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ORIGINAL PAPER

The EFQM excellence model, the knowledge management process and the corresponding results: an explanatory and predictive study

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Abstract

This study aims to analyse the relationships among the EFQM model, the knowledge management (KM) process and the corresponding results. It also seeks to analyse the predictive power of the phases of the KM process with regard to organisational results. The sample under study is composed of 113 Spanish organisations that feature some kind of Excellence Recognition System granted by the European Foundation for Quality Management (EFQM). This paper uses partial least squares (PLS) path modelling to test and validate the research model and the proposed hypotheses. In addition, thorough analyses are conducted to assess the model's predictive performance. The results show that organisations that use the management framework proposed by the EFQM model implement the phases of the KM process efficiently. Moreover, the synergies resulting from the simultaneous implementation of the EFQM model and the KM process contribute to improving the corresponding results. Also, the predictive power of the phases of the KM process is confirmed in terms of their ability to anticipate the results that the organisation will be able to achieve with respect to customers, people, society and key business factors. Finally, this study provides empirical evidence of the direct and indirect relationships among the EFQM model, the KM process and the corresponding results. In addition, the paper identifies out-of-sample prediction as an integral element of the evaluation of the model using PLS-SEM and as a way to evaluate its practical relevance, since it allows us to predict results.

Keywords EFQM model · Knowledge management · Organisational results · PLS-SEM · Predictive modelling · Out-of-sample prediction

JEL Classification M10 · M16

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1 Introduction

The perspective of a knowledge-based organisation views knowledge as a strategic resource that can contribute to the achievement of sustainable competitive advantages. This resource translates into improved results and organisational performance. Therefore, it is necessary to manage it efficiently (Chyi Lee and Yang 2000). On the other hand, quality management (QM) is included in the contingent theories of management. QM seeks the continuous improvement of organisational processes to satisfy customers and other stakeholders as well as the competitiveness of the company. To achieve this goal, organizations need to act quickly (Gómez-Conde et al. 2022) and the commitment of all members are essential (Dahlgaard-Park et al. 2018).

In this context, Calvo-Mora et al. (2015) and Linderman et al. (2004) propose that the use of models and quality management systems can serve as a basis for and aid to the efficient implementation of KM. Thus, the literature has highlighted the existence of commonalities and synergies between KM and QM (Sánchez-Franco et al. 2022). These commonalities are reflected in aspects such as the importance of having an open and flexible organisational culture, committed leadership, trained and motivated human resources, information systems, an organisational structure that encourages contact between people, and the implementation of process-based management (Molina et al. 2007; Marchiori and Mendes 2020). In addition, these relationships and synergies have positive effects on organisational results (Linderman et al. 2004; Loke et al. 2012; Calvo-Mora et al. 2015). More specifically, the relationship between QM and KM has been studied from various perspectives. Thus, some studies analyse the way in which QM practices favour the development of the phases of the KM process. Molina et al. (2007) and Iqbal (2021) confirm the importance of the different QM practices (leaderships, teamwork, autonomy, process control, cooperation or reward systems) to internal and external knowledge transfers. Colurcio (2009) finds that QM provides policies and tools (such as the participation of all employees, teamwork and communication at all levels) that are intrinsically useful as facilitators of the creation and dissemination of knowledge. On the other hand, Bou and Sauquet (2004) note that the documentation used in QM to organise and control the work (flow charts, procedures or technical instructions) constitutes a set of very useful tools for capturing and storing organisational knowledge.

However, the most widespread approach to such research is to analyse the relationships between KM and QM by reference to the main systems and models used by organisations to implement QM. First, some studies analyse the relationships between the ISO 9000 series and the KM process. In this context, the ISO 9000 series standards consider knowledge to be a strategic resource and highlight the need to determine the knowledge necessary to properly develop the QMS processes and meet the corresponding requirements (Wilson and Campbell 2016). Schmitt (2022) notes that these standards offer a common language that can facilitate the integration of KM into the organisation and that favour auditing and certification processes, primarily for the purpose of informing and involving

customers effectively. In addition, ISO 9001 includes requirements related to the knowledge, skills and aptitudes that people related to QMS must obtain (Wilson and Campbell 2020), thus enhancing the role played by people; furthermore, it does not require the use of complicated systems based on technological tools or complex information systems to manage knowledge (Demir et al. 2021).

Second, we must mention the BEMs. These models consider the organisation to be a system in which QM and organisational management are understood as synonyms for the purpose of seeking excellence at all levels (Aladwan et al. 2022). BEMs have a greater scope and are more complex than standard management systems (ISO 9000 2015), since they seek to obtain results for all interested parties, not merely the customer. The three most recognized BEMs worldwide are the North American Malcolm Baldrige award, the BEM associated with the Deming Prize (Japanese model) and the BEM linked to the European Foundation for Quality Management (EFQM) or the EFQM model (EM) (Kennedy 2019). According to Giménez Espín et al. (2022), the EM requires organisations to use KM to enhance the effect of facilitating criteria (key management factors) on the achievement of excellent results. Allameh et al. (2014) maintain that the evaluation of the organisation using the EM promotes the exchange of knowledge, which affects performance positively. Calvo-Mora et al. (2015) note that the EM is a valid framework for implementing KM projects, in which context the use of the process methodology and the involvement of stakeholders are key factors that enable KM to have a significant impact on key organisational results. Abbas (2020), Ooi (2014) and Ryan et al. (2012), who use the Malcom Baldrige Model as a reference, find that the criteria of the model pertaining to leadership, strategic planning, the management of human resources and customer orientation improve the KM process.

We take the EM as a reference since it is the most widespread BEM in the closest socioeconomic environment and is used by more than 50,000 organisations in the public and private sector worldwide (Giménez Espín et al. 2022). In addition, studies such as those conducted by Fonseca (2022) and Criado-García et al. (2020) maintain that the EM is an adequate framework for organisational KM and provide evidence suggesting that organisations' use of the EM leads to satisfactory results with respect to KM and results in improvements to organisational performance.

Despite this evidence, Criado-García et al. (2020) and Marchiori and Mendes (2020) highlight the lack of consensus regarding the manner in which the relationship between QM and KM should be defined, delimited and addressed. These authors also emphasize the need for continued research on the development of a solid theoretical framework that can help to provide empirical evidence of the relationship between QM, KM and the corresponding results. In this context, our study aims to advance our knowledge of the relationships among KM, QM and the corresponding results, since many previous studies have been theoretical or have not provided empirical evidence. Thus, the main novelty of this study is that it is focused on the analysis of the EM subcriteria (enablers) that include aspects of KM systems and the ways in which their efficient implementation supports the development of the phases of the KM process. In addition, the effects (direct and indirect) of these variables on the results for customers and other people as well as social and key business factors are analysed. In short, the EFQM

model allows to study in detail the relationships between two organizational study strategic fields, quality management and knowledge management, closing the research gap observed, through the synergies between both of them. Also, from a methodological perspective, the literature more commonly includes studies that analyse the causal relationships among QM, KM and the corresponding results (Ooi 2015; Calvo-Mora et al. 2016) and evaluate whether the model coefficients are significant and in the hypothesised direction. In this sense, empirical research contributes to the literature on both fields of study, which seeks to establish relationships with organisational outcomes. Thus, it demonstrates how KM issues, present in the EM, facilitate KM processes that influence the outcomes of key stakeholders for the organisation. Some research even uses structural equation techniques (PLS, AMOS, LISREL) and emphasises the predictive nature of its analyses; however, such evaluations are based exclusively on techniques designed to assess the explanatory power of the research model (Shmueli et al. 2019). In this sense, the evaluation of the predictive power of a model is a crucial element of any study (Shmueli et al. 2016). In addition, on the possibility of prediction in the social sciences has received less attention (Shmueli 2010).

Therefore, the task deepening our understanding of how the EM can be used to promote KM is useful not only for organisations associated with EFQM but also for many other organisations that use the EM to evaluate themselves and to progress towards sustainable and excellent management. Moreover, the ability of the managers of these organisations to know in advance, in probabilistic terms, the effect that their management decisions may have on organisational results is a powerful tool that would make it clear in advance which decisions could lead to certain results and which decisions could not, thus guaranteeing better results.

More specifically, this research has the following objectives:

(1) Analyse how the implementation of the EFQM model (knowledge-related aspects) contributes to the development of the phases of the KM process (creation, storage, transfer and use) and the improvement of business results.
(2) Explain the potential synergies between QM (in terms of the implementation of the EFQM model) and KM by reference to the direct and indirect effects that they have on the results.
(3) Determine whether the appropriate development of the KM process phases (creation, storage, transfer and use) is capable of generating accurate predictions of the results contemplated in the EM.

To achieve the proposed objectives, this research begins by analysing the aspects of KM systems that are present in the criteria and subcriteria of the EM. The hypotheses and research model, the methodology used in the study and the results thus achieved are subsequently discussed. Finally, the conclusions, implications, limitations and future lines of research are presented.

The results of our study provide empirical evidence regarding the manner in which the phases of the KM process can be implemented more efficiently, thus allowing organisations to rely on the EM. This evidence allows organisations to

improve results related to customers, people, society and business. It also identifies the nature of the direct and indirect relationships among QM, KM and the corresponding results. Finally, it corroborates the fact that out-of-sample prediction can become a differential element in model evaluation and a way of evaluating a model's empirical relevance since it facilitates the prediction of results.

2 Theoretical framework and hypotheses

2.1 Knowledge management, quality management and the EFQM model

Contemporary environments are becoming increasingly turbulent, and organisations must develop proactive mechanisms to survive and compete. Current challenges include continuous changes in consumers, pressure from stakeholders and competitors, innovative solutions, new technologies and disruptive business models (Felipe et al. 2020). This situation forces organisations to generate value with speed, agility and efficiency. To achieve this aim, flexible organisational structures, human resources that are open to change, new technologies and the use of proven knowledge are necessary (Fonseca 2022). Management professionals need new forms, tools and organisational solutions that favour adaptation to this dynamic and uncertain environment with the aim of taking advantage of, if not proactively creating, new business opportunities (Heubeck and Meckl 2022; García-Sánchez et al. 2017). In summary, to be competitive, organisations must continuously generate and assimilate new knowledge and skills (Demir et al. 2021).

A management philosophy of quality and excellence, which is based on continuous improvement, innovation and learning, can serve to create a context and favourable conditions for the development of KM initiatives and can contribute to the acquisition sustainable competitive advantages (Tian et al. 2021; Wang et al. 2021). Furthermore, KM initiatives are meaningless if they are not developed systematically, and in this sense, the framework offered by BEMs models in general and the EM in particular is especially useful (Giménez Espín et al. 2022). As we have already noted, the efficient integration of KM in organisations can be achieved through the use of different QM models and systems, which can allow organisations to reach higher levels of performance (Calvo-Mora et al. 2015; Marchiori and Mendes 2020). The most frequently studied reference frameworks for the integration of KM and QM are the ISO 9001 international standards or the BEMs, such as the EFQM model, that are taken as a reference in this work.

An ISO 9001 QMS is a set of interrelated or interacting elements that an organisation uses to establish policies and processes and to achieve objectives related to quality (ISO 9000 2015). QMS are based on management principles: customer focus, leadership, people commitment, process focus, improvement, evidence-based decision-making and relationship management (Carmona-Calvo et al. 2016). The ISO 9001 standards contains requirements (the organisational context, leadership, planning, support, operation, performance evaluation and improvement) aimed at increasing confidence in the products and services provided by an organisation and, therefore, at increasing customer satisfaction (ISO

9001 2015). Other benefits can also be expected, such as improved internal communication or better understanding and control of organisational processes (Sá et al. 2022).

BEMs are a schematic representation based on various systemically interrelated criteria (management and results) associated with the complex network of elements that describe the way in which an outstanding organisation operates to achieve high levels of excellence and performance (Ubaid and Dweiri 2021). Every BEM must make it possible for an organisation to self-assess its approach to management compared to the approach described by the BEM to ensure that it can identify the strengths and weaknesses that affect the design and implementation of improvement plans aimed at the achievement of higher levels of performance and, in general, the ability to meet objectives (Giménez Espín et al. 2022). BEMs ensure that organisations with high levels of excellence and better results develop KMS to support their strategies and plans to achieve the objectives they have set more efficiently (Criado-García et al. 2020; Tian et al. 2021).

The EM is a structured, practical and nonprescriptive model (EFQM 2012) that serves as a tool for organisations' self-assessment, benchmarking and continuous improvement (Escrig-Tena et al. 2019). The structure of the EM features the fundamental concepts of excellence, management criteria and results as well as a process of evaluation and improvement (Calvo-Mora et al. 2015).

The fundamental concepts of excellence included in the EM lay the foundations for a culture of excellence. In practice, these principles are expressed in terms of nine criteria that help implement the management system and measure results. Specifically, the EM states that the results for customers (Criterion 6), people (Criterion 7), society (Criterion 8) and key business factors (Criterion 9) are based on the design and application of leadership (Criterion 1), strategy (Criterion 2), people (Criterion 3), partnerships and resources (Criterion 4), and the optimisation of processes, products and services (Criterion 5) (EFQM 2012). Additionally, each criterion includes a variable number of subcriteria. The model includes up to 32 subcriteria, whose task is to elaborate the criterion to which it belongs in greater detail.

The model is updated periodically, and as a result, a new version of the EFQM model was published in 2020. In 2021, the two versions of the European model (2013 and 2020) coexisted, and organisations could choose the model with which they wanted to be assessed.

As noted by Criado-García et al. (2020), the EM presents a management approach that promotes innovation, learning, creativity and KM. Therefore, we can identify key aspects of KM systems and the associated phases in various elements of the structure of the model, particularly in the management criteria or enablers. More specifically, Criado-García et al. (2020) conducted a content analysis and identified the following KM issues in the EM agent criteria (Table 1).

For the EFQM Model 2020, knowledge translates into skills and capabilities acquired by a person through experience and education. In addition, the model includes theoretical and practical understanding of things, as well as the ability to take action (EFQM 2020). Fonseca (2022) notes that the EFQM Model 2020 also incorporates synergies and complementary elements with KM. More specifically, it identifies a number of subcriteria that explicitly address aspects of knowledge:

Table 1 Knowledge issues in the EFQM model 2013 y 2020

The knowledge management issues in the EFQM Model 2013 (Criteria/Sub-criteria) (Criado-García et al. 2020)	Correlation with Criteria/Sub-criteria EFQM Model 2020 (Fonseca et al. 2021)
Leadership/1a. Leaders develop the mission, vision, values and ethics and act as role models	Organizational culture and Leadership/2.1 Steer the Organisation's Culture and Nurture Values; 2.4 Unite Behind and Engage in Purpose, Vision and Strategy
Leadership/1b. Leaders define, monitor, review and drive the improvement of the organization's management system and performance	Purpose, Vision and Strategy/1.3 Understand the Ecosystem, own Capabilities and Major Challenges Driving, Performance and Transformation/5.1 Drive Performance and Manage Risk; 5.4 Leverage Data, Information and Knowledge
Leadership/1c. Leaders engage with external stakeholders	Organizational culture and Leadership/2.1 Steer the Organisation's Culture and Nurture Values Execution/3.3 Business and Governing Stakeholders – Secure and Sustain Ongoing Support; 3.4 Society: Contribute to Development, Well-Being, and Prosperity
Leadership/1d. Leaders reinforce a culture of excellence among the organization's people	Organizational culture and Leadership/2.1 Steer the Organisation's Culture and Nurture Values Execution/3.2 People: Attract, Engage, Develop and Retain Driving, Performance and Transformation/5.5 Manage Assets and Resources
Strategy/2b. Strategy is based on understanding internal performance and capabilities	Purpose, Vision and Strategy/1.2 Identify and Understand Stakeholders Needs; 1.3 Understand the Ecosystem, own Capabilities and Major Challenges Organizational culture and Leadership/2.3 Enable Creativity and Innovation Driving, Performance and Transformation/5.4 Leverage Data, Information and Knowledge
Strategy/2c. Strategy and supporting policies are developed, reviewed and updated	Purpose, Vision and Strategy/1.2 Identify and Understand Stakeholders Needs; 1.3 Understand the Ecosystem, own Capabilities and Major Challenges; 1.4 Develop Strategy Driving, Performance and Transformation/5.1 Drive Performance and Manage Risk
People/3b. People's knowledge and capabilities are developed	Execution/3.2 People: Attract, Engage, Develop and Retain
People/3c. People are aligned, involved and empowered	Purpose, Vision and Strategy/1.4 Develop Strategy Organizational culture and Leadership/2.3 Enable Creativity and Innovation Execution/3.4 Society: Contribute to Development, Well-Being, and Prosperity
People/3d. People communicate effectively throughout the organization	Organizational culture and Leadership/2.3 Enable Creativity and Innovation; 2.4 Unite Behind & Engage in Purpose, Vision and Strategy Driving, Performance and Transformation/5.4 Leverage Data, Information and Knowledge

Table 1 (continued)

The knowledge management issues in the EFQM Model 2013 (Criteria/Sub-criteria) (Criado-García et al. 2020)	Correlation with Criteria/Sub-criteria EFQM Model 2020 (Fonseca et al. 2021)
Partnerships and Resources/4a. Partners and suppliers are managed for sustainable benefit	Execution/3.5 Partners & Suppliers: Build Relationships and Ensure Support for Creating Sustainable Value
Partnerships and Resources/4d. Technology is managed to support the delivery of strategy	Organizational culture and Leadership/2.3 Enable Creativity and Innovation Driving, Performance and Transformation/5.3 Drive Innovation & Utilise Technology
Partnerships and Resources/4e. Information and knowledge are managed to support effective decision making and to build the organization's capability	Purpose, Vision and Strategy/1.5 Design & Implement a Governance and Performance Management System Organizational culture and Leadership/2.3 Enable Creativity and Innovation; 2.4 Unite Behind & Engage in Purpose, Vision and Strategy Driving, Performance and Transformation/5.2 Transform the Organisation for the Future; 5.4 Leverage Data, Information and Knowledge
Processes, products and services/5b. Products and services are developed to create optimum value for customers	Execution/3.1 Customers: Build Sustainable Relationships Creating Sustainable Value/4.1 Design the Value and How it is Created
Processes, products and services/5d. Products and services are produced, delivered and managed	Organizational culture and Leadership/2.3 Enable Creativity and Innovation Creating Sustainable Value/4.1 Design the Value and How it is Created; 4.2 Communicate and Sell the Value

- *Criteria 1:* Purpose, Vision and Strategy. In particular, Subcriteria 1.3. Understand the Ecosystem, Own Capabilities & Major Challenges.
- *Criteria 3*. Execution. People: Attract, engage, develop and retain.
- *Criteria 5*. Driving, Performance and Transformation. In particular, Subcriteria 5.4. Leverage Data, Information & Knowledge.

Furthermore, Fonseca et al. (2021) conducted a study to determine the equivalence between the subcriteria of the EFQM Models 2013 and 2020. Table 1 shows that, from the perspective of knowledge issues, there are no notable differences between the two versions, since all the knowledge issues included the EFQM Model 2013 and identified by Criado-García et al. (2020) are also included in the new subcriteria of the EFQM Model 2020.

The EM uses four criteria to analyse an organisation's performance. Perceptual measures (the perceptions of customers, employees and society regarding the organisation) and performance measures (the internal measures used by the organisation to monitor and improve performance and to predict the resulting impact on stakeholder perceptions) are included in customer (Criteria 6), people (Criteria 7) and social results (Criteria 8) (EFQM 2012). In addition, key business results (Criteria 9)

include the following: (1) Business results, i.e., critical financial and market results that demonstrate the successful deployment of the organisation's strategy, and (2) Performance indicators, i.e., key financial and market indicators that are used to measure an organisation's operational performance (Calvo-Mora et al. 2020).

2.2 The EFQM model and knowledge management process

A great deal of the knowledge that the organisation possesses at the individual and collective levels is formalized in the organisation's processes. In this sense, it is necessary to attempt to identify and measure this explicit knowledge since it is fundamental to the correct development of the KM process (Alavi and Leidner 2001). In addition, self-assessment using the EM facilitates the localisation of tacit or non-formalized knowledge. This methodology allows us to deepen our understanding of the internal management of an organisation, the compartments of the people in the organisation and the various types of resources that it uses (Calvo-Mora et al. 2015). Subsequently, taking into account the characteristics of the environment and key factors associated with the sector in which the organisation operates, it is necessary to identify and obtain information regarding the knowledge, skills and attitudes needed to compete in this arena (Ju et al. 2006). For Abbas (2020), this information can be obtained from the partners and stakeholders with whom the organisation interacts. The implementation of the EM facilitates contact and exchanges of information with partners and stakeholders. This process also facilitates the sharing of experiences and knowledge, thus making relationships more beneficial for all (Calvo-Mora et al. 2016). Now, the organisation can determine its knowledge deficit and consider the best way of filling this gap through knowledge generation or creation.

To create internal knowledge or acquire useful knowledge from external sources, an atmosphere that favours communication, creativity, learning and change is necessary (Alavi and Leidner 2001). According to Calvo-Mora et al. (2015) and Hsu and Shen (2005), the philosophy of excellence in management and continuous improvement that underlies the EM represents an ideal context for the generation of knowledge.

The knowledge generated must be synthesised and stored so that it can be transferred to individuals, groups or units. The stored knowledge constitutes the organisational memory (Antunes and Pinheiro 2020). In this sense, the teamwork and documentation (report) generated during the self-assessment and the subsequent independent external evaluation contribute to and grow the organisational memory (Criado-García et al. 2020). The report allows organisations to capture, maintain and quickly access relevant data, information and knowledge of relevant people, groups, areas and organisational activities (Calvo-Mora et al. 2015).

The adequate storage of knowledge facilitates its subsequent transfer. This phase is critical, as there must be changes in the knowledge base and skills of the people, groups and organisations involved in the KM process (De Vries et al. 2006). Thus, the highly valid and formalised information drawn from the self-assessment and external evaluation reports can be communicated to the company's departments easily and quickly. This communication allows actions aimed at improvement to be

implemented more efficiently and quickly (Criado-García et al. 2020). Furthermore, the improvement and strengthening plans resulting from the evaluations are implemented by creating improvement teams to facilitate the development of an organisational environment that is conducive to the exchange of information, knowledge, and experience as well as continuous learning (Calvo-Mora et al. 2016). On the other hand, suppliers, customers or competitors provide other types of information, experience and knowledge that are indispensable for success (Johnson et al. 2019). In this case, the use of the EM establishes permanent communication links with partners and stakeholders that allow information to be captured and disseminated. Autonomous groups can also be created to facilitate the transfer of information, experience and knowledge among partners (Kafetzopoulos et al. 2019).

Finally, the most important objective of the KM process should be the creation of value for the organisation and its stakeholders. To achieve this purpose, the knowledge that is generated, stored and transferred in the process must be used effectively and efficiently (Jevnaker and Olaisen 2022). In this regard, the absorption capacity of individuals, groups and organisations is critical. As a result of knowledge absorption, a learning process takes place that leads to the adoption of new beliefs, the establishment of new relationships and the modification or reinforcement of behaviours and values (Ooi 2014). In this sense, the EFQM assessment seeks to incorporate information regarding the organisation's level of excellence into its processes and key results to learn, exhibit creativity and innovate continuously (Calvo-Mora et al. 2015).

These considerations lead us to propose the following hypothesis:

H1 The implementation of the EM is positively related to KM process development.

2.3 Knowledge management process and results

The task of analysing the effect that KM has on its results is of great interest to the organisation (Zaim et al. 2019). The EM framework analyses four types of outcomes that affect the organisation's main stakeholders, i.e., its customers, employees, society and owners/managers (key business outcomes). As Quintana and Benavides (2005) note, this approach makes it possible to assess the impact of the KM process in depth. In this regard, the generation and transfer of knowledge among employees via the exchange of joint experiences is a key milestone for the acquisition of new skills by individuals and groups, thus leading to better results for people (Sapir et al. 2016). Authors such as Allameh et al. (2014) and García-Sánchez et al. (2017) confirm the direct relationship between knowledge sharing (whether tacit or explicit) and organisational performance. However, for organisational performance to be enhanced, employees must understand that their involvement is key, and management must encourage the generation, transmission, application and use of new knowledge that can improve organisational performance and results (Jyoti and Rani 2017). Furthermore, the exchange of knowledge with customers and the resulting

improvement in the detection and satisfaction of customer needs and expectations contributes to better results for customers (De Vries et al. 2006).

Cooperating with stakeholders is key to success, since the transfer of knowledge assets benefits both society and the organisation itself, since it is facilitated by experiential knowledge assets that are generated by sharing experiences with suppliers, partners or competitors. According to Tubigi and Alshawi (2015), the application and transfer of knowledge are the most influential factors of the KM process with respect to the corresponding results. According to Criado-García et al. (2020), the implementation of an adequate KM model improves administrative practices in aspects such as planning, strategies, processes or information improvement. These improvements ultimately lead to improvements in key operational and strategic business results (Calvo-Mora et al. 2015). In this sense, Zack et al. (2009) note that KM improves decision-making, teamwork or employee training and development, which contributes to improved operational and strategic results. Accordingly, success factors of KM include the development of a KM strategy that allows sources and users of knowledge to be identified as well as the creation of strategies that allow knowledge to be stored and processes that can be efficiently applied (Jennex and Olfman 2006; Jevnaker and Olaisen 2022). In fact, KM determines strategic decisions, thereby increasing competitiveness and performance.

Finally, in the context of the key results, the literature also focuses on KM and contains evidence regarding the corresponding economic-financial results (Abbas 2020; Al Ahbabi et al. 2019; Tanriverdi 2005). In fact, there is a positive relationship between business outcomes and the effective implementation of the KM process (Dzenopoljac et al. 2018). For example, the transfer phase (in terms of loyalty programmes as well as the customer-company communication function) and the knowledge application phase (through self-monitoring of work) positively influence these types of results (Tarí and García-Fernández 2013).

These considerations lead us to propose the following hypotheses:

H2a KM process development is positively related to customer results.

H2b KM process development is positively related to people-related results.

H2c KM process development is positively related to social results.

H2d KM process development is positively related to key results.

In summary, this study proposes that the implementation of the EM creates an organisational context that is conducive to the development of the KM process (knowledge creation, storage, transfer and application). Furthermore, the efficient development of the KM process has a positive impact on results pertaining to customer, people, and society as well as key business results (Fig. 1).

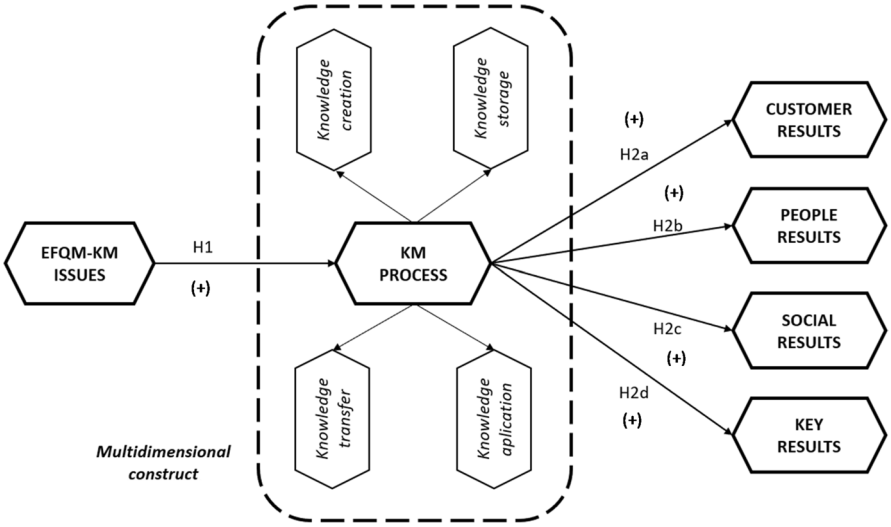

Fig. 1 Research model and hypotheses

3 Method

3.1 Sample and data collection

The population under study is composed of Spanish organisations that feature some kind of EFQM recognition. This recognition acknowledges organisations that are working to improve their management systems through the self-assessment methodology proposed by the EFQM. This methodology is applied under the supervision of prestigious certification bodies (AENOR, Bureau Veritas, Cámara Certifica, Eduqatia, SGS and TÜVRheinland) to guarantee its correct application and development. One advantage of these EFQM recognitions is the accompanying validation resulting from the European recognition of the EFQM, which indicates that obtaining the relevant seal supports the internalisation of Spanish organisations in an increasingly global economy. There are currently four levels of recognition depending on the organisation's score following the self-assessment and external evaluation processes (ranging between 0 and 1000 points): Commitment to Excellence (200 +) and various European Seals of Excellence, i.e., 300 + (3 stars), 400 + (4 stars) and 500 + (5 stars).

The promotion and management of the EM and recognition systems in Spain is handled by the *Club Excelencia en Gestión* (partners of EFQM in Spain). According to information on its website (www.clubexcelencia.org), as of December 2019, 593 organisations had EFQM Recognition. These organisations constitute the population under study in this paper. As noted above, the 2013 and 2020 versions of the European model coexisted until mid-2021. Thus, organisations had the option to be assessed by either version. Consequently, insufficient data

are as yet available regarding experiences with and the results of the application of the EFQM Model 2020.

A questionnaire was designed as an instrument for obtaining the relevant data. The questionnaires were sent by e-mail and post to quality managers, general managers and other directors or area managers (the first questionnaires were distributed in December 2019, while the last questionnaires were received in June 2020). The integration and visibility of the corporate data of all participants through the digital platform of *Club Excelencia en Gestión*, has facilitated the sending of our questionnaire. A total of 113 valid questionnaires were obtained, for a response rate of 19%. 2. The main drawback of a small sample is that the population may not be correctly represented. However, in this case, the population is controlled and not very large. Nevertheless, we justify in the Data Analysis section, the reasons for working with such a sample and demonstrate its statistical power. Table 2 shows the sample characteristics.

3.2 Measures

The proposed research model contains six design constructs or tools (Fig. 1) that are modelled as composites. The variables in this research are considered to be design constructs that are composed of more elementary components or indicators (Henseler 2017). Composites represent linear combinations of their indicators (Calvo-Mora et al. 2020).

The EFQM-KM Issues construct is one-dimensional and is estimated in Mode A. According to Chin (2010) and Hair et al. (2021), in PLS-SEM, Mode A is based on a compound created to model reflective measurement constructs. The indicators of this construct are the EM subcriteria that refer to KM systems. For the identification of these indicators and the construction of the measurement scales, the criteria and subcriteria of the EM and the study conducted by Criado-García et al. (2020) are used as references. The KM Process construct is a second-order molecular construct (superordinate multidimensional construct) and is estimated in Mode A, since the correlations among the dimensions of the constructs are expected to be high. In this case, the dimensions of which the construct is composed are the phases of the knowledge management process: creation, storage, transfer and application. For the construction of this scale, the following works are used as references: Gold et al. (2001) and Chou et al. (2007). Finally, the constructions that refer to the measures of the results (customer, people, social and key) include only one dimension and are estimated in Mode A. The indicators and measurement scales are obtained from the EM results subcriteria (EFQM 2012). In this regard, the EM does not contain specific measures of performance criteria but instead only recommendations. For this reason, a group of EM expert evaluators was consulted to validate the proposed performance indicators, following the stages indicated by Sireci and Padilla (2014) and Utkin (2006). In this evaluation, we achieved a high degree of agreement among evaluators (kappa statistic = 0.8 and significance level 0.01).

To obtain the data, a four-part questionnaire was designed. The first part of the questionnaire contains contextual variables: type of recognition system, number of

Table 2 Sample

Levels of excellence	Frequency (approximate percentage)	Company size	Frequency (approximate percentage)	Sector	Frequency (approximate percentage)
Committed to excellence (200+)	28 (25%)	Micro (less than 10 workers)	6 (5%)	Service sector	47 (40%)
Recognised for excellence 300+	18 (16%)	Small (between 10 and 49 workers)	32 (29%)	Public administration	21 (19%)
Recognised for excellence 400+	32 (28%)	Medium (between 50 and 249 workers	42 (37%)	Education	20 (18%)
Recognised for excellence 500+	35 (31%)	Large (over 249 workers)	32 (29%)	Health	19 (17%)
				Others	6 (5%)
Total	113 (100%)		113 (100%)		113 (100%)

employees and activity. The remaining three parts correspond to the variables or constructs that constitute the research model. To measure the variables of which the research model is composed, we used a Likert-type scale ranging from 1 to 7 (with 1 indicating total disagreement and 7 indicating total agreement) (Table 3).

3.3 Data analysis

The constructs used in our study represent a composite measurement model (Rigdon 2012), so it is appropriate to use the partial least squares (PLS) technique and variance-based structural equation modelling (Roldán and Sánchez-Franco 2012) to test the research model. Another reason for selecting the PLS is the use of the component scores in a subsequent analysis to model multidimensional constructs using the two-stage approach (Wright et al. 2012; Calvo-Mora et al. 2020). Furthermore, as Reinartz et al. (2009) note, PLS can estimate structural models with small samples. More specifically, Hair et al. (2019) recommends estimating the effect size by taking into account both the model and the data. In this sense, a statistical analysis using the G*Power software determined, with an error probability of 5%, that a total sample size of 74 was necessary. In addition, based on the maximum number of independent variables related to some construct of the structural model, the sample is representative. Finally, the model was estimated in Mode A using correlation weights (Becker et al. 2013). These circumstances justify the use of SmartPLS 3.2.8 software to conduct our analysis (Ringle et al. 2015).

3.4 Common method bias

Common method bias (CMB) refers to the systematic variation between two or more variables that results from the method used to collect the data, i.e., it focuses on the problems that arise when respondents answer a questionnaire in a way that is considered to be acceptable to the interviewer (Podsakoff et al. 2012). Thus, to detect possible CMB, vertical and lateral collinearity are evaluated (Kock and Lynn 2012). Our model, with a maximum VIF of 2.15 (Table 4), can be considered to be unaffected by CMB because the VIF values are lower than 3.3 (Kock and Lynn 2012).

4 Results

4.1 Measurement model

Recent research addresses the evaluation of measurement fit models through the interpretation of fit indices. The contributions of Mai et al. (2021) for CBSEM (Covariance-based Structural Equation Modelling) or Henseler (2021), Henseler et al. (2016) and Williams et al. (2009) for Partial Least Squares Structural Equation Modelling (PLS SEM) stand out. Our study is based on the latter, given its confirmatory purpose. According to Hu and Bentler (1998), the evaluation of the standardised root mean square residual ratio (SRMR) yields a satisfactory value of 0.060

Table 3 Variables and measurement tools

Variables/constructs	Type	Scale	Source
EFQM-KM issues	Exogenous constructs (one dimension, estimated in Mode A)	Likert-type scale from 1 to 7 (1 being total disagreement and 7 being total agreement)	Criado-García et al. (2020)
KM process *(Dimensions: Knowledge Creation; Knowledge Storage; Knowledge Transfer; Knowledge Application)*	Endogenous constructs (second-order molecular construct, estimated in Mode A)		Gold et al. (2001) and Chou et al. (2007)
Customer results	Endogenous constructs (one dimension, estimated in Mode A)		EFQM (2012)
People results			
Society results			
Key results			

Table 4 Full collinearity VIFs

Variables	EFQM-KM issues	KM process	Customer results	People results	Social results	Key results
VIF	2.01	2.15	1.68	1.51	1.75	1.89

for the measurement model, below the usual cut-off of 0.08 (Hu and Bentler 1999). Therefore, our measurement model fits the data well.

The variables included in our model are estimated in Mode A. We rely on the correlation of indicators and composite dimensions, as the constructs were designed as tools. Therefore, according to Henseler et al. (2016), it is possible to apply the measures of reliability and validate internal consistency.

With regard to the individual reliability of the items, the indicators of the model have loadings above 0.7 (Table 5). This fact indicates that the construct explains more than 50% of the variance of indicator, which is considered to be satisfactory (Hair et al. 2021). The weights and dimensions of the model's indicators are also provided. The weights provide information regarding the relative importance of each indicator and the dimension associated with the composition of their respective composites. We assessed the internal consistency of the constructs through the composite reliability criteria. The first-and second-order constructs exhibit composite reliability (CR) with values above 0.7. Therefore, the variables satisfy the condition of construct reliability. The assessment of convergent validity was performed by examining the average variance extracted (AVE). In this respect, as the values of all constructs and dimensions exhibit AVEs above the level of 0.5 (Table 5), this criterion is satisfied. Therefore, more than 50% of the variance of the reflective indicators is explained by the latent variable.

Finally, applying the Fornell-Larcker and HTMT criteria (Henseler et al. 2014) (Table 6), we observe that all constructs reach discriminant validity, as all values are below 0.85.

4.2 Structural model

Figure 2 and Table 7 show the direct effects among the constructs included in the research model. Using the bootstrapping approach (5000 samples), we obtain the t values and confidence intervals that allow us to evaluate the statistical significance of the relationships. By employing hypotheses that specify direct and positive relationships among the variables, we produce a one-tailed Student t-distribution. In addition, we also use confidence intervals for hypothesis testing (Hair et al. 2019). Using both these methods, we observe that the hypotheses proposed are confirmed with high levels of significance.

Regarding the predictive power of the structural model, Fig. 2 illustrates the explained variance (R^2) for the endogenous constructs. Based on Chin (1998), moderate values are found for the KM process (0.669), customer results (0.608), people results (0.631) and social results (0.366), while a weak value is found for key results

Table 5 Measurement model

Construct/*Dimension*/Indicator	Loadings	Weights	CR	AVE
EFQM-KM Issues (composite Mode A)			0.960	0.670
In your organisation…				
Leaders develop the mission, vision, values and ethical principles and act as a reference model	0.868	0.113		
Leaders define, monitor, review and drive both the improvement of the organisation's management system and its performance	0.864	0.113		
Leaders get involved with external stakeholders	0.790	0.085		
Leaders reinforce a culture of excellence among people in the organisation	0.870	0.108		
Strategy is based on understanding internal performance and capabilities	0.735	0.082		
Strategy and supporting policies are developed, reviewed and updated	0.802	0.103		
People's knowledge and skills are developed	0.846	0.106		
People are aligned with the needs of the organisation; they are involved and take responsibility	0.777	0.091		
People communicate effectively with each other	0.790	0.101		
Relationships with partners and suppliers are managed for sustainable benefit	0.787	0.096		
Technology is managed to make the strategy a reality	0.774	0.098		
Information and knowledge are managed to support effective decision-making and build organisational capacity	0.864	0.117		
Products and services are developed to provide optimal value to customers	0.782	0.091		
Products and/or services are produced, distributed and managed, strengthening the value chain	0.800	0.099		
KM Process (MC)			0.968	0.884
Knowledge creation (composite Mode A)	0.913	0.265		
In your organisation…				
Units or departments interact with senior management to acquire new knowledge	0.770	0.201		
Other areas are visited for information or communication	0.782	0.190		
It is common to organise special meetings with customers or third parties to acquire new knowledge	0.705	0.159		
Employees meet regularly with external professionals such as advisers, managers or consultants	0.784	0.173		
New opportunities to serve customers are quickly identified	0.827	0.168		

Table 5 (continued)

Construct/*Dimension*/Indicator	Loadings	Weights	CR	AVE
Changes coming from the market are quickly analysed and interpreted	0.859	0.184		
Changes in our customers' tastes are quickly analysed and interpreted	0.858	0.177		
Knowledge storage (composite Mode A)	0.952	0.262		
In your organisation…				
Employees retain and archive new information for future use	0.849	0.251		
The value of new knowledge acquired over existing knowledge is understood	0.914	0.299		
Storing and organising knowledge	0.903	0.283		
Replacing obsolete knowledge	0.877	0.294		
Knowledge transfer (composite Mode A)	0.944	0.268		
Your organisation has processes for…				
Selecting the right knowledge in each situation	0.900	0.188		
Transferring organisational knowledge to employees	0.903	0.184		
Incorporating employee knowledge into the company	0.930	0.180		
Incorporating the knowledge of other companies into the company	0.800	0.155		
Distributing knowledge throughout the company	0.896	0.188		
Integrating different sources and types of knowledge	0.930	0.184		
Knowledge application (composite Mode A)	0.950	0.268		
Your organisation has processes for…				
Applying the lessons learned from the mistakes made	0.865	0.093		
Applying the lessons learned from experience	0.919	0.102		
Using knowledge in the development of new products and services	0.941	0.107		
Using knowledge to solve new problems	0.949	0.105		
Quickly finding the kind of knowledge needed to solve each problem	0.900	0.095		
Using knowledge to improve efficiency	0.933	0.101		

Table 5 (continued)

Construct/*Dimension*/Indicator	Loadings	Weights	CR	AVE
Using knowledge to adapt strategic plans	0.889	0.099		
Locating and applying the knowledge needed to change competitive conditions	0.883	0.101		
Making knowledge available to all those who need it	0.860	0.103		
Quickly taking advantage of new knowledge coming into the company	0.921	0.106		
Quickly applying the necessary knowledge in urgent and/or critical competitive situations	0.862	0.096		
Customer Results (composite Mode A)			0.953	0.801
CR1. Increased customer value for products and services	0.942	0.224		
CR2. Improving the distribution of products and services	0.908	0.216		
CR3. Increased customer loyalty and commitment	0.907	0.230		
CR4. Improved service, attention and support to the customer	0.836	0.205		
CR5. Involvement of customers in the design of products, processes and/or services	0.879	0.242		
People Results (composite Mode A)			0.951	0.795
PR1. Increased employee satisfaction	0.912	0.224		
PR2. Increased employee motivation	0.910	0.225		
PR3. Acquisition of skills and improvement of staff training	0.869	0.219		
PR4. Improving communication between workers	0.886	0.231		
PR5. Improving working conditions	0.880	0.224		
Social Results (composite Mode A)			0.929	0.724
SR1. Improving environmental impact	0.831	0.227		
SR2. Greater commitment and involvement of the organisation with social causes	0.872	0.230		
SR3. Improving the image and reputation of the organisation in society	0.816	0.285		
SR4. Compliance with legislation and the various regulations that affect it	0.849	0.206		
SR5. Improving occupational health and safety performance	0.884	0.230		
Key Results (composite Mode A)			0.943	0.770

Table 5 (continued)

Construct/*Dimension*/Indicator	Loadings	Weights	CR	AVE
KR1. Increased sales	0.820	0.208		
KR2. Improving economic and financial results	0.926	0.239		
KR3. Improving the results or performance of key processes	0.887	0.210		
KR4. Improving the perception of the stakeholders providing funding	0.812	0.226		
KR5. Improving budget management performance	0.935	0.255		

CR: composite reliability; AVE: average variance extracted; MC: multidimensional construct

Table 6 Discriminant validity assessment

Fornell and Larcker Criterion							Heterotrait–Monotrait Ratio (HTMT)						
	EKI	KMP	CR	PR	SR	KR		EKI	KMP	CR	PR	SR	KR
EKI	***0.819***						EKI						
KMP	0,818	***0.940***					KMP	0.832					
CR	0,710	0.780	***0.895***				CR	0.745	0.821				
PR	0.766	0.794	0.791	***0.891***			PR	0.807	0.840	0.845			
SR	0.584	0.605	0.743	0.796	***0.851***		SR	0.618	0.641	0.802	0.816		
KR	0.516	0.545	0.684	0.674	0.779	***0.877***	KR	0.541	0.578	0.733	0.723	0.849	

EKI: EFQM-KM Issues; KMP: KM Process; CR: Customer results; PR: People results; SR: Social Results: KR: key results. Diagonal elements (bold italics) are the square root of the variance shared between the constructs and their measures (average variance extracted). Off-diagonal elements are the correlations between constructs. For discriminant validity, diagonal elements should be larger than off-diagonal elements

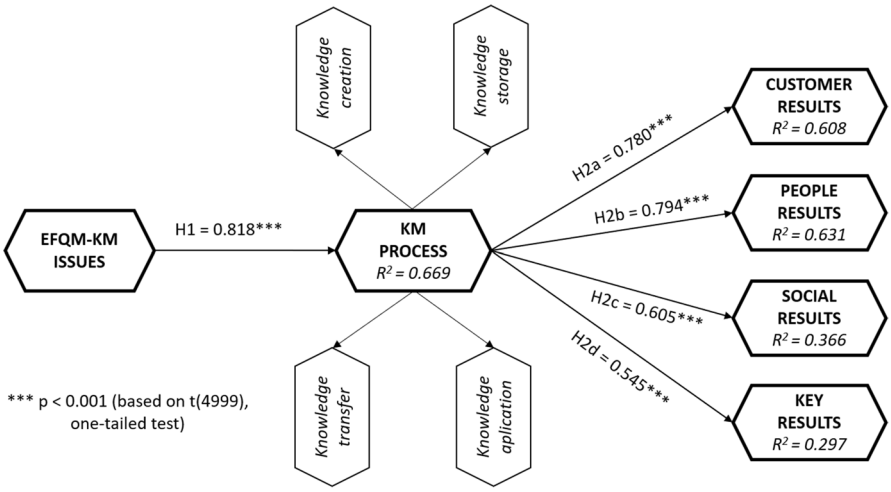

Fig. 2 Structural model results

(0.297). On the other hand, we measure the degree to which the exogenous constructs explain the endogenous constructs in terms of R^2. Based on the effect size (Cohen 1988), all relationships have large effects (f^2) (Table 7).

4.2.1 Post hoc *assessment of indirect effects*

The research model includes four indirect effects. The effects of the EFQM-KM issues on each of the four outcome variables are transmitted by a mediating variable, i.e., the KM process. Hence, a post hoc indirect effects analysis was conducted to test the four indirect effects. For this purpose, we followed the advice of Nitzl et al. (2016) by adopting an analytical approach. The results indicate that the EFQM-KM issues have significant indirect effects on all outcome variables (Table 8). This finding indicates the partial or complete mediation of the KM process variable, namely, in the relationship between EFQM-KM issues and the results.

4.2.2 Predictive model assessment

Following Hair et al. (2020), with respect to our model, we assessed the out-of-sample predictive power by analysing whether it could predict unseen data (Danks and Ray 2018). This task was accomplished using PLSpredict according to the holdout sample-based approach developed by Shmueli et al. (2016). According to Danks and Ray (2018), such an approach allows us to test whether it is possible to generalise the model to other populations, which is essential for empirical research on KM and the EM (Suárez et al. 2017). In this regard, this analysis focused on the outcome variables of our model.

Following Hair et al. (2020), to proceed with prediction using PLS, we first conducted a k-fold cross-validation featuring k = 3 subgroups. This process was

Table 7 Bootstrap confidence interval through critical value t and intervals and f_2 values

Effects on endogenous variables	Direct effect (path coefficient)	*t*-Value (bootstrap)	*p*-Value	Percentile 90% confidence intervals	Theoretical sense (support)	f^2
EFQM-KM Issues → KM Process	0.818	23.313	0.000	(0.758; 0.872) Sig.	+ (Yes)	2.019
KM Process → Customer results	0.780	15.355	0.000	(0.693; 0.861) Sig.	+ (Yes)	1.551
KM Process → People results	0.794	19.631	0.000	(0.723; 0.856) Sig.	+ (Yes)	1.709
KM Process → Social results	0.605	9.522	0.000	(0.505; 0.712) Sig.	+ (Yes)	0.577
KM Process → Key results	0.545	7.163	0.000	(0.421; 0.669) Sig.	+ (Yes)	0.423

Table 8 Indirect Effects

Effects on endogenous variables	Indirect effect (path coefficient)	*t*-value (bootstrap)	*p*-Value
EFQM-KM Issues → Customer results	0.638	11.092	0.000
EFQM-KM Issues → People results	0.650	12.835	0.000
EFQM-KM Issues → Social results	0.495	8.247	0.000
EFQM-KM Issues → Key results	0.446	6.250	0.000

intended to cover the minimum sample size of N = 30 for the holdout sample. This procedure was repeated 10 times. After this step, we conducted a PLSpredict analysis of the model according to the steps outlined by Shmueli et al. (2019) (Table 9):

(1) First, the condition with respect to the variables of the model is fulfilled. That is, all the indicators that constitute each of the four constructs or the endogenous variables present prediction values of Q2, i.e., greater than 0.

Table 9 PLSpredict assessment of indicators

Indicator	PLS			LM		PLS – LM	
	RMSE	MAE	$Q^2predict$	RMSE	MAE	RMSE	MAE
CR1	0.865	0.683	0.409	0.911	0.717	−0.046	−0.035
CR2	1.014	0.805	0.349	1.028	0.805	−0.014	−0.001
CR3	0.955	0.766	0.420	1.119	0.828	−0.164	−0.062
CR4	0.845	0.626	0.341	0.994	0.707	−0.149	−0.081
CR5	1.152	0.960	0.386	1.229	0.994	−0.077	−0.034
PR1	0.974	0.767	0.455	1.090	0.861	−0.116	−0.094
PR2	0.989	0.762	0.454	1.109	0.880	−0.120	−0.118
PR3	0.885	0.690	0.407	1.026	0.771	−0.141	−0.080
PR4	0.826	0.675	0.486	0.899	0.704	−0.073	−0.029
PR5	1.050	0.859	0.384	1.224	0.961	−0.173	−0.102
SR1	1.309	1.010	0.211	1.461	1.141	−0.153	−0.131
SR2	1.279	0.971	0.147	1.507	1.135	−0.229	−0.164
SR3	0.927	0.673	0.295	1.131	0.802	−0.203	−0.128
SR4	1.282	0.958	0.204	1.379	1.037	−0.097	−0.079
SR5	1.235	0.920	0.227	1.354	1.056	−0.118	−0.137
KR1	1.661	1.297	0.115	1.897	1.494	−0.236	−0.197
KR2	1.521	1.156	0.173	1.651	1.295	−0.130	−0.140
KR3	1.270	0.945	0.174	1.477	1.098	−0.207	−0.153
KR4	1.304	1.041	0.196	1.389	1.072	−0.085	−0.031
KR5	1.356	1.023	0.264	1.464	1.116	−0.108	−0.093

RMSE: Root mean squared error. MAE: Mean absolute error. PLS: Partial least squares path model. LM: Linear regression model. CR: Customer Results. PR: People Results. SR: Social Results. KR: Key Results. $K = 3$ subgroups, number of repetitions = 10

(2) Second, to evaluate the prediction error associated with the PLS-SEM analysis, the summary statistical values of the prediction error were compared with naive values obtained using a linear regression model (LM). The prediction error of the PLS SEM results should be lower than that of the LM results, specifically in terms of their root mean squared error (RMSE) or mean absolute error (MAE) values. In this sense, the skewness values for the prediction errors of the results indicators as a whole were under |1| (Hair et al. 2019) for both the PLS-SEM and LM analyses. That said, RMSE was chosen as the basis for assessing predictive power, although we also provide MAE statistics. Table 6 shows that the PLS-SEM analyses had lower RMSE and MAE prediction errors than the LM estimates of the model. According to Hair et al. (2020), we thus confirm the high predictive power of our model.

5 Discussion

Our research demonstrates that the EFQM model and KM are compatible and establish positive synergies for business management. In contrast to other work, we fill another research gap by linking the issues of KM and EM to the organisation's key stakeholders, such as customers, employees and society, as well as to key business outcomes. Another important difference between this study and other previous ones is that, by analyzing the indirect effects, the current research demonstrates the existence of synergies among the agents who facilitate knowledge of the EM and the phases of the KM process with regard to the results of this process for the main stakeholders. Another novel contribution is the confirmation of the predictive power of this model.

The results show that the proposed research model is reliable and valid (Table 5). All hypothesised relationships (H1, H2a, H2b, H2c and H2d) or direct effects posited in the research model are also confirmed at high levels of significance (Table 7 and Fig. 2). More specifically, the positive relationship between the EFQM-KM issue and the KM process (0.818) is corroborated, i.e., the implementation of the EM and the development of both self-assessment and external evaluation processes favour the effective and efficient development of the phases of the KM process. Along these lines, Abbas (2020) and Loke et al. (2012) argue that organisations that implement total quality management (TQM) principles and practices (leadership, strategic planning, human resource management or customer orientation) promote higher value KM activities and a greater level of learning. Ooi (2014) finds that certain TQM practices, such as strategic planning and human resources management, impact KM positively. Honarpour et al. (2017) and Hung et al. (2010) defend the synergistic effect of the relationship between TQM and KM. With regard to our study framework, Criado-García et al. (2020) demonstrate that KM can be developed efficiently through the systematic application of the EM. Quintana and Benavides (2005) investigate the facilitator and outcome criteria of the EM and establish connections with the KM process. Martín-Castilla and Rodríguez-Ruiz (2008) consider the EM to be

a strategic framework that facilitates the governance of organisational knowledge via the integration of intellectual capital. Our work empirically demonstrates this positive relationship and elaborates on it through the phases of KM, reducing the research gap in this field.

Similarly, the positive relationship between the KM process and the results that the organisation achieves in relation to customers and people as well as social and key results is confirmed (Table 7 and Fig. 2). These findings confirm the significance of the proper development of the KM process to achieve superior results and obtain sustainable competitive advantages. Thus, within the framework of the EM, Calvo-Mora et al. (2016) find that KM has a significant impact on key business results, both strategically and operationally. Tarí and García-Fernández (2013) demonstrate that KM practices improve operational results as well as customer and employee satisfaction. Furthermore, knowledge transfer between customers and employees is positive for both parties and ultimately affects organisational performance (Molina et al. 2007). Choi and Lee (2003) prove that KM enablers influence the KM process and simultaneously affect organisational performance. In this regard, according to Linderman et al. (2004), KM process phases are key to organisational performance, and this process mediates the relationship between KM practices and financial performance (Shahzad et al. 2020; Zack et al. 2009).

Finally, the EFQM self-assessment process facilitates organisational learning and knowledge improvement, which are ideal for achieving greater social commitment, through the implementation of corporate social responsibility practices that affect social results positively (Martín-Gaitero and Escrig-Tena 2018). Thus, the managers must use their knowledge and experience to establish social improvements (Bouncken et al. 2022). Moreover, the post hoc evaluation of the indirect effects shows that EFQM-KM issues are positively and significantly related to different outcome measures via the development of the KM process (Table 8). These results reveal the potential of the EM and TQM in general to facilitate the implementation of KM activities that improve the organisation's performance. In this sense, Loke et al. (2012) corroborate the claim that organisations that implement TQM practices and integrate KM into their operations achieve greater profitability and market share. Yusr et al. (2017) demonstrate how TQM practices influence KM processes, thereby improving innovation performance. Calvo-Mora et al. (2015) find that the EM is a valid framework for implementing KM. The use of process methodology and the involvement of suppliers and partners in this process should be highlighted as key factors that have a significant impact on key business results.

Unlike previous studies, this research adopts an empirical approach and does not attempt to analyse the effects of specific TQM practices on learning or any of the KM phases. In contrast, this study uses a global framework for excellent management (EFQM model), which has been contrasted at the European level. On the other hand, this study investigates the direct effects of KM on the results pertaining to the main stakeholders in the organisation (customers, employees, owners, shareholders and society in general) rather than only on specific performance measures such as operating results and customer or employee satisfaction.

Finally, the assessment of the out-of-sample prediction allows us to determine the capability of the model to predict observations that were not included in the original

sample. The PLSpredict evaluation at the indicator level demonstrates the ways in which the KM process can predict the outcome variables associated with additional samples that are separate from the dataset used to test the theoretical research model. Hence, we could use this model to predict outcome variables (e.g., customer, people, social and key results) based on new data or data collected in the future. This result helps reduce the risk associated with strategic decisions aimed at ensuring more sustainable and excellent management. The EM also stresses the need to interpret the results thus obtained to shape future management decisions (Van Schoten et al. 2016), which is why a model that guarantees predictability can provide valuable information for management in the future. In this sense, we did not find studies that have used predictive analysis to reduce risk in the context of decision-making with the aim of enabling us to continue advancing towards excellent management.

6 Conclusions and implications

6.1 Theoretical implications

The study shows that organisations can use the TQM implementation framework offered by the EM to efficiently develop the phases of the KM process. In the same way, they can use the synergies associated with knowledge issues in the EM and KM processes to improve the main results for stakeholders.

In general, organisations that use the EM self-assessment and external evaluation methodology exhibit stronger KM practices and improve their results for customers, people, society and key business stakeholders. Similarly, the EM needs adequate management to ensure its success, which is why the KM process is identified as a key asset that favours the correct implementation of the EM.

Our findings provide significant improvements in the field of quality and knowledge management. They allow us to advance in the study of business excellence models (BEM); specifically, in the ME model. Through this model, we deepen the relationships and synergies between these two relevant fields of study for organizational management. In addition, our study delves into excellence management and its importance within the Total Quality Management. It also empirically demonstrates that knowledge management processes have an impact on the results of critical business stakeholders, specifying which ones are more relevant.

Furthermore, this study represents an advance in the quantitative research related to the EM by providing evidence regarding a recent line of research: prediction (Suárez et al. 2017). More specifically, a valid and reliable prediction model that links the EM, the KM process and organisational results is proposed. This paper proposes out-of-sample prediction as an integral element of the evaluation of the model in PLS-SEM and as a way of evaluating its practical relevance since it allows us to predict results (Shmueli et al. 2019). This model is thus a powerful tool for deciding what actions to take in the future, as it can help minimise the risks and therefore the costs arising from mismanagement or incorrect decision-making. As indicated by Shmueli et al. (2016), studies in the social sciences have focused more on explanation than on prediction; however, it is very important to know whether a

model can predict new cases. In fact, a well-fitted model designed in an explanatory context can malfunction with regard to out-of-sample prediction, thus limiting its practical usefulness (Shmueli 2010).

6.2 Management implications

Our paper presents a novel management framework based on knowledge that favours the achievement of objectives and the results obtained for strategic stakeholders. On the one hand, customers enhance the perceived value of products/services. Thus, involving the customer in the configuration of such products/services promotes the exchange of knowledge and consequently encourages innovation, continuous improvement and quality. Regarding staff, improvements that favour the development of their skills in the context of a culture of excellence are implemented.

On the other hand, the mechanisms for evaluating the resources necessary to improve environmental impact and social commitment are improved. Likewise, this approach responds to the demands of non-profit groups and enriches the corporate reputation of the organisation. Furthermore, forecast management is a powerful strategic tool that helps the organisation achieve competitive advantages. If the knowledge-based vision perceives knowledge as a strategic resource for decision-making, predictive models support the strategic relevance of knowledge by anticipating the corresponding results. In this sense, the ability to decide which actions to take and which not to take reduces the risk associated with management practice in general and with the achievement of quality and excellence in particular.

6.3 Limitations and directions for future research

This study has several limitations. First, PLS-SEM assumes linear relationships among the latent variables. This model established direct linear relationships between EFQM-KM issues and the KM process, but there could also be inverse relationships in this context. This possibility should be taken into account in future research. Second, the sample used in this study was limited to 113 Spanish organisations. In this sense, certain local factors, such as the culture, the economy or the situation of the labour market in a country, could limit the extrapolation and generalisation of the results of this study. This factor raises the possibility of expanding the sample in the future to conduct comparative or more global studies. Third, future research can test the possible moderating effects of environmental factors, such as level of excellence, EFQM self-assessment experience, size or sector, in this context.

Similarly, future research should expand the sample referenced by this study to include organisations that do not use this model of excellence to serve as a contrast to the moderating effect of the EFQM model on the relationship between KM process and the corresponding results. When sufficient data are available, knowledge issues and other management issues can be analysed in the framework of the new EFQM Model 2020. Finally, with the intention of improving the robustness of our results, intertemporal effects could be examined through the use of longitudinal data.

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