM?* Following previous research on the topic, our research question is universalistic in nature (Davison and Martinsons, 2016). The relationships we propose are designed and assessed using the universalist concepts and measures proposed in previous literature.

2. Conceptual framework

2.1 Knowledge-based organizational support

Organizational support – the way in which the organization promotes its projects to enable better performance – is considered an important factor for improving PP and achieving successful results. Previous research identifies intangible organizational support as the most relevant factor for PP. This includes PM-oriented organizational culture, top management support for project development, incentive schemes, trust, commitment and open communication (Fossum *et al.*, 2020; Doskočil and Lacko, 2018; Gunasekera and Chong, 2018; Lin *et al.*, 2018; Aarseth *et al.*, 2011; Gelbard and Carmeli, 2009; Fortune and White, 2006).

In the context of projects, knowledge management is a key success factor. Organizational support facilitates knowledge management processes in the macro-environment of the project (the organization) to crucially support its management and performance. However, organizational support has not been approached from a knowledge-based perspective. For this reason, the concept of KOS we propose includes two dimensions: IC and KMDC.

On the one hand, IC includes knowledge, skills, stakeholder connections, processes, routines and individual and collective learning (Oh, 2019; Fuentes-Ardeo *et al.*, 2017; Gasik, 2011). On the other hand, KMDC allows the organization to adapt and move in dynamic

environments by reconfiguring knowledge management practices. KMDC and IC are a manifestation of knowledge-based capabilities facilitating the achievement of objectives (Garcia-Perez *et al.*, 2020; Paoloni *et al.*, 2020; Martínez-Martínez *et al.*, 2020; Oh, 2019). Therefore, KOS is defined as knowledge management-supported infrastructure that the organization uses to assist its PM to attain better performance at both project and organizational levels. IC refers to the organization's set of intangible resources, namely, knowledge, experience, technologies, designs and processes, information and relationships, etc. The *Project Management Institute* (PMI) considers IC as one of the organizational factors influencing PM through support for project planning, development and execution (PMI, 2017; Bontis, 1998).

When examining in detail how IC is structured, three dimensions stand out: human capital, structural capital and relational capital. Human capital refers to the individual capabilities, knowledge, abilities and experience of the project's members and stakeholders. In turn, structural capital refers to the mechanisms that the organization makes available to the project team such as systems, procedures, organizational routines or culture. Such mechanisms aim to facilitate the accomplishment of the project's goals in terms of time, cost, scope and value creation. Finally, relational capital is concerned with the quality of the firm's interactions with its internal and external stakeholders, including customers, suppliers, government, unions, investors, etc. (Alexandru *et al.*, 2020; Garcia-Perez *et al.*, 2020; Cegarra-Navarro *et al.*, 2019; Bontis, 1998).

KMDC refers to the organizational capabilities that are used to reconfigure knowledge management practices to adapt to environmental changes. These capabilities arise from creating and sharing knowledge practices implemented in projects and organizations. KMDC is important for initiating, planning, executing, monitoring, controlling and closing projects, as they are conceived as knowledge-based formalized initiatives for the renewal of the organization (Asiaei *et al.*, 2021; Faccin *et al.*, 2019; Easterby-Smith and Prieto, 2008; Cepeda and Vera, 2007).

KMDC includes two dimensions: external learning and internal learning. External learning refers to the firm's abilities to create and integrate new knowledge by interacting with the environment and other organizations. With regard to projects, the interaction of the project members with the project's macro-environment (the organization) and with the external environment facilitates new knowledge absorption and integration, benefiting PM. Conversely, internal learning refers to the new knowledge created by the firm's own cumulative experience using its own resources to meet project goals (Wang *et al.*, 2021; PMI, 2017; Alegre *et al.*, 2013).

2.2 Project management, project performance and organizational performance

International standards such as those published by the PMI and the *International Project Management Association* (IPMA) concur that PM is the application of knowledge, methods, tools, techniques, skills and competencies to project activities to efficiently and effectively achieve goals through processes, including the integration of the various phases of the project life cycle (PMI, 2017; IPMA, 2015).

The core functions of PM refer to characteristics, processes, activities or conditions established throughout the project life cycle that significantly influence its outcome. When these functions are identified and managed promptly, they facilitate effective decision-making and improve project results. Currently, PM is understood from an organizational perspective; that is, projects are considered as temporary organizations in close interaction with a permanent organization (PMI, 2017; Andersen, 2016; Yun *et al.*, 2016; Winter *et al.*, 2006).

The outcome of PM is PP. Following previous literature, we define PP as the completion of a project within the scope, timeline and budget established, assuring end users' and

stakeholders' satisfaction (Ling *et al.*, 2009; Todorović *et al.*, 2015; PMI, 2017; Irfan *et al.*, 2019).

Finally, outstanding PP should improve OP. OP refers to measuring organizational results; that is, evaluating the level of organizational effectiveness. The focus of corporate strategic management is to improve OP overtime. OP measurement comprises financial and non-financial metrics. Financial performance includes profitability indicators, sales growth rate and economic value-added, while non-financial performance covers aspects such as innovation performance, market share, productivity and quality (Jugdev *et al.*, 2020; Irfan *et al.*, 2019; Tseng and Lee, 2014).

3. Research model

According to contingency theory, the chances of project success will increase insofar as the permanent organization – the macro-environment of the project – has an infrastructure suitable for PM, consisting mainly of intangible aspects such as KOS. In turn, organizations will be willing to adopt a PM strategy provided that it leads to a significant improvement in OP (Aubry and Hobbs, 2011; Lawrence and Lorch, 1967). Tables 1 and 2 display previous empirical evidence supporting direct and indirect connections (through PM) between KOS and OP.

Given that knowledge is considered the most important intangible resource for PM, organizational support must focus on building knowledge-based organizational infrastructures. KOS supports decision-making, facilitates problem-solving and fosters knowledge creation and knowledge exchange (Han *et al.*, 2019; Le and Lei, 2019; Fuentes-Ardeo *et al.*, 2017; Liu *et al.*, 2015; Gasik, 2011; Young and Jordan, 2008; Gosain *et al.*, 2005). PM benefits from all these advantages deriving from KOS (Table 1). Hence, we put forward the following hypothesis:

H1. KOS has a positive effect on PM.

PM represents an organizational strategy for achieving competitive advantages. As organizations develop mature PM processes, a significant impact will be generated on

Table 1 Indirect effects of KOS on OP

Effect on PM	*References*	*Effect on PP (through PM)*	*References*	*Effect on OP (through PM and PP)*	*References*
Supports decision-making and facilitates problem-solving	Young and Jordan, 2008; Gosain *et al.*, 2005; Liu *et al.*, 2015	Improvement of "hard" aspects of the project such as time, cost and quality	Albert *et al.*, 2017; Fossum *et al.*, 2020; Sabden *et al.*, 2020	Enhances knowledge creation and competitive advantage	Jugdev and Mathur, 2006; Jugdev *et al.*, 2019
Fosters knowledge creation and knowledge exchange	Han *et al.*, 2019; Le and Lei, 2019	Improvement of "soft" aspects of the project such as motivation, communication and stakeholders' management	Gustavsson and Hallin, 2014; Larsson *et al.*, 2018		

Table 2 Direct effects of KOS on OP

Direct effects on OP	*References*
Improves employees' performance	Chen *et al.*, 2020; Astuty and Udin, 2020; Ridwan *et al.*, 2020
Improves project team performance	Kim, 2017; Haar and Brougham, 2020; Abuzid and Abbas, 2017
Facilitates knowledge exchange and learning processes	Yang *et al.*, 2020; Shateri *et al.*, 2020; Correia-Lima *et al.*, 2019

project success and on OP. In consequence, project success or failure is closely linked to the proper application of PM methods and tools, including hard and soft aspects (Fossum *et al.*, 2020; Sabden *et al.*, 2020; Ronald and Tamara, 2018; Larsson *et al.*, 2018; Albert *et al.*, 2017; Gustavsson and Hallin, 2014; Yazici, 2009). PP might be enhanced as a result of these PM methods and tools (Table 1). Therefore, we hypothesize:

H2. PM has a positive effect on PP.

Organizations are willing to adopt a PM strategy only if it is proven to represent a source of value creation. However, previous literature has not yet found strong empirical evidence for this impact. In fact, although the advantages of PM have been extensively studied, project failure rates remain high, suggesting that further research is needed to gain a better understanding of this phenomenon (Aubry and Hobbs, 2011; PM, 2017).

Previous studies have recognized that even though the tangible resources of PM are valuable, they are not sufficient to develop a competitive advantage. It is intangible resources such as knowledge that lead to competitive advantages (Jugdev *et al.*, 2019; Jugdev and Mathur, 2006). Consequently, because PP generates new knowledge (Table 1), we propose the following hypothesis:

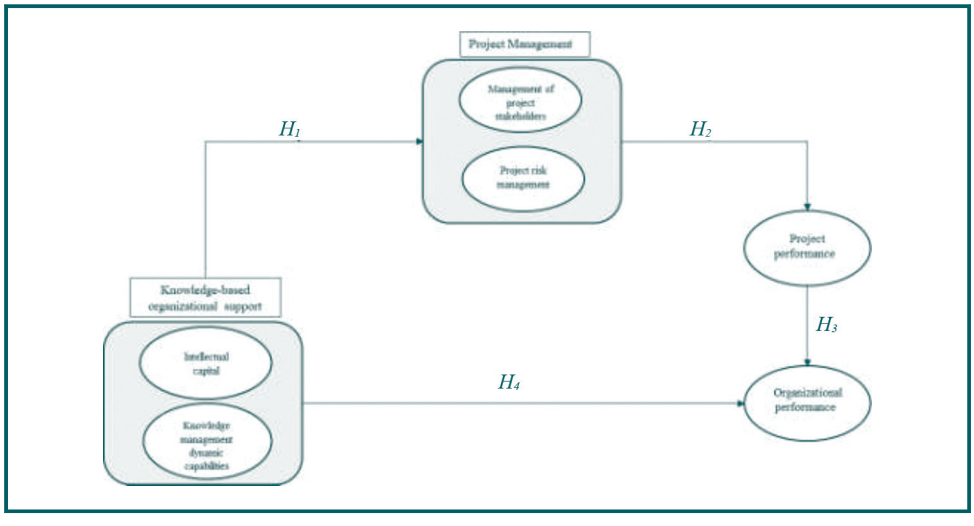
H3. PP has a positive effect on OP.

Recent research has underscored the positive effects of KOS on OP. More precisely, recent findings (Table 2) highlight the contribution of KOS to employees' performance, project team performance and knowledge exchange and learning processes (Li and Liu, 2021; Imran and Aldaas, 2020; Park *et al.*, 2020; Yang *et al.*, 2020; Shateri *et al.*, 2020; Chen *et al.*, 2020; Astuty and Udin, 2020; Ridwan *et al.*, 2020; Haar and Brougham, 2020; Correia-Lima *et al.*, 2019; Kim, 2017; Abuzid and Abbas, 2017). Following this line of research, we hypothesize:

H4. KOS has a positive effect on OP.

By testing *H4* we will assess the importance of the direct effect of KOS on OP while including the mediating and indirect effects through PM and PP (*H1*, *H2* and *H3*). Figure 1 depicts the research model and the hypotheses proposed in this study.

Figure 1 Research model



4. Method

4.1 Sample and data collection

The target population was constructed from public databases in Colombia. The unit of analysis was the organization. Before launching the survey, a pre-test was conducted with three PM experts to validate the content of the indicators, as well as to verify the translation from original sources in the context of the organizations under study (Cegarra-Navarro *et al.*, 2020; Ferreras-Méndez *et al.*, 2016). These experts were a university professor, a university researcher and an industry consultant.

Following Bono and McNamara's (2011) research design recommendations, the information was obtained from two individuals surveyed in each organization (general manager for organizational issues and project manager for project issues) to avoid common method variance bias. An online questionnaire addressed to general managers and project managers from Colombian organizations was administered from October 2017 to March 2018. We accessed information on a project for each company, corresponding to the latest project managed by the respondent. We obtained 106 valid questionnaires, which is an adequate sample to test the model with a statistical power of 80% (Hair *et al.*, 2017; Kock and Hadaya, 2018; Arias-Pérez *et al.*, 2020). Table 3 summarizes the distribution of the sample.

4.2 Measures

KOS: This concept is conceived as a multidimensional construct made up of IC and KMDC. IC is measured with the scale developed by Wang *et al.* (2016) based on Bontis (1998). KMDC is measured with the scale proposed by Alegre *et al.* (2013). These scales are provided in the Appendix. They were chosen for the following reasons:

- they facilitate the connection with the knowledge management literature,
- they have been recently published in relevant academic journals; and
- their validity and reliability have been satisfactorily tested in previous studies (Alegre *et al.*, 2013; Villar *et al.*, 2014; Wang *et al.*, 2016; Asiaei *et al.*, 2018).

PM: Following Yun *et al.* (2016), we conceive PM from the recent core functions perspective as a multidimensional construct with two latent factors: management of project stakeholders and project risk management. Core functions are characteristics, processes, activities or conditions established throughout the project life cycle. They significantly influence its outcome (PMI, 2017). The PM scale is provided in the Appendix.

Table 3 Sociodemographic characteristics of the participants

Organizations	*Levels*	*(%)*
Sector		
	Service/trade	64
	Industrial	36
Size		
	Micro	6.5
	Small	23.5
	Medium	39
	Large	31
Age (years)		
	<20	26.4
	[20, 40)	34
	≥40	39.6

PP: PP is measured with the scale proposed by Ling *et al.* (2009), which has a comprehensive approach, including project delivery, competency at the organizational level and profitability. This scale is provided in the Appendix and has been previously used with satisfactory results (Yang, 2013).

OP: OP was measured through return on assets (ROA). ROA has been used extensively in the management literature to assess OP. Furthermore, it is an objective measurement that increases the reliability of our analyzes when performed together with perceptual measures (Bono and McNamara, 2011; Ul-Haq, 2021). The organizations' financial information was obtained from Colombian public databases and corresponds to the end of December 2018, representing a one-year time lag with respect to the online questionnaire applied to collect primary information. This time lag between the independent variables and the dependent variable is recommended by Bono and McNamara (2011): KOS and PM need to be implemented for a period of time to have observable effects on OP.

4.3 Procedure

The variance-based structural equations models technique was applied through estimation by partial least squares (PLS), using SmartPLS (v. 3.3.3) software. The PLS technique was used for the following reasons:

- the complexity of the structural model, which includes direct and indirect relationships with third-order constructs;
- the use of aggregated scores to model the multidimensional construct following the three-stage approach;
- the use of secondary data, specifically financial indicators, to operationalize OP;
- the fact that data do not follow a normal distribution; and
- latent variables are composites, which is very common in the knowledge management research field (Vatamanescu *et al.*, 2020; Cepeda-Carrion *et al.*, 2019; Hair *et al.*, 2019; Rigdon, 2012).

A three-stage approach was followed to analyze the multidimensional constructs. In the first stage, the aggregated scores of the first-order dimensions were estimated. In the second stage, these scores were used to model the second-order constructs. In the third stage, the aggregated scores of the second-order constructs were estimated and they were used to model the third-order constructs (Sarstedt *et al.*, 2019).

Following Hayes (2015), the conditional indirect effect was analyzed through the moderated mediation index. Finally, data analysis was carried out in two stages: the measurement model was assessed and the structural model was tested (Hair *et al.*, 2017).

The quality of the scales was verified considering the goodness of fit, convergent and discriminant validity and reliability measures (Hair *et al.*, 2017). Following Henseler *et al.* (2016), the goodness of fit was assessed through the following bootstrap-based fit tests with 5,000 subsamples for the saturated model: standardized root mean square residual (SRMR) < 0.08, SRMR $<$ 95% bootstrap quantile (HI95 of SRMR), unweighted least squares discrepancy (dULS) $<$ 95% bootstrap quantile (HI95 of dULS) and geodesic discrepancy (dG) $<$ 95% bootstrap quantile (HI95 of dG).

We used the average variance extracted (AVE) to test convergent validity, accepting values equal to or above 50% (Fornell and Larcker, 1981). We used the Fornell and Larcker criterion to assess discriminant validity, verifying that the AVE was greater than the squared correlation between factors (Fornell and Larcker, 1981). Discriminant validity was also assessed satisfactorily through the Heterotrait-Monotrait (HTMT) criterion: all values were lower than or equal to 0.9 (Henseler *et al.*, 2016). Finally, to assess the scales' reliability we

used Cronbach's alpha, Dijkstra-Henseler's (ρA) index and Dillon-Goldstein's (ρc) index, accepting values greater than 0.7 in all of them.

The possible influence of common factor bias was considered using the ex-ante and ex-post perspectives (Podsakoff *et al.*, 2003). From the ex-ante perspective, two respondents from each organization were surveyed. The anonymity of participants was respected and all responses were considered valid; that is, there were no right or wrong answers. The response scale was different for the dependent and independent variables. Both primary and secondary sources were used and the organizations' financial information included a one-year delay. A pre-test with experts was also carried out before administering the questionnaire. All these procedures are in line with Bono and McNamara's (2011) recommendations.

From the ex-post perspective, Harman's single factor test was applied. All the indicators making up the constructs analyzed were included in factor analysis. This model showed an adequate fit (χ2: 3,264.677, p: 0.00, df: 860, χ2/df: 3.80; SRMR: 0.185, RMSEA: 0.163, CFI: 0.370, GFI: 0.280, AGFI: 0.208, NFI: 0.308), suggesting that common method variance does not represent a significant problem (Podsakoff *et al.*, 2003).

In the structural equations model, the hypotheses were tested through a re-sampling procedure with 5,000 samples. A one-tail test was performed, reporting R^2 and adjusted R^2 of the endogenous variables, the path coefficient (magnitude, sign), significance (*p*-value, confidence interval), endogenous constructs' variance inflation factor (VIF) and size effect (f^2) (Henseler *et al.*, 2016). Because the multidimensional constructs are estimated with the three-stage approach, the structural model is assessed in the third stage (Sarstedt *et al.*, 2019).

Additionally, the global fit of the model was analyzed using the following bootstrap-based fit tests: SRMR $<$ 0.08, SRMR $<$ 95% bootstrap quantile (HI95 of SRMR), unweighted least squares discrepancy (dULS) $<$ 95% bootstrap quantile (HI95 of dULS) and geodesic discrepancy (dG) $<$ 95% bootstrap quantile (HI95 of dG) (Henseler *et al.*, 2016).

5. Results

5.1 Evaluation of the measurement model

Following Henseler *et al.* (2016), the goodness of fit of the saturated model was assessed in the three stages, obtaining SRMR, dULS and dG values lower than the values corresponding to the 95% quantile, as shown in Table 4. Fit criteria were met in the three stages.

The evaluation of the measurement model yields favorable results, as all constructs and dimensions present a Cronbach's alpha $>$ 0.7, AVE $>$ 0.5, composite reliability $>$ 0.7 (Table 5) and discriminant validity is confirmed (Table 6), confirming that the scales meet the psychometric properties. Three indicators (IC3, KMDC8 and PP1) were eliminated in the process for presenting loadings $<$ 0.7 and considering that their elimination does not affect the constructs' content validity. Table 5 shows the outcome of the model's first stage, providing evidence that all validity and reliability criteria are met. These criteria were also assessed satisfactorily in the second and third stages.

Table 4 Goodness of fit of the saturated model

First stage (first-order constructs)	*Original sample*	*HI95*
SRMR	0.058	0.060
dULS	0.220	0.238
dG	0.082	0.113

Table 5 Psychometric properties

		First stage (first-order constructs)			
Construct	*Dimension*	*Cronbach's alpha*	*Composite reliability (ρc)*	*Dijkstra-Henseler's (ρA)*	*AVE*
Knowledge-based organizational support (KOS)	Intellectual capital (IC) knowledge management dynamic capabilities (KMDC)	0.673	0.849	0.85	0.739
Project management (PM)	Management of project stakeholders (MPS) project risk management (PRM)	0.689	0.856	0.847	0.75
Project performance (PP)		0.881	0.914	0.90	0.645
Organizational performance (OP)		1	1	1	1

Note: All loadings are significant and above 0.7

Table 6 Discriminant validity

	Fornell-Larcker criterion					*Heterotrait-Monotrait (HTMT) criterion*			
Constructs	*OP*	*PM*	*PP*	*KOS*		*OP*	*PM*	*PP*	*KOS*
OP	1.000				OP				
PM	−0.085	0.866			PM	0.120			
PP	0.035	0.439	0.803		PP	0.134	0.534		
KOS	−0.166	0.267	0.052	0.860	KOS	0.197	0.334	0.127	

5.2 Structural model contrasting

Figure 2 presents the structural model (Model 1) with parameter estimation. Table 7 shows the results of hypothesis testing. The goodness of fit of the estimated model was assessed, obtaining SRMR, dULS and dG values lower than the values corresponding to the 95% quantile (Table 8).

R^2 and adjusted R^2 were used as criteria to analyze the explained variance of the endogenous variables, yielding these acceptable results: PP (R^2 = 0.198, R^2 adjusted = 0.185), OP (R^2 = 0.030, adjusted R^2 = 0.011), PM (R^2 = 0.073, adjusted R^2 = 0.064).

Figure 2 Model 1

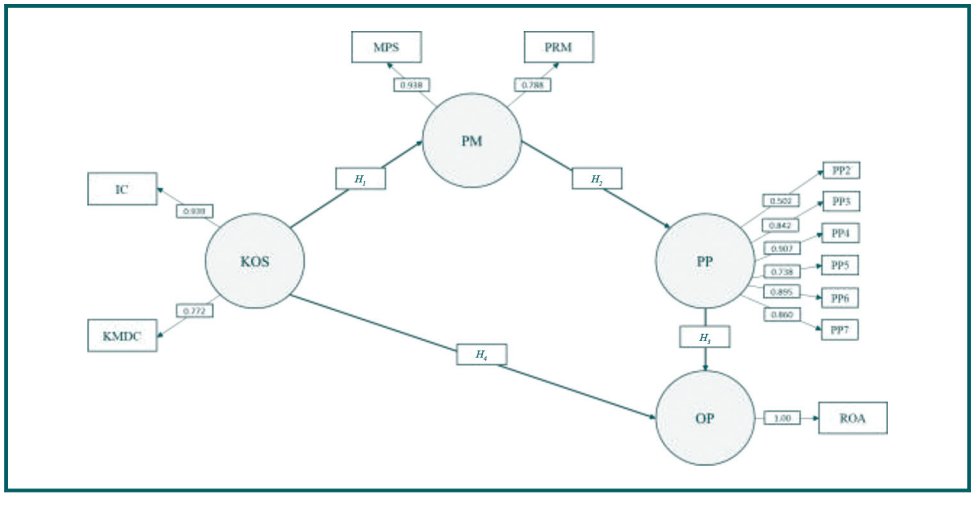


Table 7 Model 1 hypotheses testing

Structural relation	*Hypotheses*	*Standardized coefficient*	p-*value*	*Bootstrapping interval 1 at 95%*	*Result*
KOS-PM	*H1*	0.267	0.014**	(0.080, 0.478)	Supported
PM-PP	*H2*	0.439	0.000***	(0.325, 0.566)	Supported
PP-OP	*H3*	0.044	0.302	(−0.095, 0.178)	Not supported
KOS-OP	*H4*	−0.168	0.009***	(−0.285, −0.054)	Supported with negative coefficient

Notes: *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$, [1]Based on 5,000 sub-samples

Table 8 Goodness of fit of the estimated model

Goodnes of fit indices	*Original sample*	*HI95*
SRMR	0.063	0.073
dULS	0.262	0.351
dG	0.085	0.116

Because we want to achieve a better understanding of the relationships between PP and OP (not supported) and between KOS and OP (supported with negative coefficient), an additional test is performed. This test explores the moderating effects using the following firm variables: age (0: young firms < 25 years of existence in the market, 1: consolidated firms > 25 years of existence); size (0: small firms < 60 employees, 1: large firms > 60 employees); and sector (0: trade and services, 1: industrial).

Our main interests are to explain in which scenarios PP can generate a significant impact on OP and to understand under what conditions the effect of KOS on OP is positive and significant. The resulting model (Model 2) is depicted in Figure 3; it considers the statistically significant moderating effects using the orthogonalization method. Table 9 shows the results of the moderated mediation model.

The moderating effects present positive and statistically significant coefficients, thereby supporting the hypotheses. A theoretical argumentation on the pertinence of these moderating effects is presented in the discussion section to provide a better understanding of the conditions under which KOS has a positive effect on OP. Moreover, as the moderated

Figure 3 Model 2

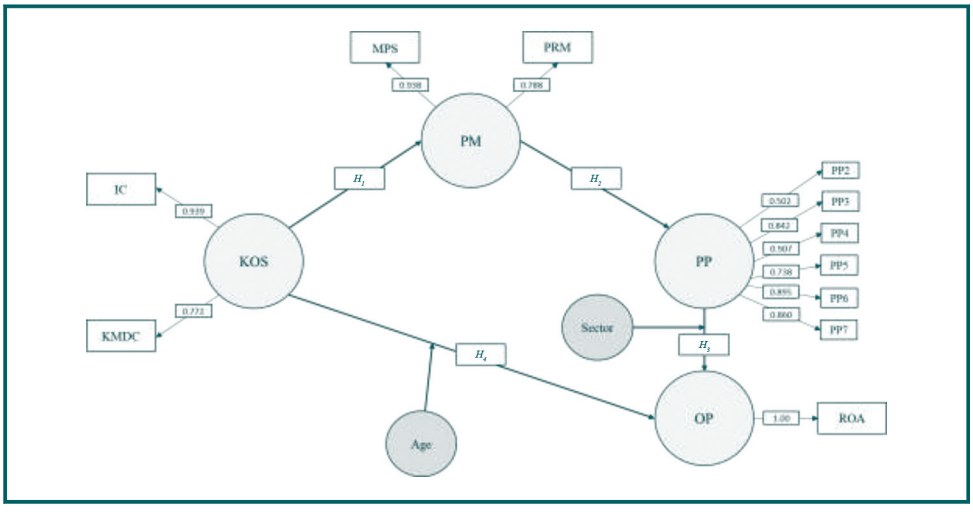


Table 9 Model 2

Structural relation	*Standardized coefficient*	p-*value*	f^2	*Bootstrapping interval*[a] *at 95%*	*Result*
KOS × Age – OP	0.228	0.024**	0.053	(0.075, 0.418)	Supported
PP × Sector – OP	0.266	0.001***	0.067	(0.149, 0.432)	Supported
Mediat moder:					
Structural relation	Bootstrapping interval1 at 95%			Result	
KOS – PM – PP × Sector – OP	(0,0078, 0,0703)			Supported	

Notes: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$, [a]Based on 5,000 sub-samples

mediation index is significant, the indirect effect of KOS on OP, mediated by PM and PP, is conditioned by the sector.

The explained variance of the endogenous variables presents acceptable results: PP (R^2 = 0.193, adjusted R^2 = 0.185), OP (R^2 = 0.154, adjusted R^2= 0.103), PM (R^2 = 0.071, adjusted R^2 = 0.062). Moreover, the VIF values of the exogenous constructs are below 5 (KOS: 1.024, PM: 1.000, PP: 1.005), suggesting that our results are not affected by collinearity.

6. Discussion

Organizational support is recognized as one of the most important critical factors for effective PM (Liu *et al.*, 2015; Young and Jordan, 2008). In this vein, Gelbard and Carmeli (2009) argue that the interactions between team dynamics and organizational support are significantly related to budget, functionality and time performance in projects.

Organizational support is approached in the present study from a knowledge-based perspective (KOS), represented by two dimensions, IC and KMDC, recognizing that knowledge leads to configuring organizational infrastructures suitable for PM (Fuentes-Ardeo *et al.*, 2017; Gasik, 2011). The scale proposed to represent this construct meets the psychometric properties of reliability and validity, which indicates that IC and KMDC, acting together, are a reasonable representation of KOS. Therefore, this new perspective in analyzing organizational support represents an important contribution to knowledge management and PM literature.

Our findings from testing *H1* and *H2* show that KOS positively and significantly influences PM and PP. This is consistent with the tenets of contingency theory and advances understanding on the reasons leading to project success or failure (Mathur *et al.*, 2014; Young and Jordan, 2008).

H3 and *H4* were not fully supported in our first analysis. Empirical management research usually focuses on contrasting preconceived hypotheses. Nevertheless, data analysis may hide an analytical value surpassing any a priori conception (Wenzel and Van Quaquebeke, 2018). In fact, according to some recent findings (Al Yami *et al.*, 2021; Seymour and Hussein, 2014), age and industry could be relevant contextual factors playing a role in our research model. Therefore, with the aim of achieving a greater understanding of the relationships between:

- PP and OP; and
- KOS and OP, additional testing was carried out, which uncovered patterns not contemplated in the research design.

Hence, our findings provide support for the existence of two moderating factors:

- firm age plays a moderating role between KOS and OP; and
- business sector moderates the relationship between PP and OP.

Regarding firm age, previous studies have shown that because of the difficulties in managing knowledge (Sánchez-Polo *et al.*, 2019), the impact of KOS on OP is not direct but depends on contextual and structural factors.

In fact, for young companies, it is very costly to develop and maintain a knowledge-based infrastructure because of their lack of financial resources (Al Yami *et al.*, 2021). Therefore, as young organizations develop a greater KOS, PM and PP are enhanced, but OP remains unaltered. In the case of consolidated firms, the impact of KOS on OP presents an upward trend; that is, the organization's investment in IC and KMDC development is reflected in a positive impact on OP.

Regarding the second of our moderating effects, results show that in organizations from the manufacturing sector, PP has a positive effect on OP, while in the trade and service sector, this effect is not significant. One explanation for this finding is that the manufacturing sector has been a pioneer in the development of project work (Seymour and Hussein, 2014). We suggest that the long experience of PM in the manufacturing sector, as compared to the trade and service sector, has enabled it to configure capabilities for the effective management of projects, minimizing risks and generating higher success rates and, consequently, a positive impact on OP. In this vein, some previous studies such as Raz *et al.* (2002), have found significant sector effects on PP.

Additionally, we found a significant indirect effect of KOS on OP mediated by PM and PP. This represents a moderating mediation (Hayes, 2015) and suggests that both PM and PP in the manufacturing sector are mechanisms that enhance the indirect effect of KOS on OP. In the trade and service sector, we find the opposite situation.

7. Conclusions

The present study empirically analyzed how KOS influences OP, both directly and mediated by PM and PP. Structural equation modeling was applied, meeting global fit, validity, reliability, parsimony and replicability criteria.

Our results show that projects are mechanisms through which KOS generates a positive and significant impact on OP. KOS is also found to be an important antecedent of PM and PP. Additionally, we found that firm age plays a moderating role between KOS and OP, while the business sector moderates the relationship between PP and OP. Moreover, the indirect effect of KOS on OP, through PM and PP, is found to be conditioned by the sector.

This study makes three contributions. First, it underscores the direct impact of KOS on OP. Second, it proposes PM and PP as mediating mechanisms enhancing the impact of KOS on OP. Third, KOS is suggested as an antecedent to PM and PP.

One further contribution of this study is the evidence it provides from Colombia. Like most emerging economies, Colombia has been understudied in the literature on knowledge-based support systems and PM. Delving into context-related concerns, previous research in KOS and PM has been mainly universalistic. As a result, our research framework also takes a universalistic approach. The relationships we propose and test come directly from previous universalistic findings. Although our theoretical model was based on Colombian data, we assume it should also be supported by data from any country, as the relationships we test are fairly generic.

However, "context is king," as Davison and Martinsons (2016) rightly point out. As research in KOS and PM is further developed, theoretical extensions dealing with context (e.g. emerging economies vs developed economies) are required. The concepts we focus on and the generic relationships we suggest in this study could be further developed to better adapt to differentiated contexts in which projects are undertaken. Some recent studies highlight bureaucratic and hierarchical organizations, difficulties in accessing financing resources, economic instability and corruption as some features that project managers in

emerging economies may have to deal with (Rincon-Gonzalez *et al.*, 2019; Guerrero and Urbano, 2020). Further developments including these specific features would provide a more detailed picture of the interactions between KOS, PM and performance in differentiated contexts.

These findings have important implications for decision-making. They provide a greater understanding of the conditions under which KOS generates a significant impact on OP, in a direct manner and through projects. Therefore, allocating resources to configure a knowledge-based infrastructure, through the development of IC and KMDC, is a vital management task. As for IC, the organization should promote the development of the capabilities, knowledge, skills and experience of the project manager and team, as well as those of the organization's personnel charged with offering advice, support and assistance to PM. Managers should also improve the mechanisms, as well as the hard and soft resources required to guarantee the achievement of project goals, while at the same time strengthening the quality of the interaction between the firm and its internal and external stakeholders. Regarding KMDC, we recommend facilitating the interaction between the project manager and team with the macro-environment of the project (organization), as well as with the external environment, enabling absorption, integration and creation of new knowledge.

This study also has some limitations. A cross-sectional design was used, so longitudinal analyzes could be conducted in future research to gain a better understanding of the phenomenon. Different levels of analysis could also be considered (organization, project and stakeholders) to perform multilevel analyzes. Furthermore, a non-probabilistic sample was used for this study; the results should, therefore, be generalized with caution. Finally, OP was analyzed from a financial perspective, so future research could include non-financial aspects for a more comprehensive view.

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Appendix

Questionnaire

A) Knowledge-based organizational support

- *Intellectual capital* Likert scale ranging from (1) strongly disagree to (7) strongly agree

Human capital	
IC1	Employees hold suitable work experience for accomplishing their job successfully in our company
IC2	Employees of our company have excellent professional skills in their particular jobs and functions
IC3	The company provides well-designed training programs
IC4	The employees of our company often develop new ideas and knowledge
IC5	Employees are creative in our company
Structural capital	
IC6	The overall operations procedure of our company is very efficient
IC7	Our company responds to changes very quickly
IC8	Our company has an easily accessible information system
IC9	Systems and procedures of our company support innovation
IC10	Our company's culture and atmosphere are flexible and comfortable
IC11	Our company emphasizes new market development investment
IC12	There is a supportive culture/atmosphere between the departments of our company
Relational capital	
IC13	Our company maintains appropriate interactions with its stakeholders
IC14	Our company maintains long-term relationships with customers
IC15	Our company has many excellent suppliers
IC16	Our company has good, stable relationships with its strategic partners

Source: Wang *et al.* (2016), Bontis (1998)

- *Knowledge management dynamic capabilities* Likert scale ranging from (1) strongly disagree to (7) strongly agree.

Please state the performance of your company as compared with your competitors in the following terms:

External learning competence	
KMDC1	Ability to obtain information about state-of-the-art scientific and technological developments through technological surveillance systems
KMDC2	Effective and updated competitive intelligence
KMDC3	Ability to create knowledge through cooperation with industry associations
KMDC4	Ability to create knowledge through cooperation with R&D institutions such as universities and technological institutes
KMDC5	Technology acquisition (patents, equipment, etc.)
Internal learning competence	
KMDC6	Degree of academic qualification of employees in the R&D function
KMDC7	Ability to be positioned on the technological front line/frontier
KMDC8	Ability to manage the innovation effort
KMDC9	Ability to assess innovation projects
KMDC10	Suitability of human resources devoted to the R&D function
KMDC11	Ability to coordinate and integrate the different innovation project phases and the consequent inter-functional interphases between engineering, production and marketing

Source: Alegre *et al.* (2013)

B) *Project management* Likert scale ranging from (1) strongly disagree to (5) strongly agree.

Effective management of project team (EMP)	
PM10	Team members were familiar with the project execution plan and used it to manage their work
PM12	The project team was well aligned in terms of objectives and expectations
PM18	The project management team was made up of appropriate personnel
PM19	The people worked effectively as a team on the project
PM22	Key members of the project team understood the goals and objectives of the project owner
Management of interaction with stakeholders (MIS)	
PM21	The interrelationships among the project stakeholders were well managed
PM29	The plan and progress, including changes, were clearly and frequently communicated to project stakeholders
PM30	There was a high degree of trust, respect and transparency among the companies that worked on the project
PM33	When problems arose, effective mechanisms existed to ensure that they were solved
Project risk management (PRM)	
PM15	The project had an effective process of risk identification and management
PM23	All key members of the project team were involved in the risk assessment process

Source: Based on Yun *et al.* (2016), PMI (2017).

C) *Project performance* Likert scale ranging from (1) expectations are not strongly met to (7) expectations are strongly exceeded.

PP1	Budget performance (actual cost versus budget)
PP2	Schedule performance (actual versus plan)
PP3	Quality performance
PP4	Owner satisfaction
PP5	Profitability
PP6	Public satisfaction (with the project)
PP7	Project scope

Source: Ling *et al.* (2009).

About the authors

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