Analysis of the key TQM factors in the EFQM model and their relation to key business results

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Abstract: - It is common in the literature on TQM to differentiate between soft and hard critical factors. This work aims to identify these factors in the EFQM Excellence model and to determine their influence on key business results. The analyses are carried out with a sample of 116 firms evaluated according to the model cited. First, the factorial analysis groups together the EFQM's five facilitating agents' criteria in three factors: (1) soft factors, (2) the strategic management of partnership and resources and (3) processes management. Second, the regression techniques point out the influence of the hard factors (the strategic management of partnership and resources, and processes management) on the key business results and it is noted that the influence of the soft factors on the results is produced through the mediation of the hard factors of TQM.

Key-Words: - TQM, soft factors, hard factors, EFQM, key results, performance.

1 Introduction

Much research has clearly shown how the principles and practices of total quality management (TQM) can be a reference for organizations to improve their management and business results. These principles and practices have been named the key TQM factors and are frequently classified as soft or hard factors [6, 22, 19]. All the same, as Black & Porter [5] point out, the distinctions between soft and hard factors are in many instances difficult to determine.

However, a framework, or reference model, is needed to implement TQM and put it into practice In this sense, excellence models offer the appropriate framework for the implementation of TQM [14, 11, 18].

The most widespread excellence models are the Deming Price in Japan, the Malcolm Baldrige National Quality Award (MBNQA) in the U.S.A., the European Foundation for Quality Management (EFQM) in Europe, the Ibero-American Management Excellence Model in Latin America and the Australian Quality Award in Oceania. These models have very similar concepts and evaluation criteria [3]. Their main differences are to be found in the considerations that they grant to the criteria in the evaluation areas or in the application framework. This is because each model tries to adapt itself to the special features of each socio-cultural and economic reference context [26].

The research that has studied the EFQM model has centered on its internal structure [9, 8] or on the benefits for organizations that arise from applying the TQM principles and practices that the model includes [11, 7]. However, there is little research that tries to go more deeply into which are the key factors that influence business results to a greater extent.

In this context, the aims of this work are: (1) to identify the soft and hard factors of the TQM that are found in the EFQM model, and (2) to determine which of them influence the key business results more.

2 Literature review

2.1 EFQM Excellence model

The EFQM presents a non-prescriptive framework that analyses the relations between what an organization does and the results that it is able to

attain. It is assumed that there are different approaches to achieving excellence [14].
The criteria that the model proposes represent the elements that indicate the degree of progression which a specific organization follows in order to achieve excellence. These criteria, or dimensions, are set in five key implementation factors or facilitating agents (what the organization "does and how it does it"). The four remaining dimensions reflect the results that the organization attains. These concern their clients, employees, society and other key results (EFQM, 2003). For all of these reasons, the EFQM has a complete, operative and useful framework for the effective implementation of the TQM [24].

2.2 Soft and hard TQM factors

Researchers have classified TQM's principles and practices into two large groups: the social aspects or soft factors and the technical or hard factors [22, 19].
The difference between both groups of factors is at times difficult to determine [5]. There is not a clear consensus concerning their content. This is due to some factors being regarded as soft by some authors and hard by others. Likewise, specific aspects can contain both soft and hard aspects [26].
Soft factors of TQM are related to behavioral aspects and generally deal with human resource aspects [19, 13]. Aspects that are specifically included within this group are leadership, human resources, customer focus, top management commitment, employee involvement, workforce commitment, shared vision, personnel training, employee empowerment, corporate quality culture, and teamwork [5, 22, 19, 13].
Hard factors of TQM are concerned with strategy, systems, management tools and processes that are necessary to support the implementation of soft factors [6, 13, 26]. In most cases, they deal with benchmarking, flexibility, quality systems, quality assurance, use just-in-time, zero defect, continuous improvement and innovation, strategic quality management, information and performance measurement, process management, process improvement, strategic planning, process control, product or service design [5, 16, 17, 22, 19, 13, 26].

2.3 Soft, hard factors and performance

Although there are studies that analyze the influence of TQM on results, few centre on pointing out the role of soft and hard aspects of TQM on results or performance.
In general, the literature indicates that the soft factors of TQM are the strongest predictors of organizational performance [17]. Most works are centered on the study of this relationship. Abdullah et al. [1], for example, analyzed the influence of some soft factors on organizational performance. The influence of three of them turned out to be important: management commitment, customer focus and employee involvement.
Rahman & Bullock [22] found a positive influence of some hard TQM elements on performance: use just-in-time, processes management, technology utilization and continuous improvement. Moreover, these authors point out that there is not a direct impact of the soft and hard factors on performance. Rather, there is also an indirect influence of the soft TQM elements on performance through the hard TQM elements. In any case, as Rahman & Bullock indicate [22], the soft TQM elements must support the influence of the hard aspects on performance.
From what has been put forward, we can state that:
H1: Soft factors are positively related to the organization's key results.
H2: Hard factors are positively related to the organization's key results.

3 Methodology and analysis of results

3.1 Sample

The data has been obtained from the assessment process of 116 private Spanish firms from the year 2003 to 2009 (Table 1). This assessment was carried out through the 2003 EFQM model and the RADAR (Results, Approach, Deployment, Assessment and Review) logic -the scoring method when using the Excellence Model.

Table 1: Sample characteristic.

		Frequency	Percentage
Company size	Small and medium	56	48.3
	Large	60	51.7
	Total	116	100
Type of business	Services	55	47.41
	Manufacturing	51	43.97
	Agriculture	10	8.62
	Total	116	100

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3.2 Measures

The measures used to obtain the data are the 5 criteria that make up the facilitating agents of the EFQM model and their 19 subcriteria. The measures of the model's key performance results and indicators have been used to measure the results (criteria 9).

Table 2: Measures.

Latent variable→ EFQM model criteria	Measures → Subcriteria
1. Leadership	1a, 1b, 1c, 1d, 1e
2. Policy and Strategy	2a, 2b, 2c, 2d
3. People	3a, 3b, 3c, 3d, 3e
4. Partnership and Resources	4a, 4b, 4c, 4d, 4e
5. Processes	5a, 5b, 5c, 5d, 5e
9. Key Results	9a, 9b

3.3 Data analysis and results

A series of analyses was carried out with the facilitating elements' set of subcriteria in order to identify the soft and hard factors of the TQM that are in the EFQM model. Next, their influence on the key results was analyzed in order to verify the hypotheses proposed.

Firstly, an exploratory factorial analysis (EFA) was carried out. As a prior step, we checked the normality of the data, the existence of a certain degree of multicollinearity and the correlation of the measurements [15]. The Kaiser-Meyer-Olkin (KMO) sampling adequacy measure for this analysis was 0.942, which is good. Likewise, the results obtained in Bartlett's sphericity test (χ^2= 2650.792; df= 276, p-value= 0.00) indicated the factorial model's adequacy. The main components and the Varimax rotation extraction methods were used. Thus, the EFA worked out that there were 3 factors that explain 72.327% of the total variance.

As is shown in Table 3, all the factorial loadings are significant (>|0.50|). Therefore, all the variables explain more than 25% of the variance of each corresponding factor [10]. This is why, based on this analysis, it was not necessary to remove any subcriteria.

Secondly, we worked out the reliability of each of the three factors obtained in the previous analysis. To do so, we opted for an internal consistency measurement - the Cronbach alpha coefficient analysis. This evaluates the thoroughness with which the indicators of the same concept (factor) are being measured. The values attained in each of the factors are very close to 1 (see Table 3). This indicates that the new variables created are reliable measurements [21].

Table 3: Factorial Analysis.

Subcriteria	Factor 1	Factor 2	Factor 3	Name of new variables	Alpha coefficients
1a	0.803			Factor 1: Soft Factor TQM (SOFT)	0.962
1b	0.737				
1c	0.607				
1d	0.798				
1e	0.524				
2a	0.510				
2b		0.605			
2c		0.543			
2d	0.615			Factor 2: Strategic Management of Partnership and Resources (SMPR)	0.913
3a	0.761				
3b	0.756				
3c	0.836				
3d	0.712				
3e	0.599				
4a		0.708			
4b		0.627			
4c		0.550		Factor 3: Processes Management (PM)	0.916
4d		0.631			
4e		0.748			
5a			0.849		
5b			0.769		
5c			0.761		
5d			0.668		
5e			0.662		

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In addition to checking the reliability of each factor, it is necessary to analyze the content validity and construct validity. The content validity is shown by the broad acceptance of the EFQM model as a reference for the implementation and evaluation of TQM in organizations [6, 18]. Moreover, the factors identified correspond to the soft and hard factors recognized in the literature. Thirdly, to check the construct's validity, each factor was subjected to an individual analysis of its main components. As Nunnally [21] or Black & Porter [6] suggested, if each factor was valid as a construct, then its set of variables would form a single factor once again (unifactorial determination). It was proved that the three factors were unifactorial and that the sample for each unifactorial determination is appropriate, as is seen in Table 4.

Table 4: Unifactorial tests.

Factor	KMO	Variance Explained (%)
SOFT	0.941	70.5
SMPR	0.913	66
PM	0.863	75.5

The KMO value is close to 1 for the three factors. This demonstrates the suitability of the sample for each unifactorial determination. Moreover, the percentage of explained variance is high (>66%) for each of the factors analyzed.

To work out the validity of the three new constructs created, as well as determining the unifactorial nature of each factor, it is necessary to carry out a confirmatory factorial analysis (CFA). This is characterized by considering the measurement of errors in its analysis. We use a variances-based structural equations model (i.e., Partial Least Squares-PLS) [23] to do this CFA. This technique allows us to verify the convergent and discriminant validity of each of the three new constructs. The convergent validity aims to ensure that the items that make up a scale, and that measure a concept, really measure it. Therefore, it is important for the items of the same scale to be strongly correlated. The degree of internal consistency of each factor is thus proved (Cronbach's alpha, shown in Table 3). The convergent validity is measured via the quantity of variance that the items obtain from the latent construct which they represent. This measurement is analyzed by PLS through the average variance extracted (AVE). Its value must be greater than 0.5 [25]. This gives the quantity of variance due to measurement error that a construct obtains from its indicators. As can be observed in Table 5, all the constructs have a value above 0.69. It is therefore accepted that the constructs have this property. Once the convergent validity has been verified, it is necessary to study the discriminant validity. To do so, we analyze the standardized correlations matrix (see Table 5) between the different factors or latent variables. This is done to verify that the variables are not explaining redundant information. Moreover, we analyze the degree of discrimination between each pair of constructs considering the variance extracted. To confirm discriminant validity, AVE should be greater than the variance shared between the construct and other constructs in the model (that is, the squared correlation of each pair of constructs [4]). These values appear in Table 5, where the diagonal elements correspond to the AVE. The remaining elements are the squared correlations between the constructs.

Table 5. Discriminant validity coefficients for TQM factors.

	SOFT	SMPR	PM
SOFT	**0.7047**		
SMPR	0.6889	**0.6926**	
PM	0.5505	0.6336	**0.7552**

The results obtained in the previous analyses lead us to confirm that the three new variables created (Soft Factor TQM, Strategic Management of Partnership and Resources; and Processes Management) represent valid and reliable measurements and that, furthermore, they group together different aspects of organizations' quality management.

Lastly, to confirm the hypotheses proposed, we use lineal regression analysis. To do so, each of the three TQM factors was represented as a variable resulting from the EFA's factorial scores. In the case of the construct "key results", this was represented as a variable ensuing from the average score of the construct's indicators [20].

In the lineal regression model proposed, we analyze the degree of significance of the effects of the three independent variables (Soft Factor TQM, Strategic Management of Partnership and Resources; and Processes Management) on the dependent variable (Key Results). As a previous step, we analyze the multicollinearity between the independent variables. It was verified that the variance inflation factor (VIF) was below 10. For these three independent variables the VIF < 5. This means that there is not

collinearity between the variables [2]. Likewise, through the Durbin-Watson statistic we checked that the remainders are not correlated. They present a value close to 2. In Table 6 we show the results of the regression analysis.

Table 6. Standardized regression results.

	Key Results	
	ß[a]	t-value
Intercept	26.172***	27.702
SOFT	0.053	0.387
SMPR	0.281*	1.988
PM	0.310*	2.414
R^2	0.353	
Adjusted R^2	0.335	
F-value	20.350***	
Durbin-Watson	2.079	

Note: Standardised beta coefficients, except in the case of intercept (unstandardised beta coefficient), *p<0.05, **p<0.01; ***p<0.001

The values obtained show that the variables that represent the hard factors of the TQM – that is, Strategic Management of Partnership and Resources (SMPR); and Processes management (PM) – have a direct, positive and significant influence on the key results.

4 Conclusions

The factors resulting from the EFA contain the soft and hard elements of the TQM identified in the literature. Factor 1 (SOFT) includes leadership and management commitment, human resources [22, 19, 13] and two elements of strategy related to including stakeholders in the formulating of strategy (2a) and the communication and deployment of strategy through stakeholders (2b). These aspects are considered as soft by authors such as Black & Porter [5]. Factors 2 and 3 include hard aspects of TQM [19, 13, 26]. Specifically, factor 2 (SMPR) has elements related to the formulating and reviewing of strategy based on information, indicators and organizational learning, as well as factors concerning external alliances (suppliers or partners) and resources management. Factor 3 (PM) encompasses the management of the organization's key processes. This is an element concerning which there is a strong consensus when qualifying it as a hard factor of TQM [5, 22, 19, 26].

With respect to the verifying of the hypotheses, there is confirmation of the hypothesis that relates the hard factors of TQM with the organization's key results (H2). On the contrary, we do not find a confirmation of H1. This may be due to the type of measurement that has been used (key results), which includes objective measurements of profitability, market share, sales, expenditures, etc. These measurements are strongly related to the implementation of strategy, resources management and the carrying out of the organization's key operative processes, and less so with the type of leadership or the way of managing human resources [7, 9]. Finally, these results lead us to consider that the influence of the soft factors of TQM on the firm's key results is produced indirectly through the organization's policies, strategies resources and processes. This is exactly as was noted in the structure of the EFQM model or as has been shown in works such as those of Rahman & Bullock [22] or Calvo-Mora et al. [9].

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