This article was downloaded by: [Universite Laval]
On: 08 May 2012, At: 03:53
Publisher: Routledge
Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK

Total Quality Management & Business Excellence

Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/ctqm20

An empirical study of the relationships within the categories of the EFQM model

Iñaki Heras-Saizarbitoria [a], Frederic Marimon [b] & Martí Casadesús [c]

[a] Department of Management, Escuela Universitaria de Estudios Empresariales, University of the Basque Country, San Sebastian, Spain

[b] Department of Management, Faculty of Economics and Social Sciences, Universitat Internacional de Catalunya, Barcelona, Spain

[c] Department of Management and Product Design, Polytechnic School, University of Girona, Girona, Spain

Available online: 08 May 2012

To cite this article: Iñaki Heras-Saizarbitoria, Frederic Marimon & Martí Casadesús (2012): An empirical study of the relationships within the categories of the EFQM model, Total Quality Management & Business Excellence, DOI:10.1080/14783363.2012.669541

To link to this article: http://dx.doi.org/10.1080/14783363.2012.669541

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: http://www.tandfonline.com/page/terms-and-conditions

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae, and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings,

demand, or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

Downloaded by [Universite Laval] at 03:53 08 May 2012

Total Quality Management
iFirst, 2012, 1–18

Routledge
Taylor & Francis Group

An empirical study of the relationships within the categories of the EFQM model

Iñaki Heras-Saizarbitoria[a*], Frederic Marimon[b] and Martí Casadesús[c]

[a]*Department of Management, Escuela Universitaria de Estudios Empresariales, University of the Basque Country, San Sebastian, Spain;* [b]*Department of Management, Faculty of Economics and Social Sciences, Universitat Internacional de Catalunya, Barcelona, Spain;* [c]*Department of Management and Product Design, Polytechnic School, University of Girona, Girona, Spain*

The relationships within the categories of the European Foundation for Quality Management (EFQM) self-assessment model are analysed in this article, based on 242 independent assessments carried out in the European region with the highest density of EFQM awards (the Basque Autonomous Community, in Spain). The main finding of the article is that the relationships within the categories of the EFQM are robust, despite the fact that there exist relationships among some of its enablers and results that fail to reach a suitable level of validity. These findings coincide with the conclusions reached in studies carried out previously on the Malcolm Baldrige model. The conclusions reached in the article may be of interest for both the academic and the professional spheres of activity.

Keywords: total quality management; self-assessment; EFQM model; relationships

Downloaded by [Universite Laval] at 03:53 08 May 2012

1. Introduction

Total quality management (TQM) may be defined as something that is both complex and ambiguous. Nevertheless, some key elements or principles are common to all TQM models (Dahlgaard-Park, 1999; Reed, Lemark, & Mero, 2000; Sousa & Voss, 2002): customer satisfaction, continuous improvement, commitment and leadership on the part of top management, involvement and support on the part of employees, teamwork, measurement via indicators and feedback.

The TQM self-assessment models, such as the European Foundation for Quality Management (EFQM) model – the leading quality award model together with the Malcolm Baldrige Model (Dahlgaard-Park, 2008) – have contributed immensely towards clarifying and disseminating TQM in Europe. José Ignacio Wert, the former President of EFQM, observed in 2006 that there were around 30,000 European organisations using the EFQM model (Wert, 2006). Regarding the dissemination of EFQM Excellence Awards, as can be seen in Figure 1, the United Kingdom, Spain and Germany ranked among the countries with the greatest number of recognitions.

However, despite the unprecedented success in the practical application of the model, empirical academic research regarding its reliability has not developed in parallel with this trend (Bou-Llusar, Escrig-Tena, Roca-Puig, & Beltrán-Martín, 2005, 2009; Williams, Bertsch, Van der Wiele, Van Iwaarden, & Dale, 2006), and, as Eskildsen, Kristensen, and Juhl (2001) pointed out several years ago, clear shortcomings are revealed when

*Corresponding author. Email: iheras@ehu.es

ISSN 1478-3363 print/ISSN 1478-3371 online
© 2012 Taylor & Francis
http://dx.doi.org/10.1080/14783363.2012.669541
http://www.tandfonline.com

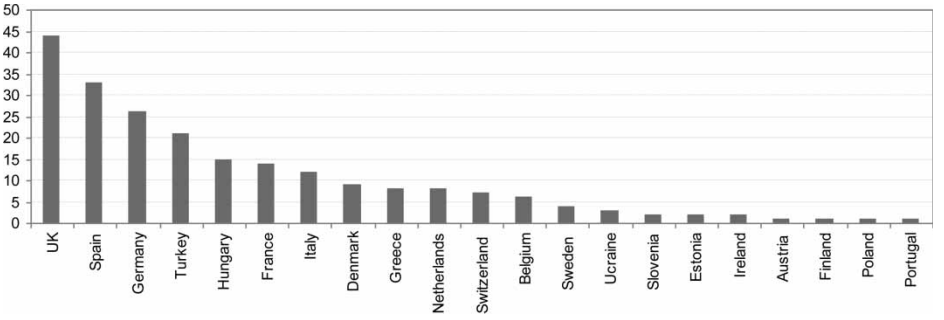

Figure 1. EFQM Excellence Awards by country (1992–2009).
Source: Data compiled by the author from information obtained from EFQM (2010).

Downloaded by [Universite Laval] at 03:53 08 May 2012

analysing the consistency of the model. As Dahlgaard-Park (2008) underlined, clear indications of cause and effect relationships in terms of enabler and results criteria may be questioned. Furthermore, as Williams et al. (2006) stressed, there is a major lack of academic work that contrasts the relationships within the EFQM model, a basic issue for the legitimisation of any management model. In this respect, this article constitutes a contribution to this latter subject.

The article is structured as follows: following this introductory section, the literature review and the conceptual framework are included in the second section; in the following – third – section, the research model and its corresponding hypotheses are articulated; in the fourth, the methodology and data used are analysed; the fifth section contains the results of the empirical research; in the sixth are to be found the discussion and the conclusions drawn from the article, with their practical implications and limitations; the seventh and last section contains the bibliographical references.

2. Literature review and conceptual framework

The EFQM model can be considered as a holistic and integrative approach, in which strategic, managerial and operational control processes are integrated into the model (Dahlgaard-Park, Bergman, & Hellgren, 2001).

In the literature, some of the internal relations existing in the EFQM model have been analysed in previous research. The analysis tended to focus on the study of the inter-relation existing between some of the elements or categories (theoretical constructs) that make up the model (Dijkstra, 1997; Eskildsen et al., 2001).

More recently, Bou-Llusar et al. (2005), analysed the EFQM model in depth, based on the information supplied by a further set of companies, in order to try and assess the causal inter-relation existing between the *enabler* and *results* criteria; the authors ascertained that the *enabler* criteria are indeed related in a balanced way to the *results*. In another interesting work by these same authors (Bou-Llusar et al., 2009), they also ascertained that the EFQM model reliably reflects the premises of TQM.

Writing from a practitioner's point of view, Tejedor-Panchón (2004) carried out a study of 168 companies that had applied to obtain two regional quality awards in Spain, in order to test the existing relationships in an example of the EFQM model dating from 1999. Later, Carmona, Rivas, and Martí (2010) followed this study by going on to test the 2003 version of the EFQM model, using for their evaluations more than 300 applicants for six different regional awards in Spain.

In the academic field, Calvo de Mora and Criado (2005) analysed the reliability, validity and predictive power of an adaptation of the EFQM model applied to the state university sphere of activity, based on a sample of 111 Spanish universities. This is a work which, despite focusing on a highly specific sector of activity for which the EFQM model has been adapted, constitutes a background and key reference point for this present research, in the same way as our own previous exploratory works (Blind reference), which have also contributed to this final article.

Similarly, in a very recent investigation Gómez-Gómez, Martínez-Costa, and Martínez-Lorente (2011) carried out an exploratory analysis of the relationships in the 2003 version of the EFQM model, using data from 68 self-evaluations of both public and private Spanish organisations. In this study, the authors also analyse whether there are possible differences in EFQM implementation between public and private organisations.

However, despite these interesting contributions that have been quoted, no study has been detected among those reviewed that has empirically contrasted the relationships within the EFQM model on the basis of reliable primary sources like the ones used in this article. Specifically, it is information deriving from external assessments made by independent professionals using a very rigorous protocol based on the scores applied to the categories and subcategories of the EFQM model. Apart from academic studies such as those produced by Calvo de Mora and Criado (2005) and Gómez-Gómez et al. (2011), other studies generally use data obtained from surveys addressed to company managers.

On the other hand, similar studies based on external assessments have been carried out in the literature for other TQM models such as the Malcolm Baldrige model (e.g. Flynn & Saladin, 2001; He, Hill, Wang, & Yue, 2011; Jayamaha, Grigg, & Mann, 2011; Pannirselvam & Ferguson, 2001; Wilson & Collier, 2000), and for other Business Excellence models used in the Asia Pacific region (Jayamaha, Grigg, & Mann, 2008, 2009; Su, Li, & Su, 2003) or in South America (e.g. González, Miles, Sorondo, & Zeballos, 2009).

As already stated by Williams et al. (2006) some years ago, it is high time for an analysis of the EFQM model to be undertaken, given that it has been in use for so many years now. However, the EFQM model involves numerous directional paths between constructs or boxes, which make it very difficult to study. For this reason, researchers such as Jayamaha et al. (2009) have developed parsimonious models to help them to achieve their objective. They use them in order to analyse which relationships in the different categories of the EFQM model can be considered robust and significant from a statistical point of view, and consequently, throw some light on the underlying theory.

It should be pointed out that two aspects are new in this type of study of the EFQM model: on the one hand, the contribution made from the point of view of the assessor and, on the other, the adjustment to the EFQM model itself. As stressed by Jayamaha et al. (2009) there is still insufficient evidence of the validity of Business Excellence models such as EFQM, due to the lack of available data, particularly with regard to the scores obtained by award applicants for the measurement items. It is extremely difficult to obtain data relating to self-assessment presented in relation to the EFQM model, which constitutes a source of data of a confidential nature with major exploratory potential (Heras, Arana, Camisón, Casadesús, & Martiarena, 2008).

In this case, it is necessary to delve below the specific characteristics of the data obtained in order to distinguish the EFQM relations, which is what differentiates this work from previous academics studies (e.g. Calvo de Mora & Criado, 2005; Gómez-Gómez et al., 2011). A first factor is the number of observations used (242 assessments), and the large number of years covered (from 1998 to 2008), with both numbers involving a higher volume of inputs than in previous works. Secondly, as described in Section 4, the

Downloaded by [Universite Laval] at 03:53 08 May 2012

quality of the observations is relevant, because they were derived from external evaluations carried out by various different professionals with evaluation criteria establish by a rigorous independent organisation. A final factor is that, since in this research the work is undertaken using scores from criteria and sub-criteria from the EFQM model, it presents a more desegregated structure than previous studies using only criteria boxes.

3. Research model and hypothesis

By analysing the relationships within the categories of the EFQM model[1] (EFQM, 2003) (see Figure 2), this article aims to explore the extent to which the *agent* or *enabler* criteria are found in practice to be related to the *results* criteria.

However, taking into consideration the objectives of the model and the difficulties arising in this kind of analysis, it will be of considerable interest to conduct first a prior analysis to ascertain whether the relationships suggested by the model during the process of identifying the different categories or *boxes* of criteria from left to right accurately represent the impact each group of *boxes* has on the criteria located on the right.

Additionally, and considering that the model suggests a causal relationship among the different criteria that comprise it from left to right, ranging from criteria of a more strategic nature (leadership) to operative results (key results), this article focuses on this aspect. Basically, the study analyses the role of leadership as the force that drives organisations to achieve their results, through the provision of people, resources, partnerships and the formulation of policies and strategy; and the relationship between their implementation of such processes and the results obtained. Thus, the first criterion (leadership) has an impact on criteria of a tactical nature (criteria 2, 3 and 4) and the latter, in turn, on operational criteria. In this way, the processes explain the results in relation to customers, people and society, and all these factors in turn ultimately explain the operational results.

It is important to note that, as Figure 2 shows, 'policy and strategy' should not be detached from 'people' or from 'partnerships and resources'; however, in order to keep the model simple, this direct relationship was not taken into consideration. In the same way, having customer results shown in the middle seems to imply that customer outcomes should be balanced against the outcomes for other two key stakeholders: people and society at large. Neither concept has been included in the model presented in Figure 3.

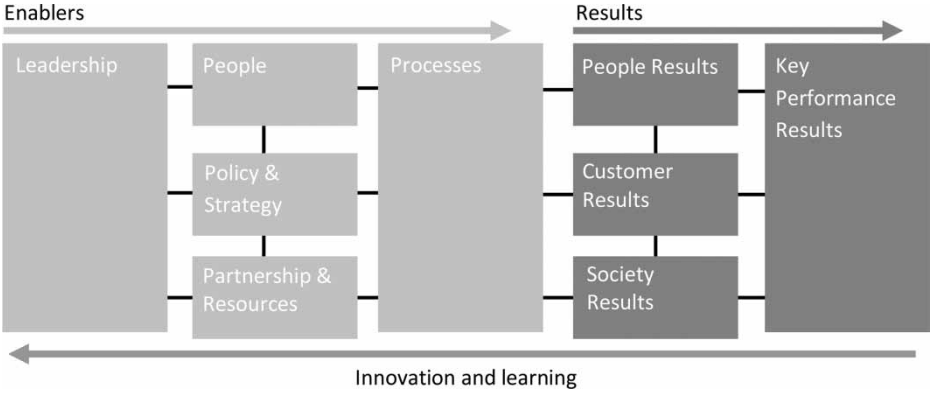

Figure 2. EFQM model.
Source: EFQM (2003).

Downloaded by [Universite Laval] at 03:53 08 May 2012

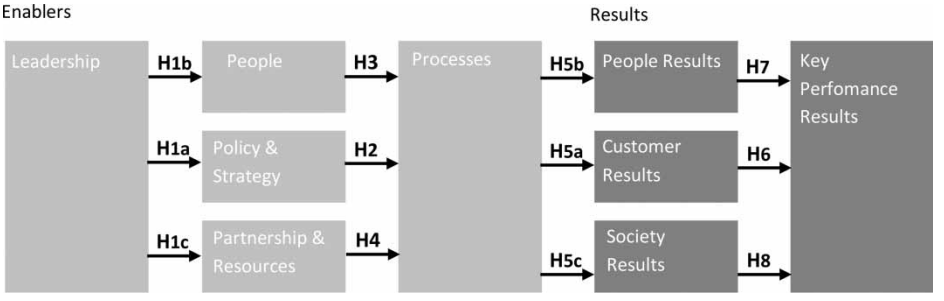

Figure 3. Research model of the relationship between the criteria of the EFQM model.
Source: Own elaboration.

Downloaded by [Universite Laval] at 03:53 08 May 2012

Additionally, it must be stressed that this model does not involve rearranging or regrouping criteria, the theoretical construct of the EFQM model that appears in Figure 2, the sub-criteria, or the concepts that define the essence of these constructs in terms of any other possible latent constructs.

The criteria or sub-criteria will not therefore be treated in the same way as in other works from the literature available which analyses other quality management models, even though this may be to the detriment of the reliability of the constructs used and also, subsequently, to the detriment of the appropriateness of the sample to the model. In short, we shall assess the model solely with the aim of detecting any possible limitations in the sample, rather than eliminating or rearranging any items to establish different criteria.

To sum up, and taking the inter-relations put forward by the EFQM model itself as a reference (EFQM, 2003), a research model (see Figure 3) is proposed for the purpose of analysing the impact of *enabler* criteria on *results*. It includes 12 working hypotheses, each corresponding to a link or inter-relation between two categories or elements of the model. They will be analysed by means of a structural equation model using SmartPLS software.

Following the work of Gómez-Gómez et al. (2011), our hypotheses assume the sense of the causal relationships implicit in the model, from left to right. The model proposed is sufficiently explicit if the content and objectives of the EFQM self-assessment model are analysed, and we shall therefore draw up the 12 hypotheses it suggests. Specifically, we shall clarify the list of hypotheses that are set out in the arrows that go from right to left, given that the direction of these relationships is determined by the EFQM model itself (EFQM, 2003). Likewise, we should take into account that this main direction of the relationships between *enablers* and *results* is also posited by the academic literature (e.g. Bou-Llusar et al. 2005; Reiner, 2002) and by other models such as the Malcolm Baldrige model (Flynn & Saladin, 2001; Pannirselvam & Ferguson, 2001) and the scheme proposed by Anderson, Rungtusanatham, and Schroeder (1994), based on theories proposed by Deming. Furthermore, these causal relationships among the criteria of the EFQM model are the main relations that have been analysed in the academic literature in the field (e.g. Bou-Llusar et al., 2005; Calvo de Mora & Criado, 2005; Eskildsen & Dahlgaard, 2000; Eskildsen et al., 2001).

In addition to this direct reference to the causal relationships implicit in the model, in order to support the hypothesis of our work presented in Figure 3, we use the academic literature focusing on the analysis of Business Excellence models. Consequently, we present the hypotheses of our work as follows:

The leadership and commitment of the management have a positive influence on policy and strategy (e.g. Calvo-Mora, Leal, & Roldán, 2005; Dijkstra, 1997; Eskildsen, Kristensen, & Juhl, 2000; Jayamaha et al., 2008; Pannirselvam & Ferguson, 2001).

H1a. Leadership has a positive relationship with Policy and strategy

The leadership and commitment of the management are drivers of the enabler People (e.g. Badri et al., 2006; Calvo-Mora et al., 2005; Eskildsen et al., 2000; Meyer & Collier, 2001).

H1b. Leadership has a positive relationship with People

The leadership and commitment of the management have a positive influence on Partnerships and Resources (e.g. Badri et al., 2006; Calvo-Mora et al., 2005; Gómez-Gómez et al., 2011).

H1c. Leadership has a positive relationship with Partnerships and resources

The enabler Policy and strategy have a positive influence on process management (e.g. Calvo-Mora et al., 2005; Eskildsen and Dahlgaard, 2000; Eskildsen et al., 2001, 2002; Martensen, Dahlgaard, Park-Dahlgaard, & Grønholdt, 2007).

H2. Policy and Strategy have a positive relationship with Processes

The enabler People management has a positive influence on process management (e.g. Calvo-Mora et al., 2005; He et al., 2011; Su et al., 2003).

H3. People has a positive relationship with Processes

The enabler Partnership and Resources have a positive influence on process management (e.g. Calvo-Mora et al., 2005; Eskildsen & Dahlgaard, 2000; He et al., 2011; Tejedor-Panchón, 2004).

H4. Partnerships and Resources have a positive relationship with Processes

Process management affects positively Customer satisfaction (e.g. Su et al., 2003; Tejedor-Panchón, 2004; Wilson & Collier, 2000).

H5a. Processes have a positive relationship with the Customer results

Process management affects positively the People results (e.g. Eskildsen, 1998; Eskildsen & Dahlgaard, 2000; Gómez-Gómez et al., 2011).

H5b. Process has a positive relationship with the People results

Process management affects positively the Society results (e.g. Calvo de Mora & Criado, 2005; Eskildsen, 1998; Westlund, 2001).

H5c. Processes have a positive relationship with the Society results

The satisfaction of the customers has a positive influence on the key performance results of the organisations (e.g. Eskildsen & Dahlgaard, 2000; Eskildsen, 1998; Gómez-Gómez et al., 2011).

H6. Customer results have a positive relationship with the Key performance results

People-related results have a positive influence on the key performance results of the organisations (e.g. Eskildsen, 1998; González et al., 2009; Prabhu, Appleby, Yarrow, & Mitchell, 2000).

H7. People results have a positive relationship with the Key performance results

Society-related results have a positive influence on the key performance results of the organisations (e.g. Gómez-Gómez et al., 2011; Reiner, 2002; Westlund, 2001).

H8. Society results have a positive relationship with Key performance results

It is necessary to now make a final observation about the model being analysed. In accordance with Calvo de Mora and Criado (2005), we shall use latent constructs with reflective indicators for the *enablers* and with formative indicators for the *result*s. In fact, the *enabler* sub-criteria demonstrate and display the latent construct that encompasses them. The sub-criteria of a specific enabler are affected by the same latent construct (Chin, 1998). However, following the line established by Collier and Bienstock, (2006), we shall consider the *results* criteria to be formative: they are the result of adding the respective items in order to obtain a global value. Indeed, formative items generate or give rise to the latent variable (Fornell, 1982). Each of these results criteria comprises two sub-criteria: one, which measures perception and another, constructed by the indicators themselves

Downloaded by [Universite Laval] at 03:53 08 May 2012

used by the organisation to measure the criterion. Therefore, these indicators do not necessarily have to be correlated. They may manifest themselves as being separate from each other (Chin & Gopal, 1995).

4. Methodology and data

The empirical analysis is based on data provided by Euskalit, the Basque Foundation for Quality, referring to scores that were obtained in external assessments of organisations in the Basque Autonomous Community (BAC) in Spain, for the years between 1998 and 2008, inclusive. Attention should be drawn to the strong dissemination of the EFQM model in the BAC: organisations from this region were awarded 21 of the 29 cases of recognition between 2001 and 2009 awarded to Spanish organisations by the EFQM.

As for the reliability of the data, it is relevant to point out that the theoretical reliability of data obtained from external assessment processes has been confirmed in academic literature (e.g. Pannirselvam & Ferguson, 2001). In the specific case of Euskalit, it should be pointed out that the EFQM assessors who took part in the field work are not EFQM licensees (neither from Euskalit nor from any other similar organisation). The assessors belong to the Euskalit Assessors' Club; they are people who have received specialist formal training in the EFQM self-assessment model and who, without any financial gain at all, are committed to improving the management quality of organisations within their milieu. To sum up, these assessors constitute a very reliable, independent source of information owing to their training and specialisation in EFQM model self-assessment and assessment work.

Furthermore, it is also important to add that the only cases of international EFQM recognition obtained by companies from the BAC confirm the rigorous work carried out by the external assessors from Euskalit; attention should also be drawn to the fact that the companies externally assessed by external assessors from the EFQM Foundation have always obtained higher scores than those obtained in external assessments carried out by Euskalit. In our opinion, this evidence corroborates the reliability of the data used.

The usual process for identifying a model that adapts well to a sample involves two stages. During the first stage, an exploratory analysis is carried out until a model is determined that can then be validated in the second, confirmatory phase. In our case, we consider the EFQM model to be good as it is, without removing or adding anything. In any case, we shall then also go on to analyse the subscales – not with the aim of refining these scales as has been stated, but rather, to ascertain their degree of reliability and validity. This will provide criteria when drawing conclusions from the subsequent analysis.

A structural equation model will be used for this subsequent analysis using the partial least squares (PLS) technique, which enables a path analysis among latent constructs to be carried out (Ringle, Wende, & Will, 2005). Smart-PLS software will be used for this purpose. The aim of this technique is to predict the latent variables and is based on covariance, to the extent that it is applied in order to explain the variance of the independent variables.

The main advantages of this technique over those based on covariance lie in the fact that it is less demanding in terms of the distribution of the sample variables and the size of the sample. Indeed, PLS enables latent constructs to be modelled under conditions of non-normality (Compeau & Higgins, 1995). In contrast, the main disadvantage arises from the fact that it does not prove to be equally effective in analyses of an exploratory nature. In fact, rather than taking on equivalent weights for all the indicators of a single latent variable, PLS permits the greatest weights for those items with a stronger correlation with the latent variable. That is why it is suitable for application in our study, as our

Downloaded by [Universite Laval] at 03:53 08 May 2012

aim is not to search for a new model, but rather to analyse the causality of an existing model that has become widespread and has been used for over a decade now (Eskildsen et al., 2001).

Specifically, the *path analysis* has been used to estimate the robustness of the relationships between the new constructs. This is a multi-variant analytical method for examining groups of relationships established by linear causal models (Jöreskog & Sörbom, 1993; Li, 1975). The EFQM model represents the causal relationships among the different sub-criteria, and so this methodology is suitable for the purpose of our analysis (Pannirselvam & Ferguson, 2001).

5. Results

5.1 *Sample and statistical description of the variables*

The study sample is made up of 242 assessments of companies from the BAC made by Euskalit according to the EFQM model between the years 1999 and 2008. Some of the companies were assessed more than once during this period. The elements that make up the sample are assessments rather than companies. We are unable to identify each of the companies assessed owing to data confidentiality.

The average scores in the different sub-criteria of the EFQM model are within a range of between 25.72 and 49.84, with the score range being between 0 and 100 in the case of all criteria. There are no cases in which the average value of the scale is exceeded. Most of the average scores of the sub-criteria are within a range between 40 and 50. The average scores of each criterion have also been calculated, and these values are between 42.02 and 45.80 in the case of the *enabler* criteria. On the other hand, the average values of the *results* criteria are 44.65 for *results in customers*, 42.37 for *results in people*, 28.78 for *results in society*, and 45.06 for *key results*. It is noted that the *results* criteria for society are far lower than the other criteria.

As regards variance, it is observed that this is between 46.08 and 163.76. It should be noted that variance in the items pertaining to criterion 8 (*results in society*) is also very different compared to variance in the other sub-criteria: the latter is far higher. All this leads us to draw the conclusion that the criterion *results in society* may prove difficult to fit into a model that lists EFQM criteria.

5.2 *Assessment of the measurement model*

We shall now proceed to analyse four aspects in this section: the individual reliability of the items; the reliability of the subscales or internal consistency; the convergent validity; and, lastly, the discriminant validity of the constructs.

The individual reliability of the item for constructs with reflective indicators is guaranteed by a load value of over 0.707. Carmines and Zeller (1979) point out that a higher value than this enables the fact that the indicator forms an integral part of the construct to be ascertained. Table 1 shows loads of the external model (in the diagonal in bold) and also includes the cross-loadings. As is noted, four of the sub-criteria do not reach this threshold. Although other authors such as Barclay, Higgins, and Thompson (1995) accept lower values, we did not follow the usual procedure for refinement of the subscales since; as has been previously stated, our aim was to test the relationships implicit in the EFQM model, rather than to seek the model of relationship that is best adapted to the sample. Despite this, a high degree of individual reliability of the items is noted. On the other hand, it can be observed that the cross-loadings are lower than the figures in bold in the diagonal.

Downloaded by [Universite Laval] at 03:53 08 May 2012

Table 1. Loads of the external model and cross-loadings.

	1 Leadership	2 Policy and strategy	3 People	4 Alliances and resources	5 Processes	6 Customer results	7 People results	8 Society results	9 Key results
1a	**0.862337**	0.649935	0.612329	0.412193	0.569921	0.190902	0.267771	0.252195	0.255406
1b	**0.868487**	0.601667	0.615381	0.387993	0.594410	0.199252	0.274194	0.157130	0.198375
1c	**0.810808**	0.540306	0.449904	0.477224	0.547413	0.114461	0.173746	0.260787	0.200443
1d	**0.731644**	0.360064	0.506374	0.225561	0.404066	0.054629	0.186368	0.102840	0.108040
1e	**0.592900**	0.313813	0.338968	0.313155	0.407039	0.068361	0.101311	0.002411	0.231409
2a	0.522227	**0.828280**	0.476533	0.579623	0.543213	0.164696	0.188920	0.235477	0.385395
2b	0.501113	**0.827361**	0.473116	0.567407	0.495882	0.161882	0.099248	0.177513	0.394067
2c	0.516045	**0.813988**	0.540452	0.535269	0.490135	0.197538	0.198039	0.251970	0.379794
2d	0.595685	**0.764908**	0.527075	0.405635	0.593597	0.126935	0.225122	0.175011	0.233122
2e	0.294278	**0.492084**	0.260649	0.240713	0.298331	0.073924	0.031817	0.091398	0.048144
3a	0.498287	0.554316	**0.797021**	0.441089	0.380444	0.175737	0.259334	0.062188	0.317818
3b	0.472917	0.497005	**0.788284**	0.436744	0.446211	0.248033	0.264931	0.127057	0.263431
3c	0.484024	0.349446	**0.699835**	0.160049	0.409132	0.096674	0.222494	0.146223	0.054509
3d	0.547333	0.470382	**0.768599**	0.364639	0.448884	0.124072	0.240292	0.202194	0.135039
3e	0.478558	0.443118	**0.708039**	0.377483	0.307242	0.120184	0.287956	0.179970	0.261925
4a	0.340048	0.458875	0.330106	**0.728077**	0.403737	0.064070	0.096169	0.228048	0.296571
4b	0.317085	0.478544	0.369767	**0.706028**	0.355778	0.224095	0.139434	0.089247	0.459446
4c	0.275613	0.448646	0.281671	**0.743846**	0.431502	0.219939	0.082839	0.245579	0.389055
4d	0.377796	0.427771	0.342285	**0.756283**	0.431124	0.038753	0.086283	0.141031	0.307567
4e	0.439440	0.539684	0.438865	**0.791643**	0.503569	0.124910	0.118499	0.144626	0.346084
5a	0.479218	0.514392	0.430807	0.315550	**0.692735**	0.093850	0.165762	0.251899	0.054750
5b	0.532065	0.561884	0.413161	0.456214	**0.829758**	0.176945	0.185402	0.208776	0.197828
5c	0.537221	0.473935	0.397355	0.476089	**0.751087**	0.153535	0.155036	0.101027	0.317012
5d	0.455140	0.366453	0.351968	0.412080	**0.707213**	0.142974	0.207911	0.074999	0.260979
5e	0.500391	0.549888	0.430439	0.518873	**0.822487**	0.220170	0.178187	0.187016	0.300960
6a	0.172243	0.109202	0.097546	0.004090	0.157065	**0.446949**	0.223041	0.058842	0.160044
6b	0.146705	0.187970	0.199130	0.192309	0.189811	**0.977516**	0.479116	0.225563	0.372690
7a	0.218050	0.092936	0.328557	−0.01166	0.105115	0.273146	**0.435267**	0.119769	0.013156
7b	0.258442	0.208530	0.320320	0.146321	0.231136	0.484307	**0.996916**	0.253059	0.287169
8a	0.168982	0.174922	0.182074	0.191858	0.162357	0.221306	0.260490	**0.840257**	0.091173
8b	0.212713	0.263797	0.164830	0.212840	0.222809	0.186987	0.211887	**0.943691**	0.137585
9a	0.238807	0.374772	0.241199	0.452179	0.300364	0.312056	0.228191	0.158962	**0.833196**
9b	0.225698	0.360583	0.251906	0.421694	0.247642	0.360110	0.265427	0.096454	**0.944284**

Source: Put together by the authors from data supplied by Euskalit.
Note: All the loads of the *enabler* criteria are significant (*t*-value > 1.96).

Downloaded by [Universite Laval] at 03:53 08 May 2012

The sub-criteria with load on their corresponding factor below 0.707 are:

1e. Refers to motivation, support and recognition of people by the leaders of the organisation. Data are only available for companies audited in 2004 and subsequent years. This is a criterion that was introduced into the 2003 version.

2e. Refers to communication and the presentation of policy and strategy. In reality, this value is just at the limit and in fact only 56 companies answered in relation to this indicator, which explains such a weak load.

3c. Measures the involvement and extent to which responsibilities are assumed: this is a value that is very close to the boundary value established.

4b. Its load is 0.7060, just below the established limit of 0.707.

Regarding the items of the results constructs, just two of them are below 0.5: 6a and 7a. Both are measurements of perception for the results.

The robustness of these loads is analysed below using a *bootstrapping* process. Those that are below a *t*-value of 1.96 – and in which their robustness is therefore not assured – are items 6a, 7a, 8a, 8b and 9a. We wish to put on record here in view of these results that, in spite of the weakness found in these four items of enabler criteria, we proceeded with the analysis, because we insist once again that our aim was to test the unaltered EFQM model.

The second point to be analysed in order to assess the measurement model is the internal consistency of the subscales of enabler criteria, i.e. the reliability of the subscales.

The five constructs show satisfactory values according to the criteria proposed by Hair, Anderson, Tatham, and Black (1998). Five factorial analyses were also carried out in order to research the one-dimensional nature of the enabler constructs. In all cases, a single factor was extracted and the amount of variability captured ranges from 57.86% to 65.50% (Table 2).

Another scale of reference used to assess the reliability of the reflective constructs is composite reliability. Nunnally and Bernstein (1994) suggested a minimum 0.7 for valid modest reliability for the first stages of the research, although the recommended value is 0.8 for basic research purposes. The five values obtained are within a range of 0.862 and 0.884 (see Table 4).

The third point to be analysed is that of convergent validity (this also only applies to enabler criteria; the result criteria are formative). To this end, the average variance extracted (AVE) is used, which provides the amount of variance obtained via its indicators in relation to variance due to measuring error. Fornell and Larker (1981) recommend values over 0.5. The AVE indicators for the five *agent* or *enabler* criteria are between 0.5561 and 0.6084 (see Table 4). Convergent validity is therefore assured.

The fourth and final aspect to be analysed in order to assess the measurement model is that of discriminant validity. We applied the criteria used by Fornell and Larker (1981): the square root of the AVE should be higher than the correlations shown by this construct with the other constructs. Table 3 shows the square root diagonal of the AVE, while the other cells show the correlations. NA indicates the fact that the procedure is not applicable to formative constructs – in our case, those referring to *results*.

It is noted that the reflective constructs comply with the criterion used by Fornell and Larker (1981) to guarantee discriminant validity. For their part, the formative indicators also exceed the condition put forward by Fornell and Larker (1981) and by Luque (2000), as the maximum correlation is 0.45, far from the maximum 0.9 threshold recommended.

Downloaded by [Universite Laval] at 03:53 08 May 2012

Downloaded by [Universite Laval] at 03:53 08 May 2012

Table 2. Reliability analysis of the enabler constructs.

Construct	Items	Cronbach's alpha	Range of Cronbach's alpha by eliminating an item	Range of correlations of items and subscale total	Type of construct	Unidimensionality analysis	
						KMO[a]	% variance captured by the factor
1 Leadership	1a, 1b, 1c, 1d, 1e	0.866	0.822–0.864	0.586–0.748	Reflective	0.855	65.50%
2 Policy and strategy	2a, 2b, 2c, 2d, 2e	0.854	0.803–0.872	0.532–0.748	Reflective	0.841	65.47%
3 People	3a, 3b, 3c, 3d, 3e	0.816	0.761–0.801	0.535–0.667	Reflective	0.787	58.11%
4 Partnerships and resources	4a, 4b, 4c, 4d, 4e	0.814	0.766–0.796	0.554–0.642	Reflective	0.832	57.86%
5 Processes	5a, 5b, 5c, 5d, 5e	0.829	0.760–0.834	0.515–0.753	Reflective	0.771	60.76%

[a]KMO stands for Kaiser-Meyer-Olkin (test to assess the appropriateness of using factor analysis on data).
Source: Compiled by the author from data supplied by Euskalit.

Table 3. Discriminant validity.

	1 Leadership	2 Policy and strategy	3 People	4 Partnerships and resources	5 Processes	6 Customer results	7 People results	8 Society results	9 Key results
1 Leadership	*0.7800*								
2 Policy and strategy	0.659048	*0.7560*							
3 People	0.660150	0.615709	*0.7532*						
4 Partnerships and resources	0.475616	0.628333	0.472770	*0.7454*					
5 Processes	0.656164	0.656767	0.532744	0.575270	*0.7628*				
6 Customer results	0.178827	0.196964	0.203636	0.168447	0.213556	*NA*			
7 People results	0.230745	0.202988	0.274266	0.155414	0.223468	0.452885	*NA*		
8 Society results	0.216968	0.262638	0.177850	0.218836	0.225075	0.198674	0.222729	*NA*	
9 Key results	0.254630	0.398992	0.269880	0.474326	0.295095	0.377769	0.300357	0.136355	*NA*

Source: Compiled by the authors from data supplied by Euskalit.
Note: Correlations between latent variables under the main diagonal. In the diagonal are the square roots of the AVE, in italics.

Table 4. Overview of the model.

	AVE	Composite reliability	R^2	Communality	Redundancy
1 Leadership	0.608446	0.884195		0.608446	
2 Policy and strategy	0.571514	0.866546	0.434345	0.571514	0.244197
3 People	0.567289	0.867378	0.435798	0.567289	0.246166
4 Partnerships and resources	0.555639	0.861835	0.226211	0.555639	0.123675
5 Processes	0.581812	0.873684	0.493242	0.581812	0.209878
6 Customer results			0.045606	0.588419	0.029022
7 People results			0.049938	0.502893	0.030212
8 Society results			0.050659	0.741018	0.037966
9 Key results			0.165413	0.790739	0.107985

Source: Compiled by the authors from data supplied by Euskalit.

Downloaded by [Universite Laval] at 03:53 08 May 2012

5.3 *Assessment of the structural model*

PLS does not use fit indices: the fitness is established through significant path coefficients and high R^2 values. The variability explained by the model for the dependent latent variables on the left part of the model (*enabler* criteria) is higher than 0.40 in four cases. In the case of *process* criterion, it reaches nearly 50%. However, the model fails to explain so well the constructs on the right part that refers to the *results* criteria. In fact, the reliability analysis for these constructs already reveals possible problems in this part of the model. However, we once again insist on the fact that the initial purpose of this analysis is to study the EFQM model *as it is*, without any alteration (Table 4).

Table 5 shows the coefficients of the internal model. A *bootstrapping* process has been used to test the robustness of these coefficients consisting of 500 samples of 100 elements each. In each box it is noted down whether the corresponding hypothesis is accepted or rejected.

Figure 4 shows the results from Table 5. This figure only shows the significant paths between criteria. A greater density of robust coefficients is noted on the left part. Indeed, the *leadership* criterion goes a long way towards explaining the results obtained in the *agent* criteria of *policy and strategy*, *people* and *partnerships and resources*. The processes depend to a large extent on previous criteria (*policy and strategy* and *partnerships and resources*). However, they only impact on one of the *results* criteria (*results in customers*).

There is only one path from the *leadership agent* to the *key results*. If we may be permitted to refer to the classic name used in project management, we might say that the 'critical path' traverses *customer results*. These criteria are especially determinant, as the model indicated the fact that they are a necessary step towards obtaining key results.

The left part of the model (the *enabler* criteria) shows robust coefficients: only one of the six is not statistically significant, although it should be pointed out that the *t*-value associated with the relationship between the *people enabler* and the *process* enabler is 1.72, close to the boundary value established by 1.96. In other words, although this relationship is not significant to a level of 5%, it becomes so when slightly relaxed.

To sum up, it is noted that the *enabler* criteria are closely correlated. On the other hand, the *results* criteria are not as inter-related as the *enablers*. The prior analysis involving measuring assessment already enabled the results to be disclosed as shown in Table 5: the existence of a major number of rejected hypotheses in the bottom right area of the

Downloaded by [Universite Laval] at 03:53 08 May 2012

Table 5. Coefficients of steps between internal variables.

	1 Leadership	2 Policy and strategy	3 People	4 Partnerships and resources	5 Processes	6 Customer results	7 People results	8 Society results	9 Key results
1 Leadership		**0.6590** (10.4058) *H1a* accepted	**0.6610** (11.3460) *H1b* accepted	**0.4756** (6.5347) *H1c* accepted					
2 Policy and strategy					**0.3969** (3.2827) *H2* accepted				
3 People					0.1723 (1.7243) *H3* rejected				
4 Partnerships and resources					**0.2422** (2.0561) *H4* accepted				
5 Processes						**0.2136** (2.0166) *H5a* accepted	0.2234 (1.8404) *H5b* rejected	0.2250 (1.8557) *H5c* rejected	
6 Customer results									**0.2989** (2.2357) *H6* accepted
7 People results									0.1555 (1.0427) *H7* rejected
8 Society results									0.0423 (0.3276) *H8* rejected
9 Key results									

Source: Compiled from data supplied by Euskalit.
Note: The *t*-value is in brackets. The significant coefficients at a 0.05 level are in bold. Each of these results obtained are used in order to contrast one working hypothesis.

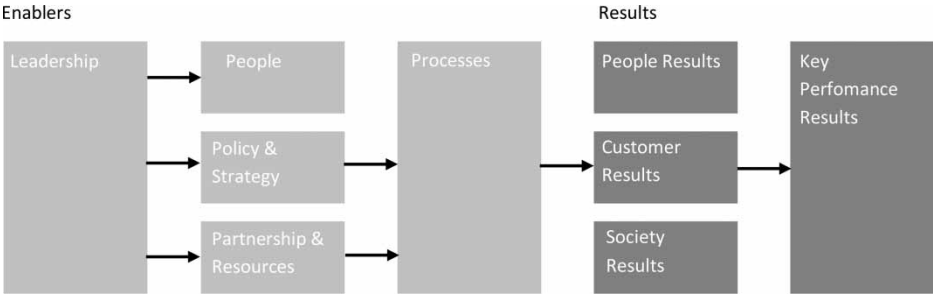

Figure 4. Significant coefficients.
Source: Own elaboration.
Note: coefficients significant at a level 0.05.

table, which refers to the relationships between *results*. Analogously, the same phenomenon is observed in the upper right-hand area, corresponding to the people results.

6. Conclusions

In the course of the analysis, it has been ascertained that there is a major impact of the *leadership* enabler on the pursuit of policy and strategy in organisations, and also on the *people* criteria and on *partnerships and resources*. The importance of leadership in the references to TQM in the literature is clearly in evidence. It should also be pointed out that both the *policy and strategy* criterion and *partnerships and resources* impact on the *process* criterion; however, the *people* enabler criterion does not have a significant impact on an improvement in processes.

On the other hand, the *process* enabler only impacts on *customer results*. This criterion, in turn, is the only one that explains the *key results* criterion. In this sense, attention should be drawn to the fact that both the results in the *people* criterion and the *results in society* criterion are excluded from the model, given that no significant relationships have been detected with other criteria.

In short, the left side of the EFQM model is considerably better supported by our data than the right side. Our data provide evidence that the relationships between enabler criteria work well; nevertheless, the data support neither the relationships between results, nor those between enablers and results. Therefore, following the interpretation by Martensen et al. (2007) and Ciavolino and Dahlgaard (2009), we might say that, in the light of the data obtained by the external evaluations, the analysed organisations might not have succeeded in establishing improvement programmes with such cause–effect relationships.[2] In other words, the lack of statistical significant relationships might be an indication that the assessed organisations have not been skilful enough to build the cause–effect relationships. An alternative interpretation might suggest that the assessors may not have been good enough to identify the relationships for several reasons (e.g., not very clear self-assessment reports within the context of the award application process). Therefore, as underlined by Ciavolino and Dahlgaard (2009), those relationships that seem to be missing in the aforementioned organisations should attract the highest priority and highest responsibility of the managers concerned and of the other internal and external stakeholders.

To sum up, regarding our data, several of the relationships among the constructs proposed by the EFQM model are significant: in fact, 7 of the 12 suggested by the model. These conclusions would seem to coincide with the conclusions reached in studies

Downloaded by [Universite Laval] at 03:53 08 May 2012

carried out previously by Pannirselvam and Ferguson (2001) for the Malcolm Baldrige model, and by Calvo de Mora and Criado (2005) and Bou-Llusar et al. (2005, 2009) for the EFQM model. Indeed, Pannirselvam and Ferguson (2001) proved the existence of significant relationships between the categories and confirmed the consistency of the Malcolm Baldrige National Quality Award framework, based on data obtained from external assessments. Both Calvo de Mora and Criado (2005) and Bou-Llusar et al. (2005, 2009) also detected strong evidence of the causal relationship between the *enabler* and *result* criteria of the EFQM model based on perceptual data.

Attention should be drawn to the fact that another main contribution made by this article is undoubtedly the proposal to use data obtained from external assessments of the EFQM model made by independent assessors, based on a training and assessment protocol such as that defined by Euskalit. As Pannirselvam and Ferguson (2001) point out in their study – and as both Calvo de Mora and Criado (2005) and Bou-Llusar et al. (2005, 2009) also stress when referring to the limitations of their respective studies based on perceptual variables – the information deriving from a third party who assesses this type of TQM model guarantees objectivity, rigour and less characteristic bias introduced than the information obtained from the management of the organisations themselves that adopt these models.

This work has several limitations that need to be fully considered when interpreting the conclusions drawn from it. The main one concerns the relationships that have been analysed. The parsimonious model used proposes relationships between criteria from 'left to right', i.e. from the criteria of a more strategic nature to the operational results. This is the main direction of the relationships between enablers and the results proposed by the EFQM and most of the academic literature, although these are not the only ones proposed in the model. Consequently, other different and/or complementary interpretations of causal relationships need to be analysed in the future.

Another limitation of our work is related to the methodology used to contrast the model. As Calvo de Mora and Criado (2005) point out, structural equations refer to the linearity of the relationships between the latent variables – in our case, the criteria pertaining to the EFQM model. In any event, we understand that the tool used is particularly suitable, as it is geared towards a predictive causal analysis in situations of great complexity, albeit with sufficient theoretical knowledge to develop analyses of a confirmatory nature. Moreover, as Diamantopoulos and Winklhofer (2001) noted, the PLS technique is suitable for assessing models with latent variables with formative and reflective indicators.

A final limitation of the article that we would like to mention is related to the limited geographical scope of the sample of data used. It would be very interesting to extend this scope to Spain as a whole or even to a series of European Union countries. In this sense, the analysis could be greatly enriched by being able to include data obtained from external assessments presented as part of award processes conferred by the EFQM.

Downloaded by [Universite Laval] at 03:53 08 May 2012

Acknowledgements

This article has been written as part of a research project entitled 'The improvement of customer satisfaction in Spanish companies through Total Quality Management models' (ECO2009-12754-C02-02) financed by the Ministry of Science and Innovation of Spain. The authors sincerely thank Euskalit, the Basque Foundation for Quality, for the data and the assistance provided. The authors would also like to express their sincere thanks to Jens J. Dahlgaard, Editor-in-Chief of *Total Quality Management and Business Excellence*, and to the journal's reviewers for their assistance in the preparation of this

article. Their constructive criticisms and suggestions have helped to improve and develop the article substantially.

Notes

1. Formally, it should be pointed out that the 2003 version of the EFQM will be the one subject to analysis (this being adapted in case no data should happen to be available for some sub-criteria pertaining to the aforementioned version in the empirical part).
2. In this point we would like to express our gratitude to Editor in chief Jens J. Dahlgaard, for the specific guidance provided for the interpretation of our data.

References

Anderson, J., Rungtusanatham, M., & Schroeder, R. (1994). A theory of quality management underlying the Deming management method. *Academy of Management Review*, *19,* 472–509.

Badri, M.A., Selim, H., Alshare, K., Grandon, E.E., Younis, H., & Adsulla, M. (2006). The Baldrige education criteria for performance excellence framework. Empirical test and validation. *International Journal of Quality and Reliability Management*, *23*(9), 1118–1157.

Barclay, D., Higgins, C., & Thompson, R. (1995). The partial least squares (PLS) approach to causal modelling: Personal computer adoption and use as an illustration. *Technology Studies*, *2*(2), 285–309.

Bou-Llusar, J.C., Escrig-Tena, A.B., Roca-Puig, V., & Beltrán-Martín, I. (2005). To what extent do enablers explain results in the EFQM excellence model? *International Journal of Quality & Reliability Management*, *22*(44), 337–353.

Bou-Llusar, J.C., Escrig-Tena, A.B., Roca-Puig, V., & Beltrán-Martin, I. (2009). An empirical assessment of the EFQM excellence model: Evaluation as a TQM framework relative to the MBNQA model. *Journal of Operations Management*, *27*(1), 1–22.

Calvo de Mora, A., & Criado, F. (2005). Análisis de la validez del modelo europeo de excelencia para la gestión de la calidad en instituciones universitarias: un enfoque directivo. *Revista Europea de Dirección y Economía de la Empresa*, *14*(3), 41–48.

Calvo-Mora, A., Leal, A., & Roldán, J.L. (2005). Relationships between the EFQM model criteria: A study in Spanish universities. *Total Quality Management*, *16*(6), 741–770.

Carmines, E.G., & Zeller, R.A. (1979). *Reliability and validity assessment*. Stage University Paper Series on Quantitative Applications in the Social Sciences, n°. 7010. Beverly Hills, CA: Sage.

Carmona, M., Rivas, M.A., & Martí, E. (2010). *Análisis de las relaciones intravariables del modelo EFQM mediante Modelos de Ecuaciones Estructurales*. 4th International Conference on Industrial Engineering and Industrial Management, XIV Congreso Ingeniería de Organización (CIO), 8–10 September, San Sebastian, Spain.

Chin, W.W. (1998). Issues and opinion on structural equation modelling. *MIS Quarterly*, *22*(1), 7–16 (Commentary).

Chin, W.W., & Gopal, A. (1995). Adoption intention in GSS: Relative importance of beliefs. *Data Base*, *26*(2–3), 42–63.

Ciavolino, E., & Dahlgaard, J.J. (2009). Simultaneous equation model based on the generalized maximum entropy for studying the effect of management factors on enterprise performance. *Journal of Applied Statistics*, *36*(7), 801–815.

Collier, J.E., & Bienstock, C.C. (2006). Measuring service quality in e-retailing. *Journal of Service Research*, *8*(3), 260–275.

Compeau, D.H., & Higgins, C.A. (1995). Application of social cognitive theory to training for computer skills. *Information Systems Research*, *8*(6), 118–143.

Dahlgaard-Park, S.M. (1999). The evolution patterns of quality movement. *Total Quality Management*, *10*(4–5), 473–480.

Dahlgaard-Park, S.M. (2008). Reviewing the European excellence model from a management control view. *The TQM Journal*, *20*(2), 98–119.

Dahlgaard-Park, S.M., Bergman, B., & Hellgren, B. (2001). Reflection on TQM for the new millennium (1). In M. Sinha (Ed.), *The best on quality* (Vol. 12, pp. 279–311). Milwaukee, WI: ASQ Quality Press.

Downloaded by [Universite Laval] at 03:53 08 May 2012

Diamantopoulos, A., & Winklhofer, H.M. (2001). Index construction with formative indicators: An alternative to scale development. *Journal of Marketing Research*, *38,* 269–277.
Dijkstra, L. (1997). An empirical interpretation of the EFQM framework. *European Journal of Work and Organizational Psychology*, *6,* 321–341.
EFQM. (2003). *EFQM excellence model*. Brussels: Author.
EFQM. (2010). General information from the webpage. Retrieved April 20, 2010, from http://excellenceone.efqm.org/Default.aspx?tabid=379.
Eskildsen, J.K. (1998). Identifying the vital few using the European Foundation for Quality Management Model. *Total Quality Management*, *9*(4/5), 92–94.
Eskildsen, J.K., & Dahlgaard, J.J. (2000). A causal model for employee satisfaction. *Total Quality Management*, *11,* 1081–1094.
Eskildsen, J.K., Kristensen, K., & Juhl, H.J. (2000). The causal structure of the EFQM Excellence Model. In: *MAAOE Conference Proceedings* (pp. 75–83). Estes Park, CO: Multinational Alliance for the Advancement of Organizational Excellence (MAAOE).
Eskildsen, J.K., Kristensen, K., & Juhl, H.J. (2001). The criterion of the EFQM Excellence Model. *International Journal of Quality & Reliability Management*, *18,* 783–795.
Flynn, B.B., & Saladin, B. (2001). Further evidence on the validity of the theoretical models underlying the Baldrige Criteria. *Journal of Operations Management*, *19,* 617–652.
Fornell, C. (1982). A second generation of multivariate analysis: An overview. In C. Fornell (Ed.), *A second generation of multivariate analysis* (pp. 1–21). New York, NY: Praeger.
Fornell, C., & Larker, D.F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(5), 39–50.
Gómez-Gómez, J., Martínez-Costa, M., & Martínez-Lorente, A.R. (2011). A critical evaluation of the EFQM model. *International Journal of Quality & Reliability Management*, *28*(5), 484–502.
González, A., Miles, J., Sorondo, A., & Zeballos, F. (2009). *El Modelo de Mejora Continua del Uruguay Análisis de las relaciones estructurales subyacentes y de la evolución de la puntuación* (Documento de Trabajo). Uruguay: Facultad de Ciencias Empresariales, Universidad Católica Dámaso A. Larrañaga.
Hair, J.F., Anderson, R.E., Tatham, R.L., & Black, W.C. (1998). *Multivariate data analysis* (5th ed.). Upper Saddle River, NJ: Prentice Hall International.
He, Z., Hill, J., Wang, P., & Yue, G. (2011). Validation of the theoretical model underlying the Baldrige criteria: Evidence from China. *Total Quality Management & Business Excellence*, *22*(2), 243–263.
Heras, I. (Dir.), Arana, G., Camisón, C., Casadesús, M., & Martiarena, A. (2008). *Gestión de la Calidad y competitividad de las empresas de la CAPV*. Bilbao, Spain: Publicaciones de la Universidad de Deusto.
Jayamaha, N.P., Grigg, N.P., & Mann, R.S. (2008). Empirical validity of Baldrige criteria: New Zealand evidence. *International Journal of Quality & Reliability Management*, *25*(5), 477–493.
Jayamaha, N.P., Grigg, N.P., & Mann, R.S. (2009). A study of the validity of three major business excellence models in the Asia Pacific region. *Total Quality Management & Business Excellence*, *20*(11), 1213–1227.
Jayamaha, N.P., Grigg, N.P., & Mann, R.S. (2011). Empirical analysis of the Baldrige Criteria as both an organizational performance measure and a theoretical model. *Measuring Business Excellence*, *15*(1), 20–33.
Jöreskog, K.G., & Sörbom, D. (1993). *LISREL 8: Analysis of linear structural relationships by maximum likelihood, instrument variables and least squares method* (8th ed.). Mooresville, IN: Scientific Software.
Li, C.C. (1975). *Path analysis: A primer*. Pacific Grove, CA: The Boxwood Press.
Luque, T. (2000). *Técnicas de análisis de datos en investigación de mercados*. Madrid: Pirámide.
Martensen, A., Dahlgaard, J.J., Park-Dahlgaard, S.M., & Grønholdt, L. (2007). Measuring and diagnosing innovation excellence – simple contra advanced approaches: A Danish study. *Measuring Business Excellence*, *11*(4), 51–65.
Meyer, S.M. & Collier, D.A. (2001). An empirical test of the causal relationships in the Baldrige Health Care Pilot Criteria. *Journal of Operations Management*, *19*(4), 403–425.
Nunnally, J.C., & Bernstein, I.H. (1994). *Psychometric theory*. New York, NY: McGraw-Hill.

Downloaded by [Universite Laval] at 03:53 08 May 2012

Pannirselvam, G.P., & Ferguson, L.A. (2001). A study of the relationships between the Baldrige categories. *International Journal of Quality and Reliability Management*, *18*(1), 14–34.

Prabhu, V., Appleby, A., Yarrow, D., & Mitchell, E. (2000). The impact of ISO 9000 and TQM on best practice/performance. *The TQM Magazine*, *12*(2), 84–91.

Reed, R., Lemark, D.J., & Mero, N.P. (2000). Total quality management and sustainable competitive advantage. *Journal of Quality Management*, *5,* 5–26.

Reiner, G. (2002). Analysis of critical factors of company success based on the EFQM excellence model. In: Kanji Quality Culture (Ed.), *Proceedings of the 7th World Congress for Total Quality Management*, *Verona*, *Italy* (Vol. 2, pp. 361–366). Sheffield, UK: Kanji Quality Culture.

Ringle, C.M., Wende, S., & Will, A. (2005). *SmartPLS 2.0 (beta)*. Retrieved March 7, 2005, from http://www.smartpls.de.

Sousa, R., & Voss, C.A. (2002). Quality management re-visited: A reflective review and agenda for future research. *Journal of Operations Management*, *14*(20), 91–109.

Su, C.T., Li, S.C., & Su, C.H. (2003). An empirical study of the Taiwan National Quality Award causal model. *TQM and Business Excellence*, *14*(8), 875–893.

Tejedor-Panchón, F. (2004). *Análisis del Modelo Europeo de Excelencia mediante la aplicación de Modelo de Ecuaciones Estructurales*. Seville, Spain: Instituto Andaluz de Tecnología (IAT).

Wert, J.I. (2006). Prólogo. In C. Camisón, S. Cruz, & T. González (Eds.), *Gestión de la calidad: conceptos, enfoques, modelos y sistemas* (pp. 7–8). Madrid: Pearson Educación.

Westlund, A.H. (2001). Measuring environmental impact on society in the EFQM system. *Total Quality Management*, *12*(1), 125–135.

Williams, R., Bertsch, B., Van der Wiele, A., Van Iwaarden, J., & Dale, B. (2006). Self-assessment against business excellence models: A critique and perspective. *Total Quality Management*, *17*(10), 1287–1300.

Wilson, D.D., & Collier, D.A. (2000). An empirical investigation of the Malcolm Baldrige National Quality award causal model. *Decision Sciences*, *31*(2), 361–383.

Downloaded by [Universite Laval] at 03:53 08 May 2012