Knowledge management orientation as a driver of competitive performance: Evidence from Polish SMEs in the aviation industry

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A B S T R A C T
Objective: This study aimed to investigate the role of knowledge management orientation (KMO) in small and medium-sized companies (SMEs) as a driver of competitive position, with customer orientation and participation in international networks as mediating variables.
Research Design & Methods: The analysis involved structural equation modelling on a dataset of 281 SMEs from south-eastern Poland specializing in the aviation industry.
Findings: The study found that KMO was the strongest positive determinant of the competitive position in the model, with more than half of the effect contributed by indirect regression paths involving mediator variables. Customer orientation enhanced competitive position only through direct effects, while international network involvement contributed to competitive advantage indirectly through the network benefits variable. Interestingly, the only meaningful difference between small and medium firms was found in the regression link between network benefits and competitive position, suggesting that larger firms are better equipped to translate benefits from cooperating with international supply chain partners into advantages against business rivals.
Implications & Recommendations: To practitioners, the study demonstrates how the interplay between knowledge management and cooperation with the supply chain can provide substantive business advantages.
Contribution & Value Added: The study adds to the existing theory by underscoring the importance of KMO to SMEs and explaining its role as an antecedent of beneficial cooperation within international networks of business partners.

INTRODUCTION

In today's information-based and deeply interconnected economy, organizational knowledge is more important than ever for firms of all sizes in the process of gaining a competitive advantage (Prieto & Easterby-Smith, 2006). Despite its prominence in published research, the mechanisms through which organizational knowledge can affect competitive advantage in SMEs are still unclear and warrant further investigation (Genc *et al.,* 2019; Kmieciak & Michna, 2018).

In empirical studies, the firm's capacity to acquire, generate, and employ knowledge is often considered to be part of organizational culture, as it is defined by the dominant shared beliefs and values in the organization that shape employees' perceptions and regulate behaviours regarding organizational knowledge and its application (Janz & Prasarnphanich, 2003). This aspect of organi-

zational culture is central to this research and formally defined as the construct of knowledge management orientation (KMO).

The choice of KMO is driven by two reasons. Firstly, it represents the most comprehensive perspective on the firm's knowledge management practices, encompassing its systematic capacity to assimilate, build, share, and use knowledge in its strategy and operations (Wang *et al.*, 2008). Secondly, the theory and practice of investigating organizational knowledge are well-developed in the literature, including a variety of scales for KMO and its sister concepts of knowledge management and learning orientation (Farooq, 2019), which provide robust methodological foundations with valid and reliable metrics for statistical analysis.

One avenue of research into ties between KMO and competitive advantage is to treat knowledge as a coordinating and supporting mechanism that aids the firm in acquiring and converting resources into capabilities (Darroch, 2005). By analysing the literature on the subject, it should be noted that there is a whole spectrum of factors that directly impact the competitiveness of businesses, however, knowledge management seems to be essential from the standpoint of the use of knowledge resources existing in the firm. Knowledge management was identified by the authors of this study as a factor that has a major influence on SMEs in the process of building their competitive position in the aviation industry. This idea served as the main inspiration for writing this article.

As such, firms with stronger KMO might be more inclined to seek external knowledge by forming closer cooperation networks with their value chain stakeholders, including suppliers, distributors, and clients (Nahapiet *et al.*, 2005). According to the concept of open innovation, such interactions stimulate two-way knowledge transfer, which could be transformed into improved competitive positions for all parties involved (Mazur & Zaborek, 2016). This blueprint for creating knowledge is deemed particularly valid for small and medium-sized businesses, which rarely control sufficient resources to develop critical innovations in-house (Terziovski, 2010). As a means of overcoming resource constraints, they could seek to forge tighter working relationships with other SMEs and large companies. This could provide ample opportunity for acquiring new competencies through observing and replicating partners' best practices, direct knowledge transfers, and joint projects on developing new technologies and other innovative solutions (Banerjee *et al.*, 2015). In the context of cooperative knowledge development, what stands out in the literature as particularly important is international partnerships of SMEs in strategic networks or business groups, which can facilitate access to innovations not only new to the firm, but also to its entire home market, thus stimulating growth, profitability, and other performance metrics (Vătămănescu *et al.*, 2020).

In this study, we aimed to model this cooperative mechanism by proposing that KMO corresponds to stronger international orientation and customer orientation, which are dimensions of organizational culture corresponding to two major sources of external knowledge. This in turn can lead to a stronger involvement in international networks, bringing about a number of network-related benefits, that, if successful, should improve the firm's competitive position. These phenomena were considered against the backdrop of enabling factors reflecting the firm's infrastructure level, such as IT technology and internationalization capacity. Moreover, an important contextual factor that we considered a control variable was the level of internationalization in the company's industry, which can drive organizational behaviours in addition to firm-specific considerations and preferences.

What is unique about the conceptual approach underlying this research is that KMO is considered an antecedent of a wide range of benefits that could be triggered by cooperative behaviour with international partners, going above and beyond those advantages that are derived solely from greater innovativeness. Thus, KMO is cast here as a critical driver of multiple contributions to competitive advantage and empirically tested as such.

This article is structured as follows. The subsequent section will overview pertinent literature sources and develop hypotheses. Then, research methods will be outlined, including the presentation of a conceptual model, sample characteristics, measurement scales, and statistical analysis procedures. The next section will report research findings with hypothesis verification tests, which will be followed by a discussion of the results against the backdrop of earlier published research. The article will conclude by considering limitations and directions for further research.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Nowadays, it is widely recognised that knowledge-based resources are key determinants of a firm's ability to compete in international markets. A number of studies have already demonstrated the strategic importance of knowledge-based resources, knowledge orientation and knowledge management in achieving a superior competitive advantage for the firm (Lee & Tsai, 2005; Subramanian *et al.*, 2009).

Resource-based view (RBV) and knowledge-based view (KBV) provide a theoretical framework that is helpful in understanding the direct mechanism of influence of knowledge management assets and knowledge management orientation (KMO) on competitive advantage. Because of their inimitability and rarity, intangible, knowledge-based assets are crucial for firms to amplify their abilities in the development and deployment of existing resources and create new ones (Porter, 1985). The strategic importance of knowledge is even greater in the case of SMEs, as it can compensate for shortages of tangible resources (Mejri & Umemoto, 2010; Musteen *et al.*, 2014).

The indirect effects of knowledge management orientation on competitive advantage could be captured by distinguishing the key dimensions of knowledge management: knowledge creation/acquisition (learning orientation); knowledge gathering, storing; knowledge transferring and sharing; knowledge exploitation and responsiveness (knowledge reuse). This model is widely used as a reference concept in knowledge management studies (Wang *et al.*, 2008; Massa & Testa, 2009; Farooq, 2019; Lin, 2015).

The first process, knowledge creation and acquisition, underpins the fact that knowledge resides not only in the organization but also beyond its formal boundaries (Dyer & Singh, 1998). The crucial factor for the effective internal creation of knowledge is organizational culture, in particular learning orientation, which shapes employees' perceptions and behaviours by enhancing their willingness to create and apply knowledge (Janz & Prasarnphanich, 2003; Rahimnia & Alizade, 2009; Farooq, 2019). Effective acquisition of external knowledge requires the firm's ability to leverage its inter-organizational relationships to learn from customers, suppliers, competitors, other value-chain members and the public (Malhotra *et al.*, 2005). While network relationships enable access to market-specific and technological knowledge, the individual level of exploration and use of externally sourced knowledge by a firm depends on its dynamic knowledge-based capabilities (Monferrer *et al.*, 2014). Additionally, for SMEs, KMO seems to be a crucial antecedent of their involvement in international networks and internationalization (Saarenketo *et al.*, 2004; Mejri & Umemoto, 2010). In particular, two types of knowledge have been found to facilitate firm internationalization: foreign market knowledge (*e.g.* entrepreneurs' and employees' international experience (Prabandari & Xiu-Hao, 2018; da Rocha *et al.*, 2019; Naldi *et al.*, 2020)) and technological knowledge (Fletcher & Harris, 2012; Naldi *et al.*, 2020).

The second process, knowledge gathering and storage, encompasses the processes of knowledge structuring and formalizing, while the third process refers to the distribution and exchange of knowledge within the company and with external stakeholders. An important factor that affects the firm's ability to store, exchange, and deploy knowledge is its IT infrastructure (Kumar, 2001; Jeong & Hong, 2007). The technological support for knowledge management is particularly designed for explicit and codified knowledge. Different, 'softer' tools and practices are required for tacit knowledge (Hansen *et al.*, 1999). Tacit knowledge sharing and management are based on social mechanisms and interpersonal interactions (Shin, 2004; Massa, & Testa, 2009).

The fourth process, knowledge exploitation and responsiveness, refers to the application of knowledge into products, services, and practices to create market value. Some studies indicate a crucial interactive effect of market orientation on the indirect relationship between knowledge management and competitive advantage (Teece *et al.,* 1997; Jeong & Hong, 2007; Werr *et al.,* 2009). As Kamya *et al.* (2010) point out, 'knowledge management interacts positively with market orientation through the conversion of market information into knowledge that creates competitive advantage.' Among the components of market orientation, customer orientation is recognized as the most important element that provides the foundation for the entire supply chain (Deshpande *et al.*, 1993; Heikkilä, 2002) and serves as the major driver of competitive advantage (Ziggers & Henseler, 2016).

Slater (1995) proposes a culturally based perspective, according to which customer orientation is part of organizational culture manifested through organizational practices targeted at the creation of customer value. These customer-focused practices not only facilitate satisfying customers' needs better than competitors but also may contribute positively to network infrastructure design (Jeong & Hong, 2007). Moreover, market-specific knowledge plays an important role in SMEs' internationalization as it constitutes a key variable in the proactive search for international market opportunities (Monferrer *et al.*, 2014). As a result, there is a better understanding of current and future market trends and a more effective response to market knowledge, which augment firm's competitiveness. A customer-led approach was found to be essential in successfully applying new technology, as well as in the firm's internationalization, which makes it an instrumental predictor variable for business success (Kim *et al.*, 2011).

While the intra-organizational aspects of knowledge management have been widely studied, the literature calls for more theoretical and empirical work to investigate in-depth inter-organizational processes related to knowledge-oriented practices (Lancini *et al.*, 2015; Werr *et al.*, 2009), especially across the supply chain (Russel & Hoag, 2004). Supply chain management requires understanding the processes involved and the accompanying knowledge transfers. Collaboration in sharing this knowledge is crucial. Much research was focused on demonstrating that collaborative knowledge sharing and transfer in supply chains can result in value creation (Tan *et al.*, 2016). According to Shih *et al.* (2012), knowledge sharing has an impact on efficient and effective decision-making. Other authors point out another benefit of knowledge transfer, *i.e.*, relationship flexibility (Blome *et al.*, 2014). Lee *et al.* (2021) add agility, adaptability, and alignment to the list of benefits. According to Fugate *et al.* (2012), knowledge sharing in supply chains can help build a competitive advantage in global markets. From these findings, one can conclude that knowledge management is directly related to supply chain performance (Dost & Rehman, 2016).

Based on the above theoretical considerations, the following hypotheses were proposed:

H1: Knowledge management orientation (KMO) is positively correlated with: H1a) customer orientation (CO); H1b) IT capacity (IT CAP); H1c) international orientation (IO), and H1d) competitive position (COM POS).

H2: Customer orientation is positively correlated with: H2a) international orientation (IO); H2b) involvement in international networks (NET INV), and H2c) competitive position (COM POS).

H3: International orientation (IO) is positively correlated with: H3a) capacity for building international networks (NET CAP); and H3b) involvement in building and coordinating international networks (NET INV).

In order to effectively deploy market-based knowledge across the supply chain, a firm has to develop adequate capabilities (Werr *et al.,* 2009). According to Johanson and Vahlne (2003, p. 93), the development of network relations is gradual and requires both time and resources. Collaboration in the supply chain is facilitated by the physical (IT) infrastructure and the social setting (social dynamics and links among network members) (Lancini *et al.*, 2015). New technology developments in the field of ICT enable firms to acquire new networking capabilities. IT systems support inter-organizational communication, coordination and collaboration (Kumar, 2001). In addition, the Internet has provided numerous cost-saving opportunities for supply chains and has contributed to the rise of new supply chain practices. The development of inter-organizational networks, however, depends not only on technology, but also on people-related aspects (Jeong & Hong, 2007). Essential factors for building long-term cooperative business networks are trust and commitment (Spekman *et al.*, 1998). As noted by Werr *et al.* (2009) 'relationships with customers and distributors are built on trust rather than contracts' and trust is generally 'a result of previous positive interactions.'

The construct of network involvement encompasses a quantitative dimension (the frequency of information and knowledge exchange) and a qualitative one (*e.g.* the nature of information and knowledge exchange, types of activities supported, etc.). Network involvement is generally thought to be driven by the search for knowledge, search for legitimacy and improved market status (Lancini *et al.*, 2015). Frequency and quality of knowledge flows impact network performance in terms of infor-

mation outcomes (involvement in R&D, innovative capabilities, and market communication), operational outcomes (competitive advantage regarding cost efficiencies, lead times, and product quality) and customer outcomes (satisfaction, retention and loyalty) (Jeong & Hong, 2007).

Thus, the following set of hypotheses was developed:

H4: Capacity for building international networks (NET CAP) is positively correlated with involvement in building and coordinating international networks (NET INV).

H5: IT capacity is positively correlated with: H5a) involvement in building and coordinating international networks (NET INV), and H5b) capacity for building international networks (NET CAP).

H6: Involvement in international networks (NET INV) is positively correlated with benefits from international networks (NET BEN).

H7: Benefits from international networks (NET BEN) are positively correlated with competitive position (COM POS).

A firm's internationalization activity and its involvement in transnational networks cannot be adequately understood without accounting for its industry context. Previous research shows that higher levels of internationalization tend to occur more frequently in highly competitive industries (Fernhaber *et al.*, 2008), since establishing contacts outside one's home market is perceived as a valid strategic response to competitors' behaviour (da Rocha *et al.*, 2019). As a result, business contexts where internationalization is commonplace put greater pressure on incumbents and newcomers to follow suit by forming foreign linkages and partnerships and competing on an equal playing field against market rivals (da Rocha *et al.,* 2019; Naldi *et al.,* 2020). Given that in highly internationalized markets the internationalization of an individual company is a necessity and thus hardly a source of competitive advantage, industry internationalization should be controlled for to better explain individual differences between firms in their asset configurations and impacts on performance. Therefore, we propose the following:

H8: Industry internationalization (IND INT) is positively correlated with: H8a) capacity for building international networks (NET CAP), H8b) involvement in international networks (NET INV), H8c) benefits from international networks (NET BEN).

In investigating the role of KMO on competitive advantage, the current research draws heavily on the theoretical background of the resource-based view, the network approach and the dynamic capabilities perspective, all of which anticipate diverse challenges and implementation effects for smaller and larger companies. A conceptual model based on such theoretical foundations is apt to demonstrate considerable differences in regression weights for firms of various sizes. As such, to avoid possible confounding effects, it is instrumental to statistically test the relationships among the focal constructs for moderation based on firm size. Thus, we hypothesize:

H9: Relationships represented in hypotheses 1-8 have different strength in small versus medium companies.

For the sake of clarity, the scope of the study, including investigated constructs, their relationships and proposed hypotheses, was depicted in Figure 1.

As shown in the diagram, the research focused on the concept of knowledge management orientation (KMO) and how it drives the competitive position of the firm (COM POS). Following the literature review reported earlier, we proposed a series of regression paths representing both direct (H.1d) and indirect (H.1a – H.1c) influences of KMO on COM POS. In particular, we expect greater levels of KMO to correspond with stronger international orientation (H.1a), higher customer orientation (H.1b), and increased IT capacity (H.1.c). The assumed relationships of KMO with IO, CO and IT CAP are the starting points of several possible pathways tracing the indirect effects of KMO on COM POS.

The direct link between KMO and COM POS (H.1d) accounts for the positive impact companies can derive from knowledge orientation in addition to those brought by the intensity and scope of their interactions with international business partners in the supply chain (NET INV). This form of benefit (NET BEN) could be attributed to all factors that were not explicitly controlled by the model as separate variables. Such effects may in part stem from the greater flexibility, adaptability, and overall productivity of knowledge-intensive firms. Accordingly, some advantages from network participation are fre-

quently intangible and, thus, difficult to establish with the survey method, but may be observed – for instance – through improvements in pertinent productivity metrics. These benefits are more likely to occur in firms with organizational cultures that enable comprehensive and rapid knowledge acquisition and deployment. Such firms are apt to find additional ways to leverage their presence in networks, for example, by gradually fine-tuning internal processes in line with the best practices observed in close business partners (Michna *et al.*, 2020).
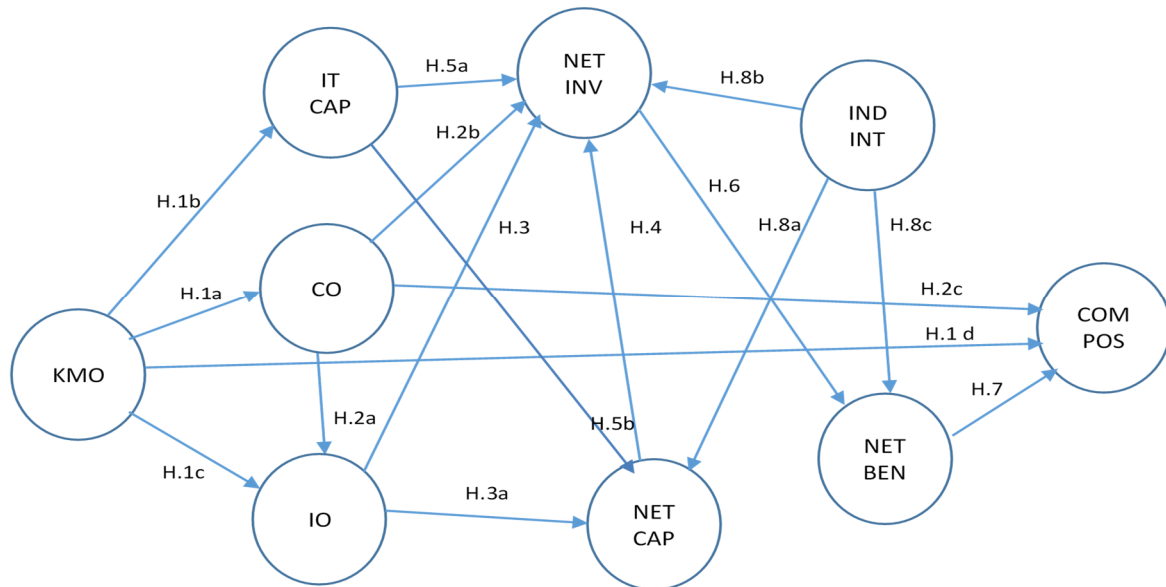

Figure 1. Conceptual model and hypotheses of the study
Source: own elaboration.

The variable of industry internationalization (IND INT) was introduced into the model to control for possible confounding effects of common involvement levels in transnational networks in different industries from which our data points were sampled. Considering that the ultimate measure of success is an improved competitive position, which is assessed in relation to other similar companies, we believe that the prospects for a firm to register competitive advantages are better if its engagement in international networks is greater than that of its market rivals. Hence, the variable IND INT provides a means to disentangle company-specific impacts from industry-wide influences.

In addition to IND INT, we looked at the moderating effect of a company's size, as measured by the number of employees. To this end, the entire model was estimated three times, separately for the whole sample and the subsamples of small firms (employing less than 50 employees) and medium ones (between 50 and 250 employees); then the regression weights were tested for significant differences. The assumption underlying this comparison is that medium firms may benefit more from international networks, due to controlling more extensive resources and wielding greater bargaining power. Furthermore, the typically more complex internal processes in bigger firms can offer more scope for improvement through the adoption of best practices and other forms of know-how from innovative and efficient foreign counterparts.

RESEARCH METHODOLOGY

A dataset for the study was obtained in 2019 by a survey of 281 managers (computer-assisted web interview; CAWI) of 281 firms operating in the south-eastern part of Poland including the city of Rzeszow, which is recognized as the regional hub of smart specialization (It should be mentioned that the highest concentration of aviation industry entities in the region under study is in Rzeszow). This area is dubbed 'the Aviation Valley' due to its high concentration of businesses in the aerospace sector and cooperating industries, such as IT, telecommunications, and astronautics. The existence of an aviation industry cluster

backed by a well-developed physical and institutional infrastructure attracted internationally recognised corporations such as Boeing, Airbus, Mitsubishi, Lockheed Martin, Bombardier, Embraer. As such, many of the investigated firms were relying on advanced technologies and were part of extensive, international supply chains. Such an environment seemed a suitable setting to investigate how KMO and internationalization can lead to a variety of operational and financial benefits.

The dataset was compiled through a simple random sampling conducted by the Regional Statistical Office in Rzeszow from a comprehensive register of businesses operating in the Subcarpathian Voivodeship in the three smart specialization industries of aviation, automotive, and IT. Overall, the collected sample can be considered representative of the population of 8073 enterprises included in the sampling register.

The latent variables comprising the research model were measured through sets of indicators of the Likert-scale type. Each indicator or proxy variable was a single manifestation (in reflective constructs) or a building block (in formative constructs) of its underlying latent variable. Statements for indicators were presented to respondents, who were asked to indicate to what extent they applied to their firms on a scale from 1 to 7, in which 7 represented the highest level of agreement.

The concept of empirical research and the selection of research tools were developed following earlier published studies. The complete list of indicators was given in Table 1, together with literature sources and factor loadings informing of the correlation level of each statement with its estimated latent variable.

Table 1. Likert statements used in the survey for multiple scales measuring latent variables with factor loadings for the overall model (including all sampled firms)

Item designation	Item content	Factor loadings for the pooled model	Literature sources
Knowledge management orientation			
KMO_1	Searching for information about our industry is an everyday routine in our firm.	0.745	(Moilanen *et al.*, 2014; Teece *et al.*, 1997; Nonaka, 2007, p. 162; Perechuda, 2005, p. 219).
KMO_2	Our management encourages employees to make use of external sources of information on our industry.	0.724	
KMO_3	Management expects that employees are regularly acquiring market information useful for the company.	0.823	
KMO_4	In our company information flow is fast.	0.715	
KMO_5	Employees have skills and competences to absorb new knowledge.	0.776	
KMO_6	Employees know how to quickly employ newly acquired knowledge to solve work-related problems.	0.776	
KMO_7	New ideas disseminate quickly among organizational units of the company.	0.822	
KMO_8	Management sets up regular meetings at which new occurrences and problems are discussed.	0.727	
KMO_9	Management supports the development of new and innovative products and solutions.	0.816	
Customer orientation			
CO_1	Satisfying customer needs is the priority of our firm.	0.834	(Lee *et al.*, 2021; Zadykowicz *et al.*, 2020; Weerawardena *et al.*, 2007; Kirca *et al.*, 2005).
CO_2	We are constantly involved in satisfying customer needs.	0.886	
CO_3	Our strategy for attaining competitive advantage is based on a deep understanding of customer needs.	0.849	
CO_4	The business raison d'etre of our company is serving customers in the best possible way.	0.837	
International orientation			
IO_1	Employees of the company have experience of working abroad.	0.820	(Camisón & Villar, 2009, p. 135; Colton *et al.*, 2010, pp. 4, 16-18).
IO_2	Our firm knows how the markets function in other countries.	0.889	
IO_3	Our e-commerce strategy accounts for differences between the national and foreign markets.	0.785	

Item designation	Item content	Factor loadings for the pooled model	Literature sources
	Involvement in international networks		
	Our firm is involved in the building and coordinating of networks to create:	0.892	(Raymond *et al.*, 2014, p. 238; Weerawardena *et al.*, 2007; Mandell & Keast, 2008).
NET_INV_1	a learning organization through cooperation with other companies	0.900	
NET_INV_2	a transnational supply chain strategy	0.932	
NET_INV_3	a transnational marketing strategy	0.729	
NET_INV_4	Internet-based segmentation and positioning in the global market	0.892	
	Capacity for building international networks		
NET_CAP_1	Our firm is capable of creating transnational networks while retaining its local sensitivity.	0.905	(Ma *et al.*, 2013; Levy & Haber, 1988; Chen *et al.*, 2019).
NET_CAP_2	The same components of our organizational structure serve both domestic and international operations.	0.868	
NET_CAP_3	Our company shows high levels of internal integration across its all geographical markets.	0.910	
NET_CAP_4	Our company maintains an intense exchange of products, resources, people, and information with our business partners.	0.870	
NET_CAP_5	Our organization is ready to transfer and acquire knowledge with our business partners.	0.881	
NET_CAP_6	The firm can build cross-border structures to connect firms in its border region.	0.887	
	IT capacity		
IT_CAP_1	The firm has a scalable IT platform to enable future development.	0.846	(Colton *et al.*, 2010, p. 18; Iyengar *et al.*, 2015).
IT_CAP_2	Key production processes are automated supporting increased cost efficiencies from future volume growth.	0.813	
IT_CAP_3	The firm is using IT technologies to facilitate supporting processes, such as decision-making, accounting, reporting, planning, and statistical data analysis.	0.869	
IT_CAP_4	All employees have sufficient skills to make adequate use of IT technologies.	0.707	
IT_CAP_5	The current know-how of the company does not hamper further development of IT solutions.	0.805	
	Industry internationalization		
IND_INT_1	In our industry, most customers search for suppliers all over the world before making the final purchasing decision.	0.917	(Oczkowska *et al.*, 2016, p. 39; Naldi *et al.*, 2020; da Rocha *et al.*, 2019; Prabandari & Xiu-Hao Ding, 2018).
IND_INT_2	Our domestic market has norms, standards, and customer expectations that are similar to the global market.	0.839	
IND_INT_3	The main direct competitors in our industry come from different countries.	0.877	
	Benefits from international networks		
The company's involvement in international networks has a positive effect on:		For formative constructs, factor loadings cannot be computed.	(Flatten *et al.*, 2011, p. 152; Johanson & Vahlne, 2003; Zhang *et al.*, 2016).
NET_BEN_1	financial outcomes		
NET_BEN_2	involvement in R&D		
NET_BEN_3	capacity for market communication		
NET_BEN_4	acquiring new experience and knowledge		
NET_BEN_5	diversification of the product portfolio		
	Competitive position		
Your evaluation of the firm's market position against major competitors		For formative constructs, factor loadings cannot be computed.	(Hall, 1993; Kapler, 2007; Day & Wensley, 1988).
COM_POS_1	cost structure		
COM_POS_2	brand recognition among customers		
COM_POS_3	technological competencies and know-how		
COM_POS_4	profitability		
COM_POS_5	productive organizational culture		
COM_POS_6	marketing know-how		

Source: own study.

To verify the hypotheses, a structural equation model was estimated with the partial least squares method (PLS-SEM) using the SMART PLS software, version 3.3. We opted to use PLS-SEM instead of another common approach known as covariance-based SEM (CB SEM) because of two distinct characteristics of the data. Firstly, most Likert-scale indicators did not have a multivariate normal distribution, which is mandatory for a CB SEM model to be estimated with accurate standard error values, while PLS-SEM, which relies on bootstrapping, does not make such an assumption. Secondly, the need to estimate two formative constructs favours PLS-SEM, which is often considered the better choice over CB SEM for such analytical tasks (Hair *et al.*, 2014, p. 15).

RESULTS AND DISCUSSION

The SEM analysis generated three models representing different groups of surveyed companies. The first model illustrates the hypothesized relationships in the entire sample of 281 firms. Then, the sample was split into two parts according to employment and separate models were estimated for small companies (less than 50 employees), and medium firms (between 50 and 250 employees). As was already indicated, the need to compare smaller and larger businesses was grounded in our literature-backed expectation of dissimilar mechanisms operating in each subgroup, possibly resulting in markedly different strengths of regression paths.

The three models were shown in Figures 2-4. To make the interpretation of regression paths easier, the diagrams were simplified by leaving out indicators of latent variables (factor loadings for indicators in the first, general model were listed in Table 1; the two size-specific models had similar patterns of factor loadings, not showing statistically significant differences). The numbers next to regression paths represent standardized regression weights between respective pairs of constructs, while those inside construct circles are coefficients of determination (R-squared) informing on the proportion of variance in the construct explained by the model.
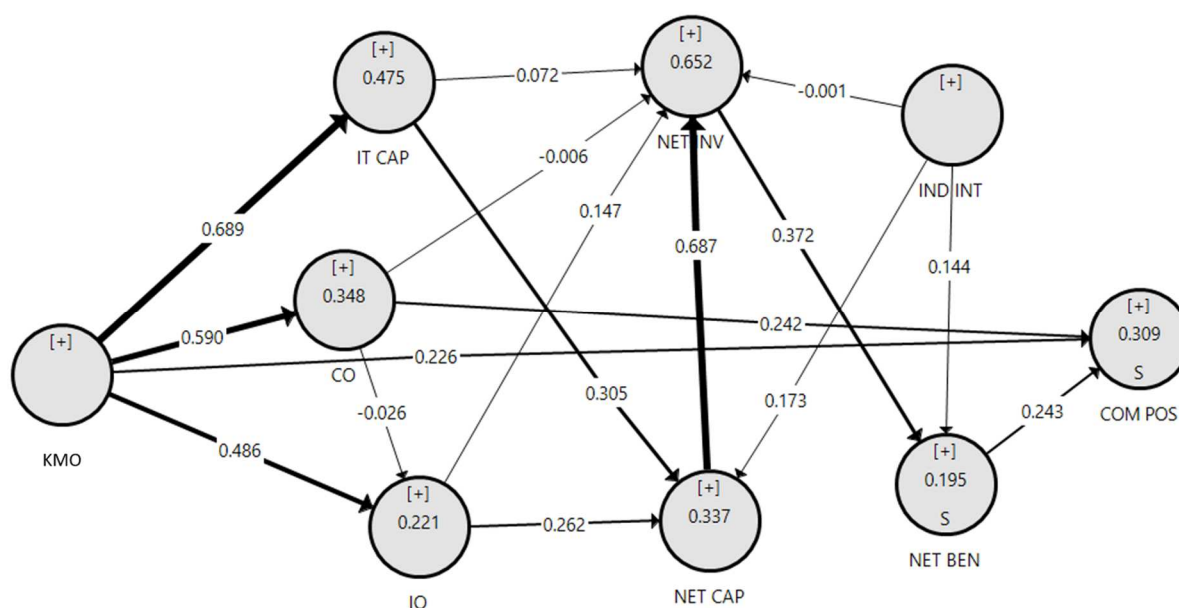

Figure 2. Structural model of relationships between knowledge management orientation and competitive position for the entire sample (n=281)
Source: own elaboration.

Prior to discussing the patterns found in the models, it is instrumental to establish the quality of the obtained solution in terms of the reliability and validity of the latent variable estimates (*i.e.,* the quality of the measurement model), as well as the significance of the regression paths.

To assess the match of the latent variables with their indicators, one needs to investigate each construct in terms of its internal reliability, convergent validity, and discriminant validity.
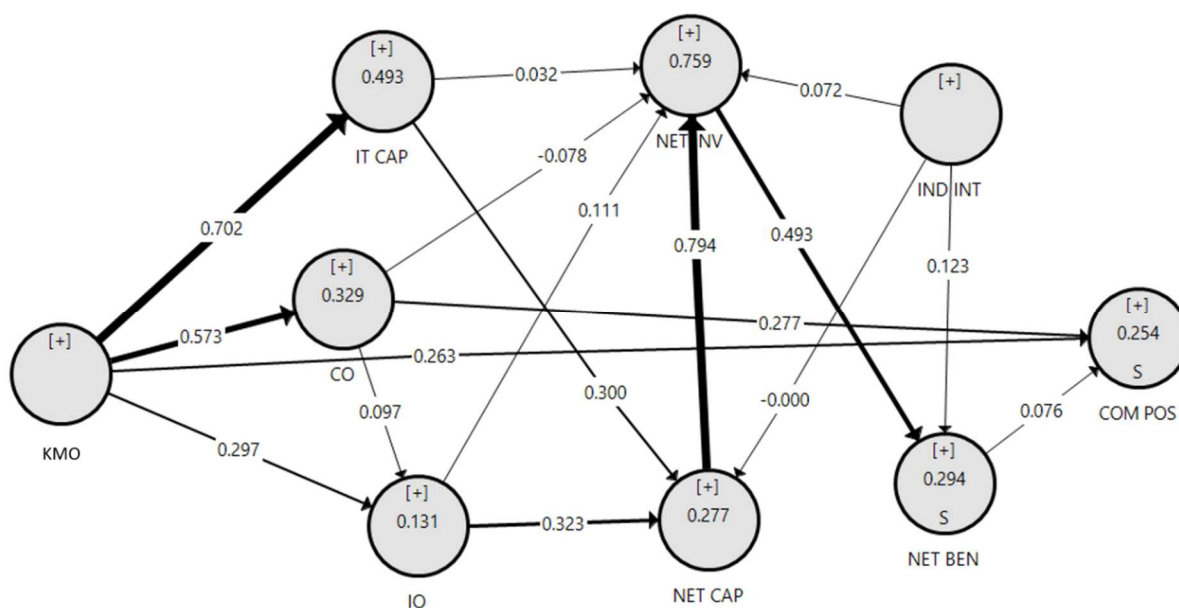
**Figure 3. Structural model of relationships between knowledge management orientation
and competitive position for small firms (employment < 50; n=93)**
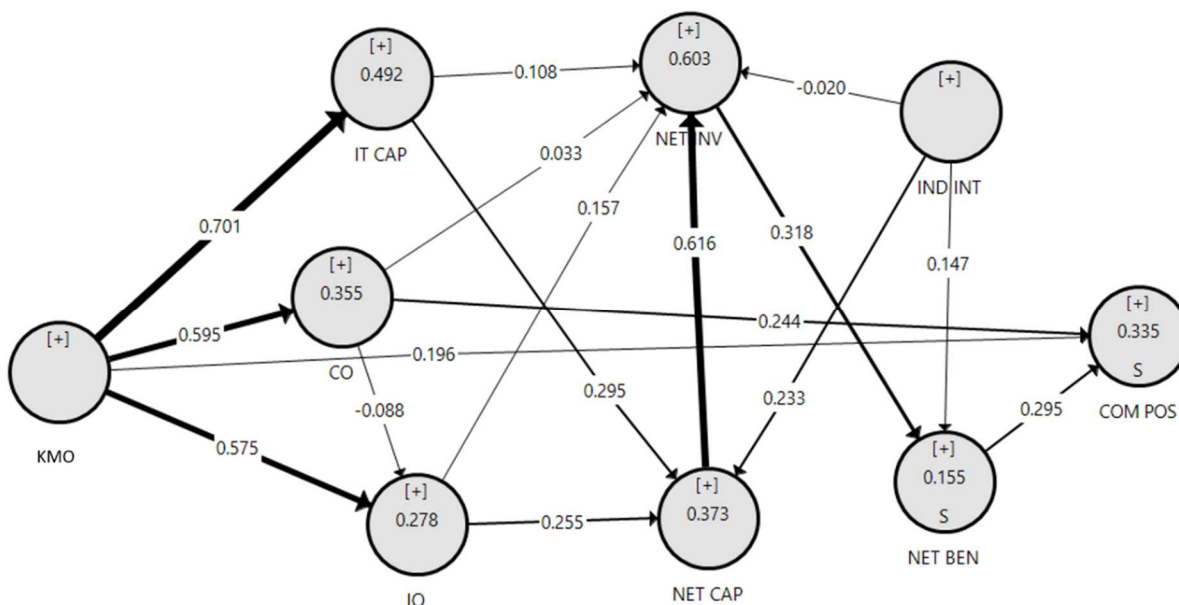Source: own elaboration.

**Figure 4. Structural model of relationships between knowledge management orientation
and competitive position for medium-sized firms (employment > = 50 & <250; n=188)**
Source: own elaboration.

A common metric of internal reliability is Cronbach's alpha, which corresponds to the average level of correlations among indicators of a construct. For a scale to be deemed reliable, Cronbach's alpha should be greater than 0.7 (Malhotra, 2010, p. 287).

Convergent validity informs how much variability in indicators is explained by a construct. The metric used here is AVE (average variance extracted) and must be greater than 0.5, which means that at least 50% of the variance in a set of observable variables is explained by their underlying construct (Hair *et al.*, 2009).

The third aspect of model quality is discriminant validity, which represents the extent to which indicators are more correlated with their designated constructs than with other constructs meas-

uring different concepts. When a set of indicators is, on average, more correlated with another latent variable than its own, it suggests a misspecified model with too much overlap between concepts' content. This approach, known as the Fornell-Larcker criterion, suggests that discriminant validity can be established when AVE is greater than MSV (maximum shared variance with other constructs in the model) (Hair *et al.*, 2009).

Table 2 sets out Cronbach's alphas, AVE and MSV metrics for each reflective construct in the model. It can be noted that the table does not include competitive position and benefits from international networks, since these are formative constructs and, as such, do not need to display consistent correlational patterns. Rather than extracting a single score from the shared variance in indicators, the two formative constructs in the model were computed by taking the mean of all observed variables representing each construct. Thus, each manifest variable was assumed to contribute the same relative amount to the value of the construct indices.

Table 2. Measures of internal reliability, convergent validity, and discriminant validity for three structural models

Construct	Entire sample			Small firms (<50)			Medium (=>50<250)		
	C.'s alpha	AVE	MSV	C.'s alpha	AVE	MSV	C.'s alpha	AVE	MSV
Knowledge management orient.	0.914	0.594	0.475	0.870	0.502	0.493	0.927	0.633	0.491
Customer orientation	0.875	0.725	0.348	0.819	0.649	0.328	0.893	0.757	0.354
International orientation	0.778	0.693	0.268	0.864	0.786	0.245	0.734	0.655	0.285
Involvement in international networks	0.888	0.751	0.627	0.868	0.726	0.713	0.900	0.769	0.564
Capacity for building international networks	0.946	0.787	0.627	0.952	0.808	0.713	0.940	0.771	0.564
IT capacity	0.870	0.656	0.475	0.877	0.671	0.493	0.866	0.655	0.491
Industry internationalization	0.852	0.772	0.193	0.813	0.725	0.208	0.860	0.781	0.190

Source: own study.

The metrics given in Table 2 are indicative of adequate measurement models for the investigated constructs. For all latent variables, Cronbach's alphas were greater than 0.7 and the smallest AVE was above a cut-off point of 0.5. Moreover, all AVEs were greater than their respective MSVs. These results imply that the constructs were measured with sufficient reliability and demonstrate adequate levels of convergent and discriminant validity. However, medium-sized firms seem to have better diagnostics overall, indicating that the scales and possibly the underlying theory may be better suited for studying these phenomena in bigger companies.

Having validated the fit of the model with empirical data, the next step in the analysis was to test the research hypotheses. It was accomplished with the bootstrapping method, which produced confidence intervals and p-values for regression weights. Here, the bootstrapping procedure involved 5000 resamples, which is considered a sufficient number to reliably estimate standard errors. Table 3 provides regression weights and significance values for the relationships indicated in the hypotheses of the study.

Tests for the significance of regression paths can determine if direct correlational effects exist between pairs of constructs. Positive outcomes (p-values < 0.05) give support to respective hypotheses, whereas insignificant results indicate that the pertinent relationships are unlikely to exist in the general population of firms. Noteworthy, direct effects do not provide the full picture of associations in the model; for pairs of variables that are linked not only by direct regression lines but also through indirect paths involving other variables (*e.g.*, KO and COM POS), it is informative to investigate indirect and total effects. Accordingly, the total effects observed in the model were reported in Table 5. However, the mere existence of direct effects is enough to validate the study hypotheses. Thus, based on the significance of the direct regression links it can be argued that:

1. Hypotheses H1a through H1d, H3a, H4, H5b and H6 are true in the general sample and in both subgroups of firms.
2. Hypothesis H2c is true in the general sample and in small firms but not in medium-sized firms.
3. Hypotheses H.3b, H.7, H.8a and H.8c are validated for the overall sample and medium firms but seem to be false for small firms.
4. There is no support for H.2a, H.2b, H.5a and H.8b in any group of companies.

Table 3. Significance tests of regression weights between constructs for the three estimated models (significant values at the 0.05 level marked in bold)

Hypotheses	Regression paths	Entire sample		Small firms		Medium firms	
		Regression weights	Bootstrap p values	Regression weights	Bootstrap p values	Regression weights	Bootstrap p values
H.1a	KMO -> CO	**0.590**	**0.000**	**0.573**	**0.000**	**0.595**	**0.000**
H.1b	KMO -> IT CAP	**0.689**	**0.000**	**0.702**	**0.000**	**0.701**	**0.000**
H.1c	KMO -> IO	**0.486**	**0.000**	**0.297**	**0.029**	**0.575**	**0.000**
H.1d	KMO -> COM POS	**0.226**	**0.002**	**0.263**	**0.025**	**0.196**	**0.032**
H.2a	CO -> IO	-0.026	0.759	0.097	0.564	-0.088	0.394
H.2b	CO -> NET INV	-0.006	0.871	-0.078	0.208	0.033	0.471
H.2c	CO -> COM POS	**0.242**	**0.025**	**0.277**	**0.044**	0.244	0.082
H.3a	IO -> NET CAP	**0.262**	**0.000**	**0.323**	**0.006**	**0.255**	**0.001**
H.3b	IO -> NET INV	**0.147**	**0.016**	0.111	0.274	**0.157**	**0.043**
H.4	NET CAP -> NET INV	**0.687**	**0.000**	**0.794**	**0.000**	**0.616**	**0.000**
H.5a	IT CAP -> NET INV	0.072	0.309	0.032	0.725	0.108	0.264
H.5b	IT CAP -> NET CAP	**0.305**	**0.000**	**0.300**	**0.013**	**0.295**	**0.001**
H.6	NET INV -> NET BEN	**0.372**	**0.000**	**0.493**	**0.000**	**0.318**	**0.000**
H.7	NET BEN -> COM POS	**0.243**	**0.000**	0.076	0.258	**0.295**	**0.000**
H.8a	IND INT -> NET CAP	**0.173**	**0.003**	-0.000	0.999	**0.233**	**0.002**
H.8b	IND INT -> NET INV	-0.001	0.988	0.072	0.278	-0.020	0.713
H.8c	IND INT -> NET BEN	**0.144**	**0.019**	0.123	0.339	**0.147**	**0.040**

Source: own study.

Even though a lot could be inferred from the above statistics about similarities and differences between small and medium firms, Hypothesis 9 was omitted from the table, because it calls for dedicated formal tests of differences. Such tests – again, based on a bootstrapping procedure – were summarized in Table 4.

Table 4. Tests for the difference of regression weights between small and medium firms (based on bootstrapping with 5000 resamples and Welch-Satterthwait formula; significant outcomes at the 0.05 level highlighted in bold)

Regression paths	Path coefficients difference (small firms - medium firms)	t-Value	p-Value
KMO -> CO	-0.022	0.210	0.834
KMO -> IT CAP	0.001	0.014	0.989
KMO -> IO	-0.278	1.793	0.076
KMO -> COM POS	0.067	0.452	0.652
CO -> IO	0.185	0.954	0.342
CO -> NET INV	-0.111	1.437	0.153
CO -> COM POS	0.033	0.168	0.867
IO -> NET CAP	0.068	0.484	0.629
IO -> NET INV	-0.046	0.366	0.715
NET CAP -> NET INV	**0.177**	**2.074**	**0.040**
IT CAP -> NET INV	-0.076	0.577	0.565
IT CAP -> NET CAP	0.005	0.033	0.973
NET INV -> NET BEN	0.175	1.667	0.098
NET BEN -> COM POS	**-0.219**	**2.395**	**0.018**
IND INT -> NET CAP	-0.233	1.873	0.064
IND INT -> NET INV	0.092	1.076	0.284
IND INT -> NET BEN	-0.024	0.166	0.869

Source: own study.

As can be seen from Table 4, smaller and larger firms had very similar regression patterns for most of the pairs of variables in the model. It could be observed that KMO has a positive direct impact on IT CAP, CO, IO, and COM POS. In all models, the strongest correlation occurred between KMO and IT CAP (0.689 in the entire sample, 0.702 in small firms, 0.701 in medium-sized firms), which explains ca. 47.5%-49.2% of the variance in these three endogenous variables (Figures 2-4). This could suggest that organizational knowledge management in companies is focused on developing technical capacities, improving marketing skills (through customer orientation), and extending international networks.

The two cases where firms of different sizes showed meaningful differences involve the relationships: NET CAP -> NET INV and, even more notably, NET BEN -> COM POS. Accordingly, the data imply that *benefits from involvement in international networks translate into an improved competitive position only for medium-sized companies*, while such an effect was not found in small firms. This suggests different mechanisms at play within each type of business, possibly linked to a greater scope, complexity and bargaining power in larger firms that serve as enabling factors for transforming direct benefits from cooperation in supply chains into a substantive competitive advantage. These findings are consistent with research by Musteen *et al.* (2014) showing that building networks might be a necessity for SMEs in order to overcome a lack of resources and achieve success.

The second significant difference involves smaller firms having stronger links between their capacity to participate in international networks and their actual involvement in such cooperative structures. This could also be interpreted in light of the superior potential and bargaining power of larger firms, which may enable them to form transnational networks that rely more on partners' resources than their own. Overall, one can conclude that the evidence collected partially supports Hypothesis 9.

In interpreting the results, additional valuable insights could be gleaned from investigating the indirect and total effects of the study variables on the benefits of participation in international networks and an improvement in a competitive position. This information can be found in Table 5.

Table 5. Total and indirect effects of model variables on joint and individual benefits from cooperation (the values could be interpreted as ordinary correlation coefficients)

Construct	Small firms				Medium firms			
	Indirect effects		Total effects		Indirect effects		Total effects	
	NET BEN	COM POS	NET BEN	COM POS	NET BEN	COM POS	NET BEN	COM POS
KMO	0.135	0.169	0.135	0.432	0.123	0.182	0.123	0.377
CO	-0.021	-0.002	-0.021	0.275	0.002	0.001	0.002	0.244
IO	0.181	0.014	0.181	0.014	0.100	0.030	0.100	0.030
NET CAP	0.391	0.030	0.391	0.030	0.196	0.058	0.196	0.058
IT CAP	0.133	0.010	0.133	0.010	0.092	0.027	0.092	0.027
IND INT	0.036	0.012	0.159	0.012	0.039	0.055	0.187	0.055
NET INV		0.038	0.493	0.038		0.094	0.318	0.094
NET BEN				0.076				0.295

Source: own study.

Despite the identified differences between the two types of companies in how network benefits correspond to a better competitive position, there are also some striking similarities in the hierarchy of drivers of competitive advantage. In both cases, the strongest positive determinant of competitive position was knowledge orientation. The findings are directly in line with previous observations. Knowledge orientation is regarded by many authors as a crucial element in building competitive advantage (Ndlela & du Toit, 2001; Muthuveloo *et al.*, 2017). Regardless of the company's size, the absolute strength of the effect was similar, and less than half of the total effect was contributed by indirect regression paths (48% for medium companies and 39% for small firms). This finding seems to underscore the importance of cultivating organizational culture and developing procedures that support the effective creation, absorption and application of knowledge. A similar conclusion was reached by Liu *et al.* (2021) in a meta-analytic study. They have demonstrated that there is a positive relationship between knowledge-friendly organizational culture and organizational performance (both financial

and non-financial). Rahimnia and Alizade (2009) stress the importance of culture for managing knowledge successfully. In the absolute sense, in our study, customer orientation was a slightly more potent factor for the competitive position of smaller versus larger companies (0.432 and 0.377). In relative terms, CO was the second most important factor in small firms but only the third one in medium-sized businesses, where it was surpassed by beneficial influences of network benefits (0.295). Aside from these three variables (KMO, CO and NET BEN), the other components of the model did not seem to have significant impacts on the competitive advantage of the surveyed firms. Overall, these findings are consistent with results reported by other researchers (Kirca *et al.*, 2005; Ziggers & Henseler, 2016). These studies suggested that customer orientation is a building block of the competitive position of firms, although no distinction was made regarding the size of companies.

One of the major findings of the study was the observation that reported network benefits do not seem to be associated with the competitive position of small companies. As it was previously mentioned, we attributed this fact to the different nature of processes operating in small versus larger firms. However, one could offer a different explanation, arguing that the main reason for the existence of such a pattern was that smaller companies obtained substantively fewer benefits from international networks than their larger counterparts. To investigate if the average amount of reported network benefits in smaller firms was any different than in larger businesses, we performed a t-test for two independent samples using construct scores obtained from the model. The outcomes of t-tests for these and other constructs in the study are shown in Table 6.

Table 6. T-tests for differences in means comparing small and medium firms on investigated constructs (significant differences marked in bold)

Constructs	Levene's test for equality of variances			t-test for equality of means		
	F	p-value	t	df	p-value	Mean Difference (smaller firms - larger firms)
KMO	2.488	0.116	0.742	279	0.458	0.094
CO	0.515	0.474	0.346	279	0.730	0.044
IO	0.010	0.921	0.675	279	0.500	0.086
NET CAP	3.051	0.082	2.380	**279**	**0.018**	**0.300**
IT CAP	0.018	0.895	1.849	279	0.065	0.234
IND INT	**4.367**	**0.038**	**2.734**	**228.49**	**0.007**	**0.316**
NET INV	1.336	0.249	1.555	279	0.121	0.197
NET BEN	1.573	0.211	1.619	279	0.107	0.205
COM POS	3. 229	0.073	1.934	279	0.054	0.244

Source: own study.

The performed t-tests indicated that only for two latent variables small and larger firms displayed meaningful differences: smaller firms appeared to have on average higher scores in NET CAP and IND INT, pointing to better-declared network capacities and a higher level of internationalization in their industries as compared to medium companies. However, these differences, although statistically significant, are not very substantial. Interestingly, in terms of other variables, no significant differences were found, implying that both groups of firms had similar levels of average values. Consequently, this observation strengthens the case for observed differences being caused by diverse organizational dynamics and mechanisms rather than unequal levels of KMO, IO, CO, or NET BEN.

CONCLUSIONS

The study sought to investigate the role of intangible resources in generating competitive advantage in high-tech SMEs. In particular, we focused on knowledge management and its interplay with cooperative behaviour in international supply chains.

The findings confirmed our assumption about the vital importance of knowledge management in building competitive advantage and the role of internationalization as a mediator between the

firm's capacity for effectively managing knowledge and its competitive performance. One of the most interesting insights emerged from the comparison of small and medium-sized businesses, showing that medium firms are much more successful in transforming their involvement in international networks into competitive benefits while in other aspects of the model both groups of enterprises did not show meaningful differences.

This implies that in order to improve a firm's market position through this type of internationalization, some additional conditions must be met, which appear to be lacking in the small firms in our sample. Since the current study did not involve additional metrics to identify the reasons for this observation, one can only speculate about the true causes. Firstly, small firms tend to have weaker bargaining power versus their medium-sized counterparts, which can influence the cooperative arrangements in the international supply chain and make them less advantageous. Another enabling factor at play here could be a critical mass of knowledge, skills, and capacities necessary for effectively employing new knowledge gained from foreign partners, which might not have been attained by many small enterprises. Whatever the underlying mechanism responsible, this finding appears to offer considerable contributions to both practice and theory, as it can point to vital managerial issues and indicate directions for new research into the topic.

Future research projects may try to replicate the outcomes of this study in other settings (both country- and industry-wise) and at the same time, they should attempt to explain the mechanism leading to the differences between small and medium firms. One avenue to follow would be to include in the conceptual model additional moderators representing pertinent resources, both tangible and intangible, that could serve as enabling factors in transforming network benefits into business performance. Moreover, it would be interesting to see how the relationships depicted by our model evolve over time in the same set of companies, which would call for longitudinal design. Some valuable explanations could also be provided by case-study research, involving a detailed in-depth analysis of a small group of companies, relying on the triangulation of multiple, detail-rich internal data sources.

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Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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