

# The Role Of Management Capability On Innovation Capability

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## Abstract:

**Purpose:** Performance of firms has traditionally examined innovation and management capabilities as separate explanatory factors, leaving the potential relationship between innovation and management capabilities being less understood. In this context, the purpose of this paper is to demonstrate how management capability influences innovation capability to enhance firm performance.

**Design/methodology/approach:** A systematic literature review was carried out resulting in 67 papers for which 14 were selected as the basis of this research. A rigorous analysis of these papers resulted in the development of an emerging model: a framework synthesizing our key findings. Furthermore, we conducted a survey involving 166 manufacturing companies in Brazil, allowing us to empirically test the proposed framework.

**Findings:** We find that the relationship between management capability and innovation capability manifests through two distinct, yet complementary concepts: knowledge management capability (KMC) and innovation management capability (IMC). At such, KMC can be considered as the main antecedent of innovation capability while IMC acts as a mediator between innovation capability and firm performance.

**Practical implications:** The framework developed herein can assist managers in comprehending the role management capability holds on innovation capability. KMC can be considered as the main factor leading to better results on innovation capability and IMC is, therefore, a determining factor to boost the business performance of other innovation capabilities. Our framework can be used as a tool to improve the innovation capability and firm performance.

**Research limitations:** Our study holds limitations that warrant attention. First, based on our systematic literature review, we propose a framework that has been empirically tested, however, as the survey was carried out in one specific context, we urge future studies to engage with the proposed framework in different industrial and geographic contexts.

**Originality/value:** There has been an upsurge in the literature on IMC and KMC highlighting their significant influence on firm performance. However, what has been lacking, are studies that are able to disentangle the mechanisms between IMC and KMC for which this paper seeks to tackle. Our contribution clarifies that management capability is important to improve innovation capability through the KMC. We highlight the role of IMC to improve the impact of innovation capability on firm performance, using financial indicators. Moreover, another contribution is the framework we have developed based on the systematic literature review, which demonstrates the relationships presented in this study.

**Keyword:** innovation capability; management capability; knowledge management capability; firm performance.

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## I. Introduction

Knowledge, experience, and skills forms the basis of firm capabilities<sup>1</sup>. Furthermore, firms' ability to integrate, build and reconfigure internal and external resources and competences, as put forward in the dynamic capabilities concept<sup>2</sup> is considered pivotal in explaining firm performance. Management and innovation capabilities are internal factors considered to significantly improve performance through being emphasized as some of the key important internal sources of competitive advantage<sup>3</sup>.

Management capability is considered as the implementation of new or improved management methods and/or practices in the organization of work and in the internal and external relations of companies<sup>5</sup>. Innovation capability can be described as the ability to absorb, adapt, and transform a given technology into specific operational, managerial, and transactional routines that can enhance firm performance, through utilizing technological development capability to internalize new knowledge<sup>4</sup>.

Management and innovation capabilities have both been considered vastly within the innovation studies literature. However, these are not considered in tandem. At such, the role that management capabilities can have on innovation capabilities are not clear. Some authors consider management capability as an antecedent of innovation capability<sup>6, 7, 8, 9</sup>. To other authors, management capability is part of the innovation capability construct<sup>4, 10, 11, 12, 13</sup>. Recent studies have paid attention to knowledge management capability being considered as an antecedent of innovation capability<sup>14, 15, 16, 17, 18</sup>.

However, despite these recent studies indicating the potential relationship between these constructs, they utilize different approaches, concepts and models leading to a lack of clear understanding how they potentially intertwine and impact firm performance (separately or combined). Consequently, we address this ambiguity, by asking whether management capability is an antecedent or mediator of innovation capability as has been put to the fore in some studies, or is it merely a different kind of innovation capability (such as development technology, or transaction capability)? In this context, the aim of this paper is to improve our understanding of what drives firms' performance by disentangling the relationship between management capabilities and innovation capabilities.

To reach our aim, we conducted a systematic literature review, and a content analysis of the material included in the review. On this basis, we developed an 'emerging model' that seeks to explain the relationship between management capabilities and innovation capabilities.

We furthermore empirically tested the emerging model involving 166 manufacturing companies in Brazil. Results demonstrate that knowledge management capability has a positive impact on innovation capability and that innovation management capability plays a mediating role in the relationship between innovation capability and performance, proving that knowledge management capability and innovation management capability play distinct and important roles in achieving enhanced performance.

## II. Theoretical background

### Management capability

Management capability refers to the knowledge, skills, and experience possessed and employed by individuals holding managerial roles<sup>19</sup>. Management capability is according to Barney (1991) pivotal in achieving sustainable competitive advantage. By conducting a systematic literature review<sup>21</sup>, we have identified three distinct concepts that encompass the term "Management capability". These concepts include general management capability, knowledge management capability and innovation management capability, as depicted in table 1 (see section 3 on the methods of the systematic literature review conducted herein).

**Table no 1:** Approaches to management capability.

Management capability	Knowledge management capability	Innovation management capability
Basterretxea I., Martínez R. (2012)	Mota Veiga P., Fernandes C., Ambrósio F. (2023)	Oliveira C.A.O., Ruffoni E.P., Maçada A.C.G., Padula Á.D. (2019)
Börjesson S., Elmquist M. (2011)	Gui L., Lei H., Le P.B. (2024)	Zawislak P.A., Alves A.C., Tello-Gamarra J., Barbieux D., Reichert F.M. (2012)
Wu W.-Y., Li C.-Y., Wu Y.-J. (2005)	Chawla, AS; Kundu, SC; Kumar, S; Gahlawat, N; Kundu, H (2021)	Lewrick M., Raeside R. (2010)
	Nguyen T.N., Shen C.H., Le P.B. (2021)	Lewrick M. (2009)
	Lei H., Khamkhoutlavong M., Le P.B. (2021)	Tuominen M., Anttila M. (2006)
		Francis D., Bessant J. (2005)

In previous scholarly work, Wu, Li, and Wu (2005) examined management capability as a multifaceted construct that encompassed other capabilities. Among these capabilities, innovation capability is a constituent element. Management capability comprises innovation capability, financial capability, corporate responsibility, managers' competence, culture, intra-industrial integration, and international operation. Following the research conducted by Wu, Li, and Wu (2005), management capability is considered the most important factor tackling external and internal threats and opportunities, and to develop and motivate employees to innovate and achieve the highest levels of performance. Therefore, in this context and according to the authors, management capability is important to improve innovation capability.

In a similar vein, Börjesson and Elmquist (2011) carried out a longitudinal case study of Volvo cars and points to a clear need to develop management capability. In addition, the authors addressed the importance of an insightful strategic top management to develop innovation in large companies. Moreover, Basterretxea and Martínez (2012) show that management capabilities are a decisive factor for the development of innovation capability in industrial firms. Therefore, firms with superior management capabilities show greater innovation capabilities, leading to superior performance. Consequently, in these studies, management capability is considered an antecedent of innovation capability.

In this sense, recent studies by the authors Lei, Khamkhoutlavong, and Le, (2021); Chawla (2021) and Nguyen, Shen and Le (2022) have treated knowledge management capability (KMC) as an antecedent capability leading to enhanced innovation performance. Consequently, in the next section, the role of KMC on innovation capability is discussed.

**Knowledge management capability**

Knowledge management capability can be described as the firm’s capabilities of acquiring, sharing, and applying knowledge resources to generate core value and sustain competitive advantage<sup>14</sup>. According to Nonaka and Takeuchi (1995), there are two essential means by which companies acquire knowledge, either by seeking and acquiring entirely new knowledge or by creating new knowledge from existing knowledge through collaboration between individuals and business partners.

In a recent study, Lei, Khamkhoutlavong, and Le, (2021) reveals that the key role of knowledge management capability (KMC) is to act as a prime strategy for firms to foster innovation capability and sustainable competitive advantage in the business environment. Their findings point at KMC holds significant effects on exploitative and exploratory innovation<sup>24</sup>.

Chawla (2021) show that effective knowledge management in firms leads to better innovation capabilities and higher firm performance. The study establishes that both technical and administrative innovations are positively influenced by knowledge management capability. The finding supports the well-established notion that KMC makes way for more innovations in the organization.

Other authors like demonstrates that KMC can serve as an effective mediator between transformation leadership and two specific aspects of innovation capability namely radical and incremental innovation. Furthermore, the influences of KMC on specific aspects of innovation capability are different and depend on the degree of collaborative culture in an organization. Mota Veiga, Fernandes and Ambrósio (2023) have found evidence supporting an association between knowledge spillovers, knowledge management capabilities and innovative capacity. This study highlighted the positive effect of knowledge management capabilities on innovation capabilities. Therefore, findings show that knowledge spillovers work as external benefits of knowledge creation, increasing the innovation activities of companies.

Gui, Lei and Le (2024) presented a significant contribution in developing a theoretical model examining the antecedents and conditions of innovation capability. Their findings highlight that influences of KMC on aspects of innovation capability are distinct and depended on the degree of innovative climate in an organization.

To measure KMC, five authors have used constructs with variables based on the previous studies of Chen and Huang (2009), Salem (2014) and Mao et al. (2016). Three authors (Nguyen, Shen & Le, 2022; Lei, Khamkhoutlavong & Le, 2021; Gui; Lei & Le, 2024) have used the validated construct of Mao et al. (2016) to measure KMC and Mota Veiga, Fernandes and Ambrósio, (2023) have used the Salem (2014) validated construct. Chawla et al. (2021) have used the variables acquisition, share and application, that are the basis of the knowledge management capability concept (Chen & Huang, 2009). Thus, it was possible to classify all other constructs according to these dimensions.

Knowledge acquisition is composed of acquisition of new partners, filter knowledge, structure to discovery new knowledge, generate new knowledge from existing knowledge. Knowledge sharing is composed of periodic meeting to share knowledge, formal processes to share knowledge, formal processes to share best practices, accessibility of knowledge to stakeholders. Knowledge application is composed of use knowledge to develop new products or services, use knowledge to solve problems, protect knowledge from inappropriate use inside the firm, technology to retrieve knowledge about its markets and competition, employees are specialists in their own part. table 2 demonstrates the different dimensions of management capability.

**Table no 2:** Dimensions of knowledge management capability.

Knowledge Management Capability	Authors from systematic literature review				
	Chawla et al. (2021)	Gui; Lei; Le (2024)	Mota Veiga; Fernandes; Ambrósio, (2023)	Nguyen; Shen; LE (2022)	Lei; Khamkhoutlavong; Le (2021)
	Authors used as base of KMC construct				
	Chen and Huang (2009)	Mao et al. (2016)	Salem (2014)	Mao et al. (2016)	Mao et al. (2016)
Processes to gain knowledge from suppliers, customers and partners	knowledge acquisition	X	X	X	X
Processes for filtering knowledge	knowledge acquisition		X		
Structure facilitates the discovery of new knowledge	knowledge acquisition		X		
Generate new knowledge from existing knowledge	knowledge acquisition	X		X	X
Periodic meetings to inform employees about the latest innovations	Knowledge sharing	X		X	X
Formal processes to share the knowledge among the different fields of activities	Knowledge sharing	X	X	X	X
Formal processes to share the best practice among the different fields of activities,	Knowledge sharing	X		X	X

Knowledge is accessible to those who need it	Knowledge sharing	X		X	X
Processes for using knowledge to develop new products or services	Knowledge application	X		X	X
Processes for using knowledge to solve new problems	Knowledge application		X		
Processes to protect knowledge from inappropriate use inside the firm	Knowledge application		X		
Uses technology to retrieve knowledge about its markets and competition	Knowledge application		X		
Employees are specialists in their own part	Knowledge application		X		

These studies have shown the importance of knowledge management capability to improve innovation capabilities and reveal that KMC precedes innovation capabilities rather than being a part of it. By analyzing prior studies, it can be inferred that the primary factor contributing to improved innovation capability is knowledge management capability. Based on the presented discussion, the following hypothesis is presented.

**H1:** knowledge management capability is an antecedent factor that has a positive influence on innovation capability.

**Firm performance**

Organizational performance measures are utilized to assess the outcome of companies, enabling the monitoring of essential indicators that offer valuable insights. These measures aid in controlling the expected outcomes of predefined actions, or determining the current state of a company<sup>28, 29</sup>.

Financial performance indicators (such as profitability, sales volume, and return on investment) are widely used to measure firm performance<sup>30</sup>. Atkinson et al. (2015) state that financial performance is related to providing greater results for shareholders, being basically constituted by indicators that monitor increased revenues and reduced costs and expenses. Financial performance measures indicate whether a company's strategy, its implementation and execution are contributing to improved financial results. Financial objectives are typically related to profitability, measured, for example, by operating revenue, return on capital employed or economic value added. Some alternative financial objectives may be rapid sales growth or cash flow generation<sup>31, 32</sup>.

Other measures that are not directly related to monetary values (such as market share, customer satisfaction and productivity), are coined non-financial measures. Thus, non-financial performance measures refer to the organization's performance on issues such as inventory, customer satisfaction, competitive advantage, service delivery time or product, quality and many others<sup>29, 33</sup>.

**Innovation management capability**

In an earlier study on management and innovation capability, Francis and Bessant (2005) presented innovation management capability as the way to organize the innovation process, considering product, process, position and paradigm, based on 4 P's innovation approach<sup>34</sup>. These outputs reveal that innovation management capability is crucial in achieving improved innovation outcomes.

Considering a different approach, Tuominen and Anttila (2006) used an innovation capability construct composed by two dimensions: technological innovation and managerial innovation. These dimensions are based on previous studies of Sanchez (1995), Gatignon et al. (2002) and Damanpour (1991). In this approach, similar to previous studies<sup>7, 34</sup>, management capability is part of the construct of innovation capability and not an antecedent. The study by Tuominen and Antilla (2006) show that technological and managerial innovation capabilities lead to better performance of firms, highlighting the importance of both capabilities.

Lewrick (2009) presented the innovativeness, capabilities, and potential model (ICP) as an initial approach to include various capabilities in the evaluation of companies and to predict the success probability. The ICP model is composed by market orientation, customer orientation, competitor, market and competitive environment, diversification and learning, management capabilities, knowledge management, organizational and inter-organizational networks, and the measurement of outcomes. ICP model forms the basis for studies by Lewrick and Raeside (2010) and have shown that management capabilities are crucial to innovation, success, and sustainability, especially in fast growing companies.

Basterretxea and Martínez (2012) studying Basque industrial firms find that firms that achieve superior performance are those firms with superior management and innovation capabilities. Moreover, it is herein highlighted that management capabilities are considered a decisive factor for the development of innovation capabilities.

Zawislak et al. (2012) presented a model holding similarities to the model developed by Tuominen and Anttila (2006) and comprising two dimensions, namely technology and business capability. However, in the model

proposed by Zawislak et al. (2012), the two dimensions are further broken into two for which technology capability is divided into technology development and operation capability, and business capability is split into management and transaction capability. This study demonstrates that every firm has all four capabilities. Furthermore, any firm, when established, is primarily technological or transactional, and as they evolve, operational or managerial.

The model developed by Zawislak et al. (2012) was validated by Alves et al. (2017) and further utilized by Oliveira et al (2019) to test the impact of innovation capabilities on innovation performance in Brazilian food companies. In this study, innovative performance is not positively affected by innovation management capability. This capability, within the wider context of innovation, seems to play a secondary role in promoting innovative performance, contrary to previous studies like Alves et al. (2017) where innovation management capability presented a positive impact on firm performance.

To measure innovation management capability, numerous authors have used constructs with variables based on previous studies including Sanchez (1995), Damanpour (1991), Gatignon et al. (2002), Aguirre et al. (2006) and Zawislak et al. (2012).

Based on these authors, innovation management capability construct is composed by strategic vision formally defined, integration of all sectors with technology, standardized documents and procedures, use innovative management tools and techniques, employee training, financial management and socio-environmental responsibility, managers' qualification, new ways of accomplishing our targets and objectives and decision-making process to achieve goals.

These authors suggests that innovation management capability can play an important role in the relationship between innovation capability and firm performance. Herein, it is apparent that innovation management capability can enhance firm performance, however, it is not clear if the effect of innovation management capability is direct, indirect or it has a mediator or moderator effect on firm performance.

In this sense, other studies have demonstrated the indirect effect of management capability on innovation, as in the research by Henao-Garcia and Montoya (2021) who carried out studies in Colombia and their results suggest that companies do not obtain the best results with the simultaneous introduction of technological and management innovations, since management innovation negatively moderates the relationship between technological innovation and performance. However, management and technological innovations positively influence company performance when they are introduced in companies separately.

Zimmermann and Ferreira (2020) analyzed the moderating effect of supply chain strategies between innovation capabilities and business performance and found that core and complementary innovation capabilities positively impact business performance and that supply chain strategies moderate the relationship between innovation resources and business performance. Tuominen and Anttila (2006) highlight that appropriate management resources are needed to balance managerial and technological innovation capability.

In other studies, Camisón and Vilar-Lopes (2014) demonstrated that organizational innovation favors the development of technological innovation capabilities and that both organizational innovation and the technological capabilities of products and processes can lead to superior firm performance. Roberts (1995) carried out a study in 109 companies around the world, which showed that a determining aspect of performance in Research and Development (R&D) depends on the effectiveness of the articulation between the business and the technological strategy. Yusof et al. (2023) demonstrated that innovation capability fully mediates the relationship between radical innovation and business performance in construction companies in Malaysia.

Ferreira and Coelho (2020) also proved that there is a direct and indirect influence of innovation capability on business performance. Lawson and Samson (2001) emphasize that, for innovation to occur effectively, there must be a link between the technological strategy and the business strategy, which is provided by management capability. Kafetzopoulos and Psomas (2015) report that managerial innovation has an impact on business performance, as it is related to reducing transaction costs, increasing productivity, increasing employee satisfaction, creating internal and external knowledge.

These definitions lead to the understanding that managerial innovation capability has an important role to improve other kinds of innovation capabilities. Therefore, innovation management capability could hold an important role as a mediator between innovation capabilities and firm performance.

Zawislak et al. (2012) describes the managerial innovation capability as the ability to transform the result of technology development into coherent operations and transaction agreements. In other words, this capability aims to influence the effect of the other capabilities. Barney and Clark (2007) present an adjustment in the theory of the resource-based view when considering the organization as a fundamental factor for a company to have a sustainable competitive advantage, considering that it is not enough to have valuable resources or capabilities, which are rare, and costly to imitate, it is furthermore essential that an efficient management is in place to obtain maximum advantage of their resources and capabilities.

Innovation management capability is, therefore, a determining factor to boost the business performance of other innovation capabilities (technological, operational, and transactional development). Thus, this capability

can be understood as a mediating force, which will exert influence (positive or negative) on other variables (innovation capabilities). This means that a sufficient level of management capability can improve levels of technological development, operation, and transaction capabilities. Based on the presented discussion, we can conclude that, innovation management capability has a mediating effect on the relationship between innovation capabilities and different types of organizational performance. Innovation management capability can be considered as a bridge between innovation capability and increased firm performance. Based on the presented theories, the second hypothesis is proposed.

**H2:** Innovation management capability has a mediator factor that improve the relationship between innovation capability and firm performance.

### III. Method

To accomplish the intended research objectives, the study was conducted in two distinct stages. Firstly, a systematic review of the literature was conducted, followed by a survey. The collected data were subsequently analyzed using statistical methods. The forthcoming sections will provide a detailed description of the methodology employed.

#### Systematic literature review

We conducted a systematic literature review based on the procedures suggested by Tranfield, Denyer and Smart (2003), starting with the review planning, in which we identified the need for a review, prepared the proposal and developed a review protocol. The next step consisted of the selection of studies, study quality assessment, data extraction and data synthesis. Finally, it was possible to proceed with a report, highlighting evidence of the selected papers.

The search was conducted in August 2023, included all years, in the Web of Science and Scopus databases, allowing the key terms (“innovat\* capabilit\*” OR “innovat\* capacit\*”) AND ("management capabilit\*" OR "management capacit\*"), to appear in the title, abstract and keywords of the material. We considered both articles and literature reviews, but limited the search area to "business, management, economics and accounting". A summary is presented in table 3.

**Table no 3:** Research protocol.

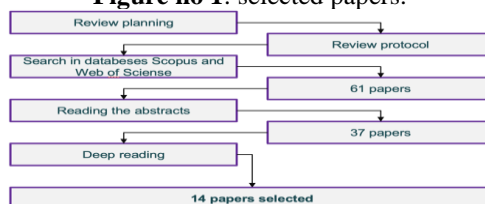
Criteria	Web of Science	Scopus
Terms	“innovat* capabilit*” OR “innovat* capacit*” AND "management capabilit*" OR "management capacit*"	“innovat* capabilit*” OR “innovat* capacit*” AND "management capabilit*" OR "management capacit*"
Search fields	Title, abstract, author keywords, and Keywords	Title, abstract, author keywords
Period	All years until august, 2023	All years until august, 2023
Document type	Article, Review	Article, Review
Subject area	Business, management, economics	Business, management, and accounting; Economics, Econometrics an Finance
Language	English	English

In all, the search yielded 82 papers (48 papers in the Scopus database and 34 papers in the Web of Science database). After the duplicates were removed, we were left with 61 papers to review (27 papers were only in the Scopus database and 16 only in Web of Science database). The 61 selected papers are composed by 56 published papers and 5 considered articles in press.

At this stage, all abstracts were read and papers that did not deal with the relationship between innovation capabilities and management capabilities were excluded. It was used as an exclusion criterion, the articles in which management capability was only related to marketing orientation, behavior of people, trust, and other subjects, but not to firm performance or innovation directly, were excluded. Consequently, we ended up with 37 articles.

In this step, all papers were read and analyzed. In this stage, we excluded 23 papers that were not related with management capability and innovation capability or were not related to the business – related literature, which left us with 14 papers. These papers were re-read in depth and were used as a basis for the results found in this research. Figure 2 illustrate the steps of papers selection.

**Figure no 1:** selected papers.



Based on the systematic literature review, it was possible to elaborate the framework of innovation capability, management capability and firm performance as shown at Figure 1 above. With the conduct of a field research, it was possible to test empirically the proposed framework. The quantitative methodological procedures are shown below.

**Scope and research subjects**

A survey was performed in a group of 166 small, medium, and large manufacturing companies located in the south region of Brazil. This sample represents 10.38% of the 1,600 manufacturing companies in the state of Rio Grande do Sul, which include more than 20 employees<sup>49</sup>. Manufacturing companies with less than 20 employees are classified as micro companies and were not included in this study. In this sample, all segments are proportionally represented, based on CNAE classification, as shown in the table 4. The respondents were owners, directors, and managers, who are responsible for managing and monitoring the innovation process of the companies surveyed.

R&D intensity is one of the most important indicators used by the OECD (2005) to classify industrial sectors according to their technological intensity, classifying sectors into four main groups of technological intensity: high technological intensity, medium-high technological intensity, medium-low technological intensity, low technological intensity. As this is research related to innovation capability, industrial companies were selected that are classified as medium-low, medium-high and high technological intensity activities.

Table 4 shows the manufacturing industrial segments that are part of the sample. It is important to highlight that the proportion that each segment represents in state of Rio Grande do Sul manufacturing industry was observed, enabling a more assertive analysis, reducing the bias in relation to any segment that could influence the results.

**Table no 4:** Field of activity of the surveyed companies.

FIELD	Level of technological intensity	Total number of companies	% of total companies	Sample	% of sample
Electronics	High	101	6.3%	13	7.8%
Pharmaceuticals	High	21	1.3%	2	1.2%
Automotive	Medium-high	162	10.1%	16	9.6%
Chemicals	Medium-high	141	8.8%	14	8.4%
Electric	Medium-high	61	3.8%	6	3.6%
Equipment carriage	Medium-high	10	0.6%	1	0.6%
Machines and equipment	Medium-high	432	27.0%	46	27.7%
Several	Medium-high	101	6.3%	9	5.4%
Machine maintenance	Medium-low	30	1.9%	3	1.8%
Metallurgy	Medium-low	80	5.0%	8	4.8%
Non-metallic	Medium-low	141	8.8%	14	8.4%
Plastic and Rubber	Medium-low	322	20.1%	34	20.5%
Total		1,600	100%	166	100%

The states of South of Brazil (RS, SC e PR) are between 5 most innovators states of Brazil<sup>50</sup>. Despite Rio Grande do Sul is considered one of the most innovative states of Brazil, there are limited studies about potential linkages between management innovation capability, knowledge management capability and performance in this region.

**Measures**

Based on the systematic literature review, validated constructs were used to test the hypotheses. Knowledge management capability is based on Chen and Huang (2009), Mao et al. (2016) and Salem (2014). The variables are detailed in figure 5. To measure Innovation management capability, validated construct from Zawislak et al. (2012), Aguirre et al. (2006), Sanchez (1995), Gatignon et al. (2002) and Damanpour (1991) are used. However, the operation capability is not used in this study because it is considered an ordinary capability, according to recent studies presented by Alves et. al (2017) and Leo et. al (2022). To measure firm performance, the Balanced Scorecard (BSC) was used as the base to measure financial firm performance. The validated construct developed by Webber et al. (2018) that is based on Kaplan and Norton (1992). The variables are detailed in table 5.

**Table no 5:** Variables to measure innovation capability, management capability and firm performance.

Construct	Cronbach alpha	Variables	Authors
Technology development capability	0.70	Capability to design its own products or services	Zawislak et al. (2012)
		Capability to prototype its own products or services (test product, pilot product...)	
		Capability to launch its own products or services.	
	0,77	Capability to impose its terms of negotiation on its suppliers.	Zawislak et al. (2012)

Transaction capability		Capability to impose its prices on the market.	
		Capability to impose its terms of trade on customers.	
Innovation management capability	0.74	Company uses internal standards and documents for work procedures.	Aguirre et al. (2006), Sanchez (1995), Gatignon et al. (2002), Damanpour (1991), Zawislak et al. (2012)
		Company uses up-to-date management tools and techniques.	
		Company uses modern financial management practices such as management software, BI (Business intelligence), performance indicators, etc.	
Knowledge management capability	0.86	Capability to obtain knowledge from suppliers, customers, and partners	Chen & Huang (2009), Mao et al. (2016) and Salem (2014)
		Company has a structure that facilitates the discovery of new knowledge (spaces for networking, laboratories, places for training, etc.)	
		Company holds periodic meetings to inform employees about the latest innovations.	
		Company has formal processes for sharing knowledge across different business areas.	
		Company has formal processes for sharing best practices across different fields of activity.	
		Company has processes to protect knowledge from inappropriate use within the company.	
Financial performance	0.81	Increase in revenue in the last 3 years	Kaplan & Norton (1992); Webber et al. (2018)
		Reduced production costs and fixed expenses over the last 3 years.	
		Increase in profit margin (gross profit) in the last 3 years	
		Increase in net profit over the last 3 years	

**Data collection and analysis**

Data collection was carried out between March 31, 2023, and May 2, 2023. 185 manufacturing companies responded to the survey and 19 were removed for having less than 20 employees, being considered micro companies, which are not part of the scope of this study, remaining 166 valid cases. The survey instrument is a questionnaire written and applied in Portuguese comprising two blocks. The first block measures capabilities, including technology development capability, transaction capability and innovation management capability. The second block measures knowledge management capability and The third block measures financial firm performance.

To verify the reliability of the data, Cronbach’s alpha coefficient was used. This measures the correlation between questionnaire responses by analyzing the respondents’ answers, with an average correlation between questions. All coefficients were above the threshold values of 0.6 (ranging from 0 to 1) as suggested by Hair et al (2009) and Malhotra (2006). Table 5 demonstrates the alpha coefficients of each construct.

Data were analyzed using structural equation modeling, which is the most appropriate technique for this study, as it combines factor analysis and regression, making it possible to relate and measure the constructs based on the variables obtained during data collection<sup>55</sup>. As it is a Likert scale, the data are considered ordinal, with no assumption of normality for these data.

To check convergent validity, the criterion proposed by Fornell and Larcker (1981) is used, which indicates convergent validation when the Average Extracted Variance – AVE is greater than 50%, or 40% in the case of exploratory research<sup>57</sup>. The values are presented in table 6. The average variance extracted indices were above 0.40, which for this research are considered satisfactory, with 3 of the 5 indices exceeding the 0.50 level. Furthermore, the composite reliability was also verified, presenting indexes above 0.70, which is the minimum recommended value.

**Table no 6:** Average variance extracted of constructs.

Constructs	AVE
Technology development capability	0.45
Transaction capability	0.56
Innovation management capability	0.54



Constructs	AVE
Knowledge management capability	0.49
Financial performance	0.55

To test the hypotheses presented, structural models were developed, using the latent variables involved in each hypothesis. It was also possible to verify the indirect effects between the dimensions of innovation capability and performance, with the mediation of management capability. Software IBM-SPSS and JASP was used to calculate correlations coefficients and regression models.

To check the adjustment of the structural models, the chi-square test was used, which is calculated through the ratio of the chi-square divided by the degree of freedom, which must be less than 3.00 to be considered satisfactory<sup>58</sup>. The GFI (Goodness-of-fit Index) was also used as a fit index, with values greater than 0.90 being desirable<sup>54</sup>. Another adjustment indicator used was the RMSEA (Root Mean Square Error of Approximation), which, according to Hair, must be below 0.08, with a 90% confidence interval, with the cut-off point being the lower and upper limits lower than 0.10.

The CFI (Comparative Fit Index) and the TLI (Tucker-Lewis Index), which are called comparative indices, were also used to check the quality of the models. These indices seek to compare the proposed model to a null model, with the reference value being greater than 0.90. As tools to carry out the analyzes presented, the software SPSS, AMOS and JASP were used.

The next sections will discuss the results about the role of management capability, and the different approach that considered management capability as knowledge management capability or innovation management capability.

#### IV. Results

The systematic literature review revealed that management capability has been studied through utilizing distinct approaches. While some studies analyze innovation management capability, others focus more on knowledge management capability. These different management capabilities have shown that they can play different roles in terms of innovation capability and firm performance. In view of these findings, two hypotheses were developed, relating knowledge management to innovation capability, innovation capability and financial firm performance, with management capability as a mediating variable.

To tests the first hypothesis a structural equation model was developed, which is shown in figure 3, where is possible to demonstrate de effects between knowledge management capability, the dimensions of innovation capability and firm performance.

Figure no 2: Structural equation model 01.

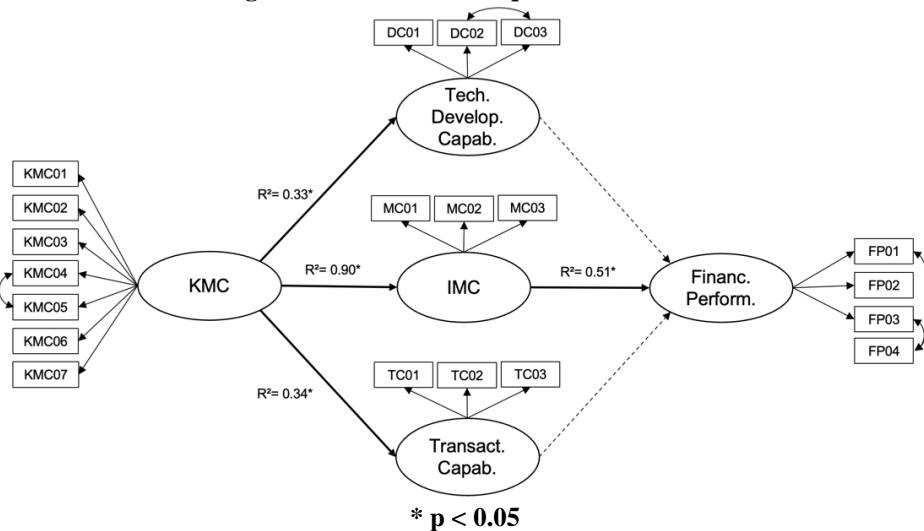


Table 7 presents the fit measures for structural model 01. The chi-square indices (2.00), GFI (0.99) and RMSEA (0.08) presented perfectly acceptable values. The CFI (0.89) and TLI (0.87) indices were below ideal, but can be considered acceptable, as they are very close to the values considered ideal.

Table no 7: Model 01 fit measures.

Fit measures	Valor
Chi-square ( $X^2 / df$ )	2.00
Comparative Fit Index (CFI)	0,89

Tucker-Lewis Index (TLI)	0,87
Goodness of Fit Index (GFI)	0,99
Root mean square error of approximation (RMSEA)	0,08
RMSEA 90% IC Lower bound	0,06
RMSEA 90% IC Upper bound	0,09

Results of structural model 01 demonstrated that Knowledge management capability has positive effect on each dimension of innovation capability. the largest effect was between knowledge management capability and innovation management capability ( $R^2 = 0.90, p < 0.001$ ), with only innovation management capability having a positive and significant effect on performance. The effects also are positive and significant between knowledge management capability and technology development capability ( $R^2 = 0.33, p = 0.049$ ) and knowledge management capability and transaction capability ( $R^2 = 0.34, p = 0.002$ ).

These results demonstrate that a high level of knowledge management capability boosts innovation capability, confirming the hypothesis H1. Knowledge is one of the bases of innovation capability, corroborating authors such as Chawla (2021) and Lei, Khamkhoutlavong, and Le, (2021) who state that effective knowledge management in companies leads to better innovation capabilities.

The second hypothesis is “innovation management capability has a mediator factor that improve the relationship between innovation capability and firm performance”. Structural model 01 revealed that technological development and transaction capabilities do not have positive effects on performance. To test hypothesis H2, structural model 02 was developed, as shown in figure 3.

Figure no 3: Structural equation model 01.

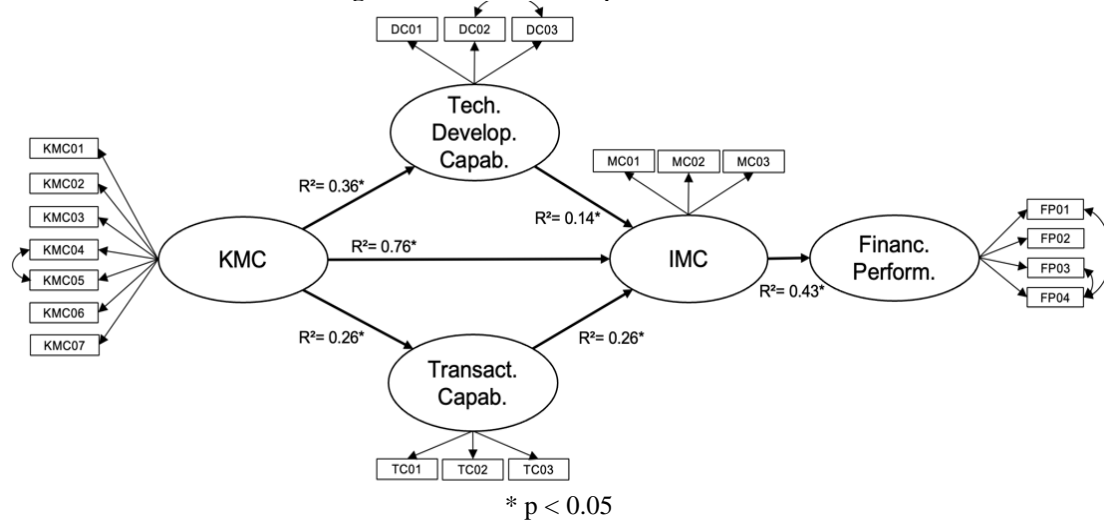


Table 8 presents the fit measures for structural model 02. The chi-square indices (1.92), CFI (0.90), GFI (0.99) and RMSEA (0.08) presented perfectly acceptable values. The TLI (0.88) index was below ideal, but can be considered acceptable, as they are very close to the values considered ideal.

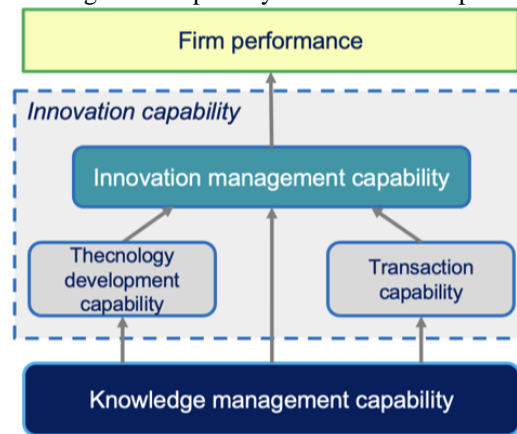
Table no 8: Model 02 fit measures.

Fit measures	Valor
Chi-square ( $X^2 / df$ )	1,92
Comparative Fit Index (CFI)	0,90
Tucker-Lewis Index (TLI)	0,88
Goodness of Fit Index (GFI)	0,99
Root mean square error of approximation (RMSEA)	0,08
RMSEA 90% IC Lower bound	0,06
RMSEA 90% IC Upper bound	0,09

Results demonstrated positive and significant effect between Knowledge management capability and technology development capability ( $R^2 = 0.36, p = 0.006$ ), Knowledge management capability and transaction capability ( $R^2 = 0.26, p = 0.013$ ) and Knowledge management capability and innovation management capability ( $R^2 = 0.76, p < 0.001$ ). The effects between technology development capability and management capability ( $R^2 = 0.14, p < 0.046$ ) and transaction capability and management capability ( $R^2 = 0.26, p < 0.001$ ) also are positive and significant. Finally, innovation management capability has a positive and significant effect on financial firm performance ( $R^2 = 0.43, p < 0.001$ ).

Structural model 02 shows that innovation management capability mediates the two other dimensions of innovation capability (technology development capability and transaction capability) and performance. Innovation management capability also mediate the effect between knowledge management capability and financial firm performance. Thus, the results confirm the hypothesis H2. After testing the hypotheses, a framework was developed that represents the relationships demonstrated in this research, which is presented in figure 4.

Figure no 4: The role of management capability on innovation capability and firm performance.



Elaborated by author.

Results demonstrated that knowledge management capability has a positive impact on innovation capability and innovation management capability is a mediator between innovation capability and financial performance. All hypotheses were confirmed, demonstrating the validity of the proposed framework.

### V. Conclusions

Studies on innovation capabilities have in recent years emphasized the pivotal role these capabilities hold for firms' performance. Extant studies have upheld the importance of both management and innovation capabilities. However, what has been less clear, and motivates our study, is to provide a synthesized overview of the role of management capability on innovation capability. Therefore, we executed a systematic literature review, and the results demonstrate that knowledge management capability can be considered the main antecedent of innovation capability and innovation management capability is a mediator between innovation capability and performance.

Our first contribution to the theory of innovation studies more generally and for literature on innovation capability specifically, lies in the importance of improving management capability to improve innovation capability through the knowledge management capability. This means that knowledge forms the basis of innovation capability, and it must be well managed to obtain better innovation results.

The second contribution is the role of innovation management capability on firm performance. The results stemming from our literature review and subsequent analysis, suggests that innovation management capability has a mediating effect on the other kinds of capabilities (technology development and transaction) and firm performance. In other words, an improved innovation management capability can enhance the impact between innovation capabilities and firm performance.

The third contribution is the framework we have developed herein. This framework demonstrates the relationships presented in this study. Within our framework, it becomes apparent that knowledge management capability serve as precursors to innovation capability, and further, that innovation management capability enhance the impact of innovation capability on firm performance.

The fourth contribution lies in the knowledge management capability construct presented. This model is composed of the main variables that have been used in previous studies and can be an important tool to future research in innovation capability field.

The fifth contribution is the innovation management capability construct that is composed to the main variables that have been used in previous studies related to innovation capability and firm performance. This model can be used to expand the knowledge about different innovation capabilities and firm performance.

Finally, the sixth contribution is related to the impact of innovation capability on financial performance. Previous studies are related innovation capability and firm performance, but our study demonstrated a strong impact of innovation capability on financial firm performance and this effect is mediating by management innovation capability. the use of financial performance can provide new approaches to measure the impact of innovation capability on firm performance.

**Managerial implications:** The framework presented here offers managers a valuable tool for comprehending the influence of management capability on innovation capability. More specifically, it can be used as a resource for enhancing innovation capability and, consequently, firm performance. Increasing expertise in managing innovation can be a determining factor in driving companies to becoming more innovative.

Entrepreneurs and managers that are seeking to be innovative, must consider implementing best practices of knowledge management capabilities to improve the innovation capability. What we have highlighted throughout, is that to achieve superior business performance through innovation, innovation management capability is significant to improve innovation capability.

**Limitations and directions for future research:** One limitation and concomitant direction for future research, is to test the proposed model empirically in other countries or in a specific field of activity. Moreover, as we have empirically tested our framework using a cross-sectional design, which holds limitations, one direction for future research could be to exploit the time dimension further. Another suggestion is the use of non-financial performance indicators as firm performance variables.

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