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# Project to improve knowledge management and key business results through the EFQM excellence model

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**Abstract**

There is a growing interest in knowledge management as a strategic weapon, although the debate continues over which are the most effective models for its implementation. In this context, the main objective of this study is to analyse the potential of the EFQM Excellence Model to design and implement a knowledge management project (KMP) which improves the key results of the business. To reach the objective, a sample was used which consisted of 225 companies with experience in EFQM evaluations. The partial least squares structural equation modelling approach was used to test the model. The results show how the EFQM Excellence Model can be a valid framework upon which to implement a KMP. In addition, the use of process methodology and the involvement of suppliers and partners are key factors for KMP to have a significant impact on the key results of the business.


*Keywords:* Knowledge management project; EFQM model; Process methodology; Supplier management; Partner management; Business results; Partial least squares

## 1. Introduction

The economic and business reality has changed much over the last decade. As Bueno Campos (2009) indicates, we are in the era of knowledge, in which this resource is the most important productive factor that organisations must manage. Their survival depends, to a large extent, on the knowledge that they possess and their ability to generate, retain, transfer and operate the capabilities of people; that is, to manage knowledge. In this context, organisations have the need to implement systems to manage their knowledge with the objective of increasing their competitive capacity. A knowledge management system (KMS) is a set of infrastructures and tools that support knowledge management activities (Alavi and Leidner, 2001). They are something more than information systems, since they must provide a context that facilitates the creation, transfer and application of knowledge. Meso and Smith (2000) differentiate between technical infrastructure (information technologies) and that of a social and cognitive nature (organisational structure, human resources and culture). In practise, the implementation of KMS is not free from obstacles (Lee and Choi, 2003) as it requires important organisational and technological changes. In this sense, it can be appropriate for organisations to use other management systems that have already been consolidated, such as those of total quality, which serve to support initiatives of knowledge management (KM) (Adamson, 2005; Ju et al., 2006).

Total quality management (TQM) is a comprehensive management philosophy oriented towards achieving excellent results in relation to stakeholders (Prajogo and McDermott, 2005). In order to attain these results, it is crucial to be able to count on the commitment and involvement of all the people within the organisation, as well as the use of certain management tools, techniques and practises (Din et al, 2011; Rahman, 2004).

Different frameworks exist to implement the principles and practises of TQM. Yusof and Aspinwall (2000) differentiate three types: (1) those based on experts or gurus of quality (Deming's 14 principles, Juran's Quality Trilogy, and Crosby's Absolutes of Quality Management Principles); (2) the excellence models or quality awards (Deming Prize, the Malcolm Baldrige National

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Quality Award—MBNQA, or the European Quality Award—EFQM model); and (3) those extracted following theoretical and/or empirical research or measurement studies (Anderson et al., 1994; Flynn et al., 1994; Saraph et al., 1989). Bou Llusar et al. (2009) and Calvo-Mora et al. (2014a) point out how the use of the excellence model guarantees that the management practises employed, form a coherent system.

In Europe, the EFQM Excellence Model is the best-known and most widespread reference when introducing and improving a TQM system. This model establishes the organisation's strategy and allows the managers to understand the cause–effect relationships which exist between what the organisation does (enablers' criteria), and the results that it achieves (results' criteria).

The aim of the EFQM Excellence Model is to support organisations to achieve business excellence through continuous improvement, learning and innovation. This involves using a mixed methodology which includes self-assessment and external evaluation processes (undertaken by independent experts) to give validity to the initial diagnosis made by the organisation itself. Information is gained from these processes about what the organisation is doing to achieve its objectives, how its plans, planned programmes and processes are developing, what resources and alliances it has to reach its objectives, as well as the impact that its actions have had on its principal stakeholders (EFQM, 2003). The level of excellence can only be diagnosed by the contextualisation and detailed analysis of the information, which is the starting point for the production of the action, improvement and learning plans.

The implementation of the EFQM Excellence Model allows knowledge to be obtained about the degree of development, effectiveness and efficiency of the internal management processes (Calvo-Mora et al., 2014a; Weske, 2007). Furthermore, it favours the implementation of a methodology for the monitoring, control and improvement of the processes in a systematic manner (Asif et al., 2013; Molina et al., 2007; Ooi, 2009). Performance improvement also depends on the indispensable strengthening of the external alliances and relationships which the organisation has with suppliers, distributors, customers and other strategic partners. These alliances and relationships generate synergies and increase the opportunities for the exploitation and exploration of new ideas and knowledge (Daud and Yusoff, 2011; Ju et al., 2006; Molina et al., 2007). The information about the previously mentioned factors (Knowledge, Process methodology and management, Supplier/partner management and Key results) cannot be obtained by means of the traditional or vertical analysis of the EFQM Excellence Model, that is to say, by analysing each criterion independently when these factors are related to other criteria of the Model in a horizontal or transverse manner. The horizontal Reading of the EFQM Excellence Model through the transversal axes is not as obvious as the vertical, but it is a powerful tool for analysing concepts important to the organisation (Fernández-Santos et al., 2010). Within the present study this horizontal or transverse perspective is used to analyse the possible start-up of a knowledge management project (KMP). This will begin with the information and knowledge that the organisation obtains from its internal processes and from its main partners and external collaborators. Finally, the effectiveness of the KMP is examined through the impact on the key results of the business, both operational and strategic.

The literature contributes evidence of relationships between quality management and KM practises. These relationships have been analysed taking as reference the ISO 9000 family of standards (Lin and Chuni, 2005; Marcus and Naveh, 2005; Molina et al., 2004; Tang and Tong, 2007) and some TQM principles and practises (Honarpour et al., 2012; Hsu and Shen, 2005; Ooi, 2009; Ribière and Khorramshahgol, 2004). However, there is a lack research that empirically analyses the suitability of the EFQM Excellence Model as a reference framework for a KMP implementation. Neither have studies been identified that use the horizontal reading of the EFQM Excellence Model as a basis for making a diagnosis about KM and the later development of improvement and strengthening plans.

For that reason, the present study poses the following research questions:

(1) Can the organisations which institute TQM develop a KMP using the experience provided by assessment through the horizontal reading of the EFQM Excellence Model?
(2) Are the critical factors of process, supplier and partner management of TQM useful for strengthening a KMP start-up?
(3) Does the KM process, in the EFQM Model framework, affect the key strategic and operational results of organisations?

In order to answer the proposed questions, this paper is organised as follows. Firstly, the literature on KM and EFQM Excellence Model is analysed. Secondly, the research model and the hypotheses are presented. This is followed by the research method and results. Finally, the conclusions are presented and the limitations and further research of the study are described.

## 2. Theoretical background and hypotheses

### 2.1. The EFQM Excellence Model

Organisations need to establish an appropriate management system to achieve success, irrespective of the sector, size or structure. Here, the EFQM Excellence Model sets out a practical and non-prescriptive management system that allows organisations to (Suárez et al., 2014): (1) prepare a basic structure for the design, implementation and improvement of a comprehensive management system; (2) evaluate their position on the path towards excellence, identifying their strengths and weaknesses as a starting point for the establishment of strengthening and improvement plans; (3) prepare a common framework and language that favours effective communication within the structure and (4) systematically integrate the strategic planning and interest group orientation into their management.

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To achieve sustained success in management the European Foundation for Quality Management propose the integration of three components (Fig. 1): fundamental concepts of excellence, EFQM Excellence Model criteria and the RADAR logic scheme.

The eight *fundamental concepts of excellence* outline the foundation for achieving sustainable excellence in any organisation. They can be used as the basis to describe the attributes of an excellent organisational culture and help to establish a common language for senior management. The fundamental concepts of excellence are: results orientation; customer orientation; leadership and consistency; management by processes and facts; development and involvement of people; development of alliances; continuous process of innovation, learning and improvement and responsibility of the organisation.

The above principles are translated and summarised into nine dimensions or criteria which serve as a guide for the implementation of the management system and the measurement of the results that are being achieved by the organisation. The nine criteria that the model proposes represent the indicative elements of the degree of progression which a certain organisation follows to achieve excellence.

These criteria are specified in five key implementation factors or enablers (leadership, policy and strategy, partnerships and resources, people and process), and the four remaining dimensions reflect the results which the organisation attains, concerning their customers, employees, society and other key results. Each of the nine criteria are accompanied by a definition which explains its significance. To develop each criteria with more detail, these contain a variable number of sub-criteria (for example, the leadership criterion has 5 sub-criteria, whilst the Results criterion in Customers has two sub-criteria). In total, the EFQM Excellence Model considers 32 sub-criteria to approach when making a complete self-assessment of the organisation (Fig. 2). Finally, each sub-criterion includes a non-exhaustive nor obligatory list of elements to take into account, the objective of which is to provide examples which clarify the significance of the sub-criteria, and guide the self-assessment of the organisation. Specifically, there are a total of 174 elements to consider.

Moreover, the EFQM Excellence Model has a dynamic nature. It indicates that activities such as innovation, learning or creativity, boost and empower the impact that the model's enablers have on the results. This refers to the system's continuous improvement in the search for excellence (EFQM, 2003).

Finally, the RADAR (Results, Approach, Deployment and Assessment and Review) logic scheme provides a structured focus with which to undertake the self-assessment based on the EFQM Excellence Model. The elements of Approach, Deployment, Assessment and Review are applied for the enablers' criteria, and analyse the evidence of what the organisation is doing. The Results element is used to assess the results' criteria. This analyses what the organisation achieves as a consequence of the efforts made.

### 2.2. Knowledge issues in the EFQM Excellence Model

Benavides and Quintana (2003); Martín-Castilla and Rodríguez-Ruiz (2008) and Westerveld (2003) maintain that the EFQM Excellence Model constitutes an element of stimulus and impetus for the implementation of a KMP. Furthermore, it provides a cultural framework that favours the effectiveness of the KM process.

Consequently the fundamental concepts of excellence approach issues related to KM. More specifically, the "Development and involvement of people" principle expressly mentions how excellent organisations recognise the increasing importance of the intellectual capital of those who comprise them and use their knowledge to the benefit of the whole organisation. In addition, the "Continuous process of learning, innovation and improvement" principle indicates that excellent organisations, through benchmarking activities, must continuously learn, and gather and share the knowledge of the people who comprise

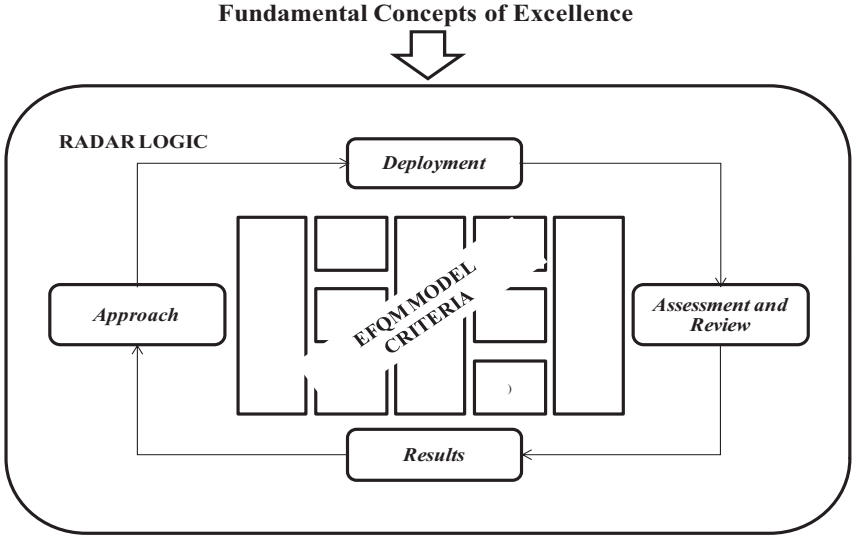


Fig. 1. EFQM Excellence Model components.

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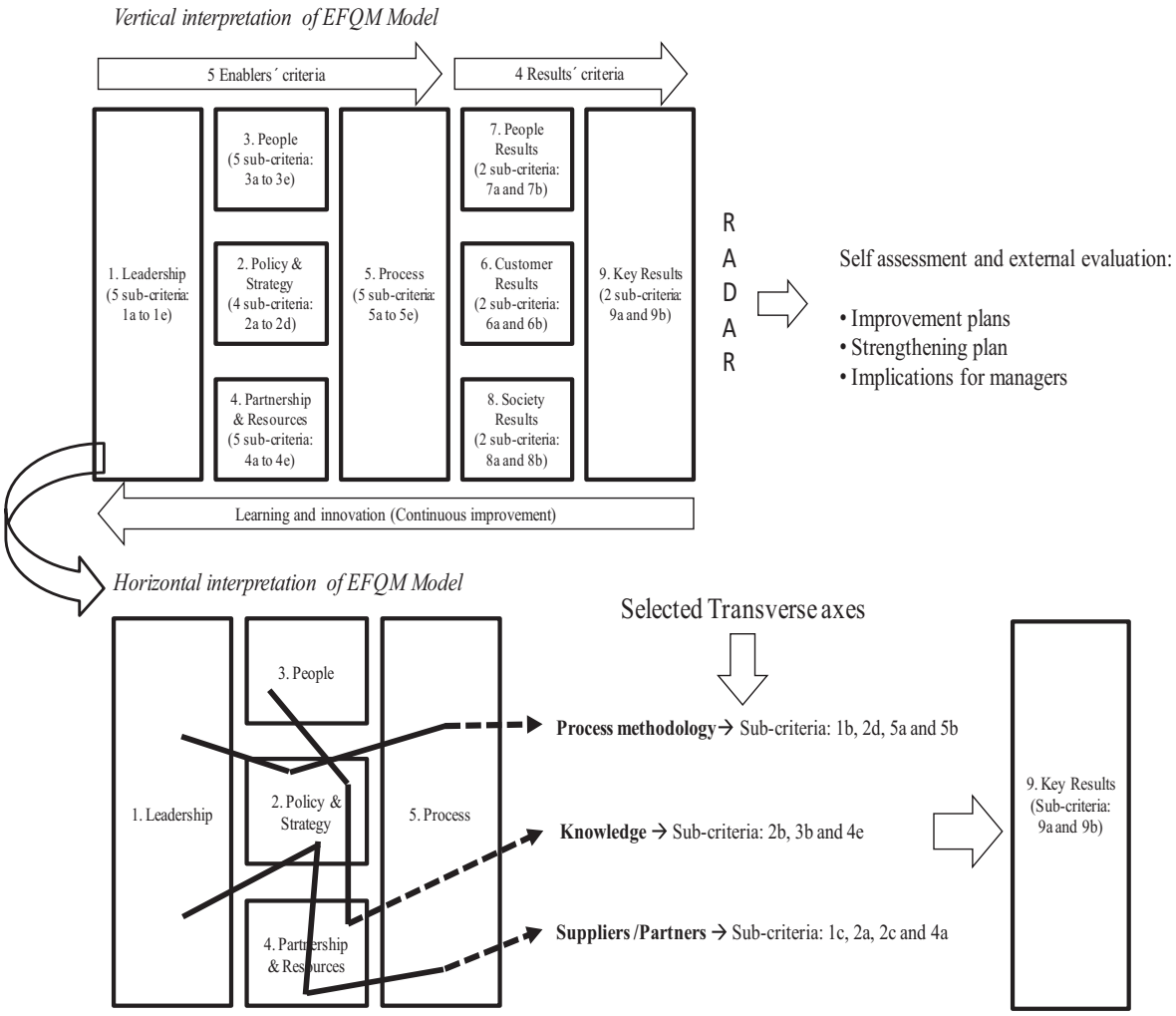


Fig. 2. Vertical and horizontal interpretation of the EFQM Excellence Model.

them, to maximise the learning in the whole organisation. Furthermore, the "management by processes and facts" principle refers to the need to manage based on the information and objective knowledge about the development of the key processes of the organisation. Finally, the principle "Development of alliances" establishes how partners must work together to reach common objectives, each helping the others with their experience, resources and knowledge (EFQM, 2003). These concepts determine the set of cultural values and principles which serve as a framework for the management of excellence, and which are specified in the nine criteria of the EFQM Excellence Model.

This is why the criteria of the EFQM Excellence Model refer, in the sub-criterion 3b of the People criterion, to the need to identify, develop and maintain the knowledge and the abilities of the people. For this, it is necessary to assess (1) how the knowledge and the competences of the personnel are identified, classified and adapted to the needs of the organisation; (2) how training and development plans are developed and implemented which contribute to guaranteeing that the abilities of the personnel are adjusted to the present and future needs of the organisation; (3) how learning opportunities are designed and promoted at the individual, group and organisational level. In addition, the "Alliances and Resources" criterion, in sub-criterion 4e, expressly mentions information and knowledge management. In particular, it analyses how the organisation (1) manages information and knowledge in support of policy, strategy and objectives; (2) identifies the current information and knowledge; (3) provides suitable access to important information and knowledge; (4) uses information technology to support internal communication and information and knowledge management; (5) cultivates, develops and protects the intellectual property to maximise its value for the customer; (6) tries to acquire, increase and use knowledge effectively; and, (7) generates a climate of innovation and creativity in the organisation by means of suitable information and knowledge resources. Aspects related to KM can also be identified in other criteria of the EFQM Excellence Model, although these aspects are not specifically mentioned. For example, the "Leadership" criterion refers to practises that help knowledge creation: the promotion of empowerment, creativity and innovation, or establishing incentives so people and groups participate in improvement activities. The "Processes" criterion also identifies aspects related to the application of knowledge when the need is mentioned to manage the information that

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comes from the customers for the development of new products and services.

As mentioned previously, in this vertical interpretation of the EFQM Excellence Model, KM is only approached in sub-criterion 4e, however, the KM issues are included within other sub-criteria of the model.

The interpretations of the relationships between the sub-criteria are made through the horizontal interpretation of the model, more specifically in the so-called transverse axes of the model. The existence of these axes implies that, by adopting a systemic management approach, when starting up improvement projects in any one of the processes or practises of the organisation, effects will be obtained in more than one criterion. This means global improvements in the organisation cannot be achieved if the different aspects of the criteria of the model are not simultaneously approached as interdependent elements (Fernández-Santos et al., 2010). The EFQM Excellence Model contemplates a non-exhaustive number of transverse axes which refer to the critical aspects of the organisation's management. Amongst these axes, critical aspects can be identified that are directly related with the KM process and which, according to the specialised literature analysed, are fundamental for success when designing and implementing a KMP (Fig. 2).

These critical aspects are (1) "knowledge", including aspects related to individual knowledge, organisational knowledge and the integration of individual and organisational knowledge (Honarpour et al., 2012; Hsu and Shen, 2005; Ooi, 2009); (2) "process methodology", due to knowledge of the organisation becoming formalised and more explicit through processes, which favours its creation, transfer and diffusion (Asif et al., 2013; Hsu and Shen, 2005; Molina et al., 2007; Ooi, 2009); and (3) "supplier and partner management", as, apart from the information derived from the internal processes, the management of the information and knowledge which comes from them is increasingly important (Daud and Yusoff, 2011; Ju et al., 2006; Molina et al., 2007). Finally, the "key results of the business", attempts to determine what benefits the organisation is reaching in relation to the planned economic–financial, market and process results and the efficiency in the management of the tangible and intangible resources.

### *2.3. Integrating the EFQM Model framework, process methodology and supplier/partner management in the knowledge management process*

There are different approaches to the concept of knowledge, as it is a complex, broad and abstract term (Alavi and Leidner, 2001). One of the more accepted definitions is that of Nonaka (1994) for whom knowledge is a dynamic human resource of justification of the personal beliefs to obtain the truth. As Segarra Ciprés and Bou Llusar (2005) indicate, this vision of knowledge emphasises its active and subjective nature. More clarifying is the definition of Davenport and Prusak (2000) for whom knowledge is a flow that combines values, experiences, abilities and attitudes that facilitate a framework of analysis for the assessment and new incorporation of experience and information. Knowledge is originated, stored and applied in the mind of individuals, and in organisations, it is found in the organisational routines, processes, practises, regulations and other documents.

As is apparent from the previous definition, there are different types of knowledge. Tacit knowledge resides in actions and experiences and comprises part of a specific context, which is why it is more difficult to formalise and to transfer or to communicate (Alavi and Leidner, 2001). On the other hand, explicit knowledge refers to knowledge that can be easily articulated or formalised in documents, manuals and procedures (Nonaka and Takeuchi, 1995). From the point of view of management, the difference between knowledge that resides in the person (individual knowledge) and that which belongs to a social group or the organisation itself as a whole (organisational knowledge) is also important (Segarra Ciprés and Bou Llusar, 2005).

KM is a set of processes by which an organisation makes use of its individual and collective intelligence to reach its strategic objectives (Grant, 1996). In addition, KM is a process that involves a series of activities related to the creation/acquisition of knowledge, its storage/retention, its transfer/diffusion and its application/use (Alavi and Leidner, 2001; Davenport and Prusak, 2000) (Fig. 3).

Before starting the KM process, the organisation must identify and measure the knowledge it already has at the individual and organisational level. A large part of this knowledge is found formalised (explicit knowledge) and located in the internal processes of the organisation (Asif et al., 2013). The non-formalised knowledge (tacit knowledge) is found using the self-assessment methodology of the EFQM Excellence Model which makes an in-depth analysis of what the organisation does, who does it and where it is done (EFQM, 2003). Next, the organisation will have to estimate the knowledge it needs. This knowledge will be determined by the environment and by the key elements needed to compete within it. Therefore, the relationships which the organisation has with its main suppliers, customers, partners and competitors will contribute a large part of the information it needs to estimate this knowledge (Daud and Yusoff, 2011).

#### *2.3.1. Knowledge generation*

When the organisation knows what knowledge it has, and what knowledge it is going to need, it can determine its knowledge gap and reflect on the best way to cover this gap through knowledge generation (Davenport and Prusak, 2000). This phase of knowledge generation is very important for the future development of the organisation because it allows it to continuously adapt to environmental changes (Zack et al., 2009). More specifically, knowledge creation stems from the interaction between tacit and explicit knowledge in their individual and organisational aspects (Nonaka and Takeuchi, 1995). Furthermore, this process can be directed towards the development of activities which generate new knowledge (exploration), or towards activities that apply existing knowledge to new uses (exploitation). In general, knowledge can be generated through activities directed to the internal creation of knowledge or to the acquisition of external knowledge

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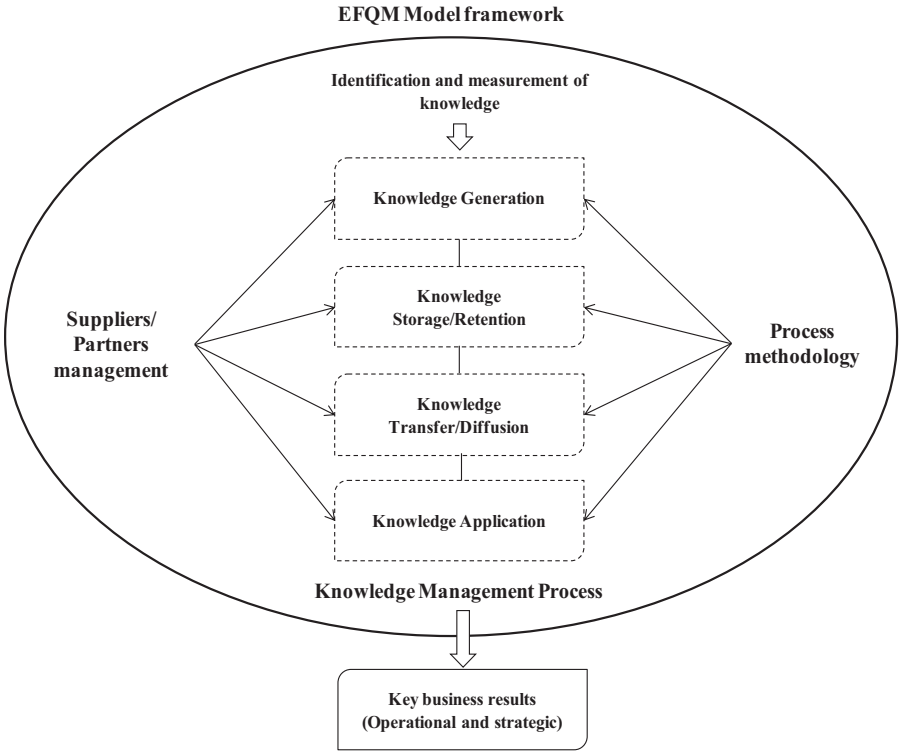


Fig. 3. Knowledge management process and EFQM Excellence Model framework.

(Davenport and Prusak, 2000). In the first case, the generated knowledge tends to be tacit, specific and unique, and therefore difficult to imitate by the competitors. The acquisition of knowledge is the fastest way to generate knowledge, although the knowledge must have a certain degree of formalisation and the source must be selected with care. Benavides and Quintana (2003) point out that, for this phase to develop suitably, it is necessary for it to be undertaken in an atmosphere that favours communication, creativity and change. These principles and values are very evident in companies that implement excellence models such as that of the EFQM (Bou Llusar et al., 2009).

### 2.3.2. Knowledge storage/retention

Once the knowledge is generated it will have to be summarised and stored so that it can be transferred to the individual, groups or units that need to apply it. The stored knowledge will form part of the organisational memory (Johannsen, 2000). Therefore, the reports from the self-assessment and external evaluation processes can be a good example of a source which nourishes the organisational memory. The report is a strong tool for capturing relevant information from the different departments and activities of the organisation, as well as for maintaining it and accessing it easily. There are software programmes available for this purpose such as the PERFIL tool. This is a powerful tool for performing self-assessments, in accordance with the requirements of the EFQM Excellence Model and the RADAR logic, which facilitates and simplifies the diagnosis. PERFIL's innovative graphic analysis interface captures the assessment data and displays the results, in real time, in a varied spectrum of representations, both numeric and graphic. Furthermore, it provides information on the strong points and areas for improvement, as well as positioning reports with respect to other similar organisations.

### 2.3.3. Knowledge transfer

The suitable storage and structuring of the generated knowledge facilitates the transfer of best practise (Szulanski, 1996). This phase is critical for the success of the KM process, as the transfer must produce changes in the knowledge base and in the abilities of the people, groups and organisations that intervene in that process (Argote and Ingram, 2000). The transfer of knowledge can be realised through information or by means of experience, within the organisation itself or between organisations.

Knowledge is transferred with the information through communication media. This is a more effective method to disseminate explicit knowledge, and to larger groups of people. However, the transfer of non-formalised (tacit) knowledge between people is more effective through experience, that is, by means of practise based learning (Sveiby, 2001). The use of the EFQM Excellence Model can facilitate the transfer of knowledge through information and experience. Thus, the assessment results provide valid, reliable and formalised information on what the organisation is doing efficiently (best practise) and on those aspects that should be improved, and can be spread internally between the different departments with ease and rapidity. Furthermore, the self-assessment process and

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the later implementation of improvement and strengthening plans are put into effect through the formation of improvement teams or groups which create a climate which favours the Exchange of experiences and mutual learning (Tarí Guilló et al., 2007). Teece (2007) indicates how other types of knowledge that are necessary to compete are found in other organisations and groups (suppliers, customers or competitors), that is, it may be necessary that transfer also occurs between organisations. In this case, the use of the EFQM Excellence Model allows information to be obtained and disseminated, as this establishes permanent communication links with these groups. Furthermore, ad-hoc groups may be constituted between the organisations to facilitate better knowledge of the partners and the Exchange of experiences (Samuelsson and Nilsson, 2002).

*2.3.4. Knowledge application*

The main object of the KM process must be to generate value for the agents which intervene in the process. To that end, the generated, stored and transferred knowledge must be applied or used in an efficient manner. For this reason, the uptake capacity of the individuals, groups and organisations is a critical aspect (Zahra and George, 2002). As a consequence of the uptake of knowledge, learning is produced which provokes the adoption of new beliefs, new relationships, modification or reinforcement of behaviour and values, as well as other types of more practical improvements such as those related to working methods, in operations or in processes (Leal-Rodríguez et al., 2014). In this respect, the use of the EFQM Excellence Model strengthens a continuous process oriented towards improvement and learning, that is, the self-assessment does not only seek to obtain information on the degree of excellence an organisation reaches in its key activities and its results, but uses that information and diagnosis to learn and improve.

From the above, it is concluded that *process methodology* describes what the organisation does and, consequently, makes its knowledge and capacities explicit (Tang and Tong, 2007). Therefore, process management facilitates the creation of knowledge (Asif et al., 2013; Marcus and Naveh, 2005), as the processes include concepts, methods and techniques to support the design, implementation and analysis of the activities that generate value. Accordingly, the information derived from the activities that form the processes are transformed into knowledge (Weske, 2007). Process management also favours the storage and the transfer of knowledge (Molina et al., 2007) when cooperating to transform it from tacit to explicit. In addition, the implementation of process management changes the structure of the company, making it more open and flexible. In this climate, the transfer and diffusion of knowledge is strengthened (Linderman et al., 2004). The main objective of process methodology is to establish a system to be able to monitor the processes which allow the organisation to learn and introduce continuous improvements (Choo et al., 2007).

In this context, process methodology also offers a framework that enables knowing, integrating and improving the key activities, or which add value, for both partners of the alliance (Spekman et al, 2002). Thus, efficiency in the development of the operation and activities in which the partners take part, facilitates the satisfaction of the expectations of both and, therefore, it increases the confidence in the alliance and its possibility of success (Fleming and Low, 2007). Other critical elements for success are communication, honesty and transparency between the parties. For that reason, organisations usually integrate suppliers and partners into their management systems (Martín-Castilla and Rodríguez-Ruiz, 2008), in which process methodology is an indispensable requirement so that the systems fulfil their objectives. Therefore, we propose the following hypotheses:

**H1**. *In the EFQM Excellence Model framework process methodology positively affects the management of knowledge.*

**H2**. *In the EFQM Excellence Model framework process methodology positively affects supplier and partner management.*

On the other hand, companies that maintain excellent relationships with their suppliers and partners can take advantage of synergies and access and exchange new or complementary knowledge, which allow the generation of value for both parties (Daud and Yusoff, 2011). This exchange of knowledge can even be obtained without having to produce explicit knowledge, as it can be made through the exchange of people or groups with common objectives and cultures which will be able to work together effectively (Davenport and Prusak, 2000).

As noted previously, confidence between the partners is an important factor that influences the effectiveness of knowledge transfer. Confidence is associated to the belief that organisations act coherently and according to expectations (Spekman et al., 2002). Confidence is closely related to the risk and the protection of knowledge. A reduction in confidence between organisations will be translated into a greater risk of losing critical knowledge. On the contrary, confidence will encourage the actors to actively share their knowledge, ensuring that this will not be used against their objectives (Linderman et al., 2004). Therefore, it is hoped that an organisation that has greater levels of confidence in its collaborative relationships with its suppliers and partners manages knowledge in a better manner (Loke et al., 2012). Accordingly, we propose the following hypothesis:

**H3**. *In the EFQM Excellence Model framework supplier and partner management positively affects knowledge management.*

Finally, to complete the research model (Fig. 4), the relationship between KM and business results is considered. Grant (1996) considers that knowledge is the most important strategic resource that organisations can have. Thus, the effective management of this resource is a source of competitive advantage that will lead to an improvement of the results (Prahalad and Hamel, 1994). The key results in the EFQM Excellence Model attempt to measure what the organisation obtains in relation to its strategic results and planned yield. More specifically, the strategic key results of the economic–financial type (sales volume, share or dividend prices, gross margins, share profits, profits before interests and taxes or operating margin), as well

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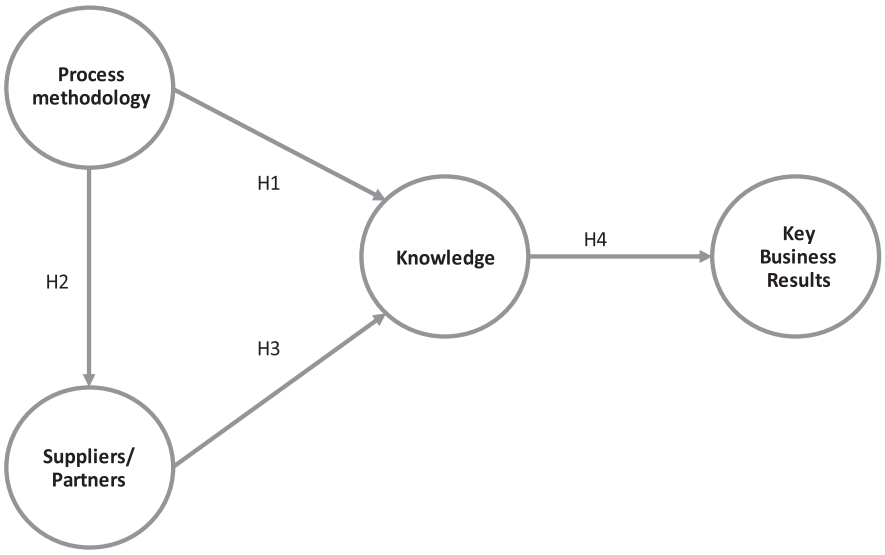


Fig. 4. Research model and hypotheses.

as those of a non-economic nature are analysed (market share, time of launching new products, success indices, process performance) which show the success achieved by the implementation of the strategy. The positive relationship between knowledge management and financial results has been confirmed in the studies of Darroch and McNaughton (2003); Huang and Shih (2009) and Tanriverdi (2005). More specifically, Tarí Guilló and García-Fernández (2013) reach the conclusion that the processes of creation, storage, transfer and application of knowledge influence economic results through greater product diversification, greater client loyalty and increased automatic control over the work.

The key economic–financial indicators (treasury, depreciation, maintenance costs, credit qualification) and non-economic indicators (performance of processes, partners and suppliers, external resources and alliances, buildings, equipment and materials, technology, information and knowledge) which the organisation uses to measure its operational efficiency. Hence, studies like those of Lee and Choi (2003); Simonin (1997); Tarí Guilló and García-Fernández (2013) and Zack et al. (2009) indicate how knowledge management contributes to improving the operational results through the development of a global vision of the company, empowerment, and improvement in decision making, reduction of errors, teamwork or the training and qualification of the workers. Therefore, the following hypothesis is proposed:

**H4**. *In the EFQM Excellence Model framework knowledge management positively affects the key results of the organisation.*

## 3. Methodology

### 3.1. Sample

According to data supplied by the Centros de Excelencia (an association that represents the bodies which manage the Excellence Awards of the different Autonomous Communities of Spain), the total number of organisations that submitted complete evaluations during the period 2003–2010 rose to 355. After contacting the different territorial associations, a total of 225 (63.4%) complete evaluations were received.

The sample includes large, as well as small and medium size companies (SMEs). According to the definition by the European Commission 96/280/EC, SME's will be considered to be those companies which employ less than 250 people, whose annual business volume does not exceed 50 million euros or whose annual general balance sheet figures do not exceed 43 million euros.

In addition, the sample also includes companies from the main sectors of activity (primary, secondary and tertiary), as well as publically and privately owned companies (Table 1).

### 3.2. Measures

The variables and their respective measurement indicators were obtained from the transverse axes of the EFQM Excellence Model (EFQM, 2003). In this study, and according to the objectives considered, three transverse axes were selected (knowledge, process methodology and suppliers and partners), as well as the key results of the business (Table 2; Fig. 5).

The data were collected from the assessment processes according to the RADAR (Results–Approach–Deployment–Assessment and Review) logic which the EFQM Excellence Model uses to score the level of excellence of organisations. The Approach, Deployment, Assessment and Review elements were applied for the Enablers, and must analyse the evidence of what the organisation is doing. The Results element was used to assess criteria related to the results, and analyse what the organisation obtained as a result of its efforts.

The points scale of the RADAR matrices for the Enablers is divided into 5 intervals which range from value 0 (without evidence or anecdotal) to value 100 (total evidence). The Results scale also varies between 0 and 100, but the meaning of the extreme values changes according to the type of result that

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Table 1
Sample characteristics.

| | Frequency | Percentage |
|---|---|---|
| *Ownership of the capital* | | |
| Private | 188 | 83.5 |
| Public | 37 | 16.5 |
| Total | 225 | 100 |
| *Size* | | |
| Small and medium | 146 | 64.8 |
| Large | 79 | 35.2 |
| Total | 225 | 100 |
| *Sphere of activity* | | |
| Services | 161 | 71.5 |
| Industry and construction | 45 | 20 |
| Agriculture | 19 | 8.5 |
| Total | 225 | 100 |

is being analysed (trend of the results, fulfilment of objectives, comparisons with other companies, causes of the results or sphere of application). The RADAR logic is a dynamic assessment framework and a powerful management tool that provides a structured approach to questioning the performance of an organisation (Williams et al., 2006).

### 3.3. Data analysis

The research models depicted in Fig. 1 were tested using a variance-based, structural equation modelling (partial least squares—PLS-). PLS allows the assessment of the measurement model and testing of the linkages proposed between constructs (Roldán and Sánchez-Franco, 2012). The choice of PLS in this study is based on the following reasons: (1) this research is focused on the prediction of dependent variables and tackles a theory building environment (exploratory analysis); (2) the sample is not too large (n = 225), and following Reinartz et al. (2009, p. 342) "PLS should be the method of choice for all situations in which the number of observations is lower than 250"; and, (3) PLS is the best option if the researcher needs to use scores of latent variables in later analyses for the purpose of predictive relevance. SmartPLS 2.0.M3 software was used (Ringle et al., 2005).

## 4. Results

As Roldán and Sánchez-Franco (2012) describe, the PLS methodology starts from the graphical description of the structural or internal model, that is, from a representation by means of symbols of the relationships existing between the latent variables (constructs), and of the relationships existing between the indicators and the constructs of the measurement or external model (Fig. 5). The latent variables are represented by means of circles, being able to distinguish between independent (exogenous constructs) and dependent variables (endogenous constructs). In this particular case, the independent variable would be the process methodology construct, the rest being endogenous constructs. The arrows and their direction indicate the predictive relationships between the latent variables. These relationships constitute the hypotheses of the model supported in the theoretical knowledge on TQM and KM.

Table 2
Measures.

| Variable/indicator | EFQM Sub-criterion |
|---|---|
| *Process methodology* | |
| Development of a process management system and to assign its proprietors | 1b |
| Identify and develop the key process diagram | 2d |
| Description of the system to design and to manage processes | 5a |
| Description of the system oriented to the improvement of processes | 5b |
| *Suppliers/partners* | |
| Involvement of the leaders with suppliers and partners | 1c |
| Establish needs and expectations | 2a |
| Balance needs and expectations | 2c |
| Manage alliances | 4a |
| *Knowledge* | |
| Contributions of knowledge to the policy and strategy of the organisation | 2b |
| Identification, development and maintenance of the knowledge in the personnel | 3d |
| Management of the organisation's knowledge | 4e |
| *Key results* | |
| Key performance outcomes. These measurements include: (1) Economic and financial results: General data (sales volume, share or dividend prices); Aspects related to profitability (gross margins, share profits, profits before interests and taxes or operating margin); Information about investments and assets (profitability of invested capital, of net assets or of capital used). (2) Non-economic results: Market share, time of launching new products, success indices, process performance, etc. | 9a |
| Key performance indicators. These measurements include: (1) Economic and financial measurements: treasury, depreciation, maintenance costs, credit qualification, etc. (2) Non-financial measurements: Processes (performance, assessments or innovations); External resources (performance of suppliers, number and added value of partnerships, number and added value of joint improvements attained with partners); Buildings, teams and materials (indices of defects, inventory rotation, use); Technology (rhythm of innovation, value of intellectual property, patents, royalties); Information and knowledge (accessibility, integrity, value of intellectual capital). | 9b |

Roldán and Sánchez-Franco (2012) indicate two stages in any PLS analysis: the assessment of the measurement model and the evaluation of the structural model.

### 4.1. Measurement model

Given that the measurement model has been designed as reflective, its assessment has to be based with regards to reliability and validity (Roldán and Sánchez-Franco, 2012). In this vein, loadings of both indicators and dimensions exceed the 0.707 threshold. Consequently, indicators and dimensions are reliable. Constructs and dimensions present high internal consistency, as its composite reliability indices are above 0.7.

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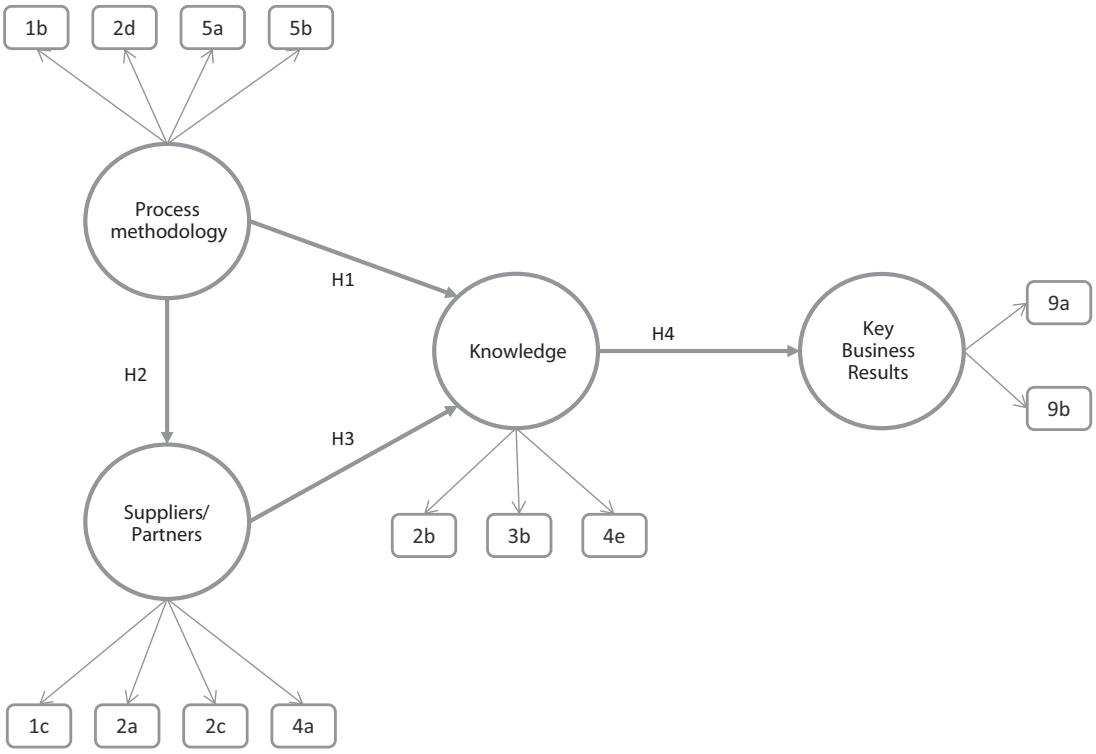


Fig. 5. Graphical description of the model.

In addition, the convergent validity is achieved for all latent variables because the average variance extracted (AVE) ratios exceed the 0.5 benchmark (Table 3).

Finally, Table 4 shows that the square root of the AVE of each latent is greater than its correlations with any other latent variable. Thus, the discriminant validity is reached, and it can be concluded that the main constructs measure different aspects.

### 4.2. Structural model

The structural model was evaluated based on the algebraic sign, magnitude and significance of the structural path coefficients, the $R^2$ values, and the $Q^2$ (redundancy) test for predictive relevance (Roldán and Sánchez-Franco, 2012). Consistent with Hair et al. (2013), bootstrapping (5000 resamples) was used to generate standard errors, t-statistics, and percentile 95% confidence intervals.

The endogenous constructs achieve $R^2$ values higher than 0.45, even attaining an outstanding figure of 0.798 for the knowledge factor. This is higher than the substantial level indicated by Chin (2010). The predictive relevance of the theoretical/structural model is assessed with the cross-validated redundancy index ($Q^2$) for endogenous constructs. Since all $Q^2$ values are greater than 0, we found evidence that our model has predictive relevance (Chin, 2010) (Fig. 6 and Table 5). In addition, Table 5 shows the amount of variance that each antecedent variable explains on each dependent variable.

A predicting variable would have to explain at least 10% (0.1) of the variance of the variable that it predicts (Roldán and Sánchez-Franco, 2012). Chin (1998) considers $R^2$ values of 0.67, 0.33, and 0.19 as substantial, moderate, and weak, respectively. In our case, all the relationships set out in the structural model fulfil this rule. The influence exerted by the process methodology variable on the rest of the variables is emphasised when explaining the more than 20% of the explained variance of the knowledge variable and more than 67% of the suppliers/partners variable. It is also worth emphasising the importance of the

Table 3
Measurement model.

| Construct/indicator | Loadings | Composite reliability | AVE |
|---|---|---|---|
| Process methodology | | 0.9120 | 0.7221 |
| 1b | 0.8720 | | |
| 2d | 0.8689 | | |
| 5a | 0.7752 | | |
| 5b | 0.8786 | | |
| Suppliers/partners | | 0.9240 | 0.7527 |
| 1c | 0.8685 | | |
| 2a | 0.9147 | | |
| 2c | 0.8695 | | |
| 4a | 0.8146 | | |
| Knowledge | | 0.8925 | 0.7348 |
| 2b | 0.8944 | | |
| 3b | 0.8490 | | |
| 4e | 0.8268 | | |
| Key business results | | 0.9534 | 0.9109 |
| 9a | 0.9523 | | |
| 9b | 0.9565 | | |

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Table 4
Discriminant validity.

| | Process methodology | Suppliers/ partners | Knowledge | Key business results |
|---|---|---|---|---|
| Process methodology | **0.8497** | | | |
| Suppliers/partners | 0.8213 | **0.8675** | | |
| Knowledge | 0.8065 | 0.8316 | **0.8572** | |
| Key business results | 0.5616 | 0.6594 | 0.6769 | **0.9544** |

Note: Diagonal elements (bold) are the square root of the variance shared between the constructs and their measures (average variance extracted). Off-diagonal elements are the correlations amongst constructs.

Table 5
Effects on endogenous variables.

| Effects on endogenous variables | Direct effect | *t*-value (bootstrap) | Explained variance |
|---|---|---|---|
| *Suppliers/partners ($R^2$ = 0.675/$Q^2$ = 0.506)* | | | |
| H2: Process methodology | 0.821 *** | 30.1145 | 67.45% |
| *Knowledge ($R^2$ = 0.798/$Q^2$ = 0535)* | | | |
| H1: Process methodology | 0.253 *** | 3.4816 | 20.4% |
| H3: Suppliers/partners | 0.674 *** | 9.559 | 56.05% |
| *Key business results ($R^2$ = 0.458/$Q^2$ = 0.417)* | | | |
| H4: Knowledge | 0.677 *** | 12.8322 | 45.83% |

*t*(0.05, 4999) = 1.645, *t*(0.01. 4999) = 2.327, *t*(0.001, 4999) = 3.092.
Sig. denotes a significant direct effect at 0.05.
Bootstrapping based on n = 5.000 subsamples.
*** $p < 0.001$, (based on *t*(4999), one-tailed test).

suppliers/partners variable when explaining the explained variance of the knowledge variable (56%).

In order to be able to compare the proposed hypotheses, the precision and stability of the obtained estimations must be assessed. For this purpose the Bootstrap technique was used which offers the standard error and the t values of the parameters. Following Roldán and Sánchez-Franco (2012), there was a generation of a Bootstrap proof of 5,000 subsamples and a one-tailed Student t distribution with (n − 1) degrees of freedom, where n is the number of subsamples to calculate the significance of the path coefficients. From these levels, the significance of the structural routes is obtained and, therefore, the support or not of the hypotheses (Table 5). Specifically, the 4 hypotheses proposed in the research have been confirmed with important levels of significance.

The Stone–Geisser ($Q^2$) test was used as a criterion to measure the predictive relevance of the dependent constructs. According to Chin (2010), if $Q^2 > 0$, the construct has predictive relevance. In our model all the $Q^2$ values of the dependent constructs display values above 0.41 (Table 5) which is why it can be said the model has predictive relevance.

## 5. Discussion and conclusions

The results support the reliability and validity of the measurement model (Tables 3 and 4), and hence the high predictive power of the EFQM model as a framework for the implementation of a KMP. It presents explained variance ($R^2$) values over 0.417, as can be observed in Table 4 and Fig. 6. Moreover, the proposed model shows a high predictive validity, since the $Q^2$ coefficient value is above 0 (Table 5). Hence, the reliability and validity of the EFQM Excellence Model for the TQM implementation has been widely studied in the literature (Calvo-Mora et al., 2014b). However, there are no studies which analyse the validity of the EFQM Model as a framework for the implementation of KM initiatives. Only Ooi (2009) uses the TQM critical factors present in the MBNQA to study their relationship with the phases of the KM process. Moreover, there are few studies that analyse the effects of the TQM and KM practises on organisational results.

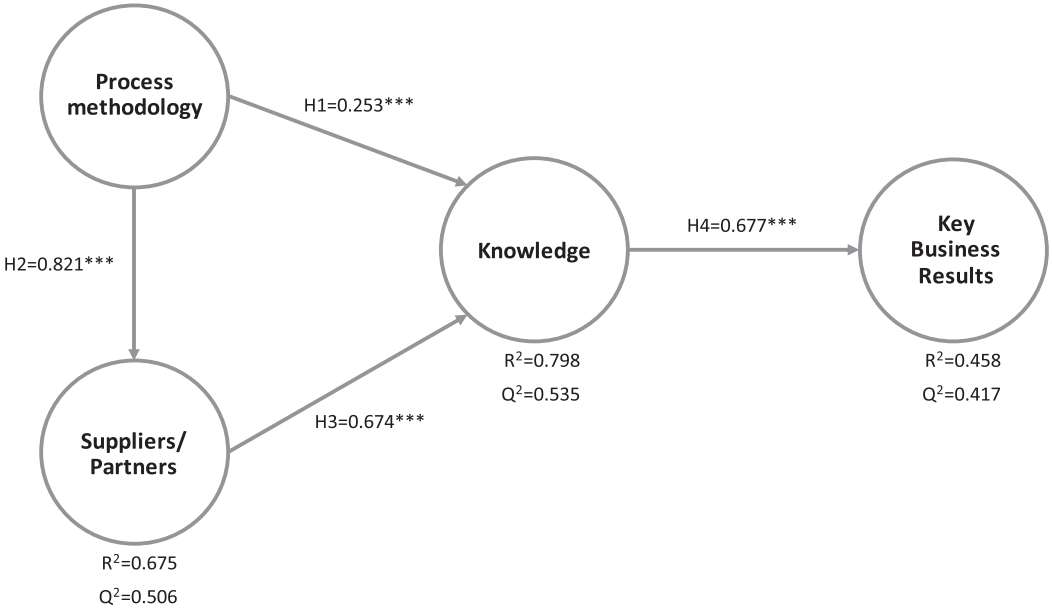


Fig. 6. Structural model results.

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More specifically, our research findings show how process methodology plays a critical role in the model that a KMP represents. Thus, process methodology exerts a significant direct influence on knowledge (H1) and on supplier and partner management (H2). In addition, it also exerts an indirect influence on the key results of the business through these variables (Table 6).

The importance of this factor is also reflected in the high percentage of variance explained (R2) both by the Knowledge variable (20.4%) and the suppliers/partners variable (67.45%). Ju et al. (2006) and Asif et al. (2013) corroborate how process management can be used by the companies as a base or platform to strengthen the implementation of KM.

The involvement of the main suppliers and partners is also a critical variable in the KMPs as evidenced by the very high influence on knowledge (H3) which explains 56.05% of its variance (Table 5). Daud and Yusoff (2011) consider that TQM soft factors, amongst which are found the contacts with suppliers and professional associates, favour the development of the KM process. In addition, the supplier and partner management indirectly affects the key results of the business (Table 6).

Finally, it must be emphasised how the specific efforts made by companies to manage their knowledge have a significant influence on the key strategic and operational results of the business (H4), with this variable explaining, by itself, the 45.83% variance of the key results variable of the business. Tarí Guilló and García-Fernández (2013) find positive relationships between the KM process and strategic results. In addition, studies such as those by Lee and Choi (2003) and Zack et al. (2009) confirm the influence of KM on the operational results.

In short, KMPs do not make sense if they are not developed systematically, as can be seen in the direct and indirect significant relationships that exist between the variables of the model. To be competitive, organisations need to continuously generate and assimilate knowledge and new capabilities. Therefore, TQM as a management philosophy based on continuous improvement, innovation and learning, and put into practise through the reference framework offered by the EFQM Excellence Model, can serve as a context and support for the start-up and later development of a KMP.

In practise, a series of obstacles can occur that complicate the implementation of a KMP, such as the integration of KM in the daily management of the organisation; the lack of effective tools to facilitate the KM process; or the cost of the information technologies (Lee and Choi, 2003). Therefore, the organisations must design projects or systems that are supported in an organisational structure, processes and cultural values (continuous improvement, innovation, learning) which promote communication, motivation, and confidence between people and groups (Alavi and Leidner, 2001; Mir and Pinnington, 2014). The previous existence of a quality management system, such as that proposed by the EFQM Excellence Model, can contribute proven management practises and very valuable experiences that are consistent with the critical factors for the success of the implementation of a KMP.

Table 6
Indirect effect.

| Structural path | Indirect effect |
|---|---|
| Process methodology → Knowledge → Key business results | 0.253 × 0.677 = 0.171 |
| Process methodology → Suppliers/Partners → Knowledge → Key business results | 0.821 × 0.674 × 0.677 = 0.375 |
| Total | 0.546 |
| Suppliers/Partners → Knowledge → Key business results | 0.674 × 0.677 |
| Total | 0.456 |

### 5.1. Implications for management

The horizontal reading of the EFQM Excellence Model through the transverse axes allows the important organisational management concepts to be analysed that are not contemplated in the vertical reading. Furthermore, it facilitates the identification of strong points and areas for improvement when analysing the different processes that cross the functional areas of the organisation. In addition, it allows the development of action and improvement plans. Accordingly, when an organisation makes an EFQM self-assessment it obtains a high number of improvement actions. The problem arises when we need to select those actions that have a greater impact on the important management areas of the organisation. Thus, if the organisation has identified its key transverse axes, it can design specific improvement plans based on the sub-criteria of the selected axes and the results obtained in the self-assessment. Hence, our study shows that organisations can use the EFQM Excellence Model as the basis for designing, implementing and monitoring its KMP. In addition, they can use the synergies contributed by the criteria of the EFQM Excellence Model and the critical factors of the TQM so that the implementation is faster and successful.

Generally, it can be stated that the companies which implement the principles and practises of TQM can improve their key results, strengthening the value of knowledge. To achieve this they will have to implement process methodology and maintain fluid and confident relationships with their main suppliers and partners. More specifically, the top management must provide a context in which the workers and partners participate in the design, development, implementation and continuous improvement of the key processes. In addition, policy and strategy must be communicated and deployed by means of a scheme of key processes which includes the transfer and application of the strategic knowledge for the company.

## 6. Limitations and future research lines

The interpretation of the results and conclusions of this study are subject to a series of limitations, principally of a methodological character. The first limitation is due to the technique used for the proposed model: structural equation modelling, which assumes the linearity of relationships between the latent variables. The second is related to the notion of causality. Our study has considered a soft modelling approach oriented more

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towards prediction than causality. Thirdly, the design of the research is cross-sectional instead of longitudinal. Objectively, the improvement and learning processes need time to produce more significant effects, so that their effectiveness can be evaluated more exactly. Finally, the conclusions reached cannot be completely generalised as they have been formed from a study pertaining to a geographic context and a specific business management style.

The indicated limitations constitute challenges for the development of new research. In addition, future studies could approach questions that have not been considered in the present research, such as: (1) To check if the results obtained with our research can be replicated segmenting the sample by size, ownership of capital and economic sector. (2) To check if the model used in our research is still valid when changing the key results for other outcomes referred to within the EFQM Excellence Model (people, clients or society). (3) To design and test the predictive power over the key results of other structural models using criteria agents and axes of the EFQM Excellence Model as variables in a combined manner (i.e. organisational government, human resource management or innovation and creativity).

## Conflict of interest

None.

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