Marta Peris-Ortiz · José Álvarez-García
Editors

Action-Based Quality Management

Strategy and Tools for Continuous Improvement

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Editors
Marta Peris-Ortiz
Department of Business Administration
Universitat Politècnica de València
Valencia, Spain

José Álvarez-García
Accounting and Financial
Economy Department
University of Extremadura
Cáceres, Spain

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Foreword

Quality is a vast and complex subject. While on one hand, everyone has a perception of the quality of products they buy and the services they are provided with, on the other, most have no notion of the technical aspects embedded in the products and/or processes related to the manufacturing/service delivery. Moreover, it is only experts who have an understanding of how organizational solutions impact the quality of products/services, even though this is critical. However, everyone is in search of good quality and expects a positive relationship between money spent and the value received.

Quality is understood in this book as a wide range of techniques and methods framed by principles of management and business development.

Decision makers have some reservations about quality as a functional area within an organization, namely in terms of its relevance and scope either due to the nature of control of their typical activities or because it is insufficiently integrated into business priorities. This is not helped by the sometimes-hermetic language used by quality professionals. Nowadays, organizations are multifaceted and operate in a competitive environment which calls for highly skilled managers. Unless the quality movement faces these challenges, it will fail to bring all the potential benefits to the organization.

At the organizational level, innovation is particularly important because competitiveness moves quickly towards the upstream areas of production/service delivery. In today's world, the means (technologies) of production in many activities are often consumer goods that can be bought by anyone. They do bring gains, but they are not lasting gains. In contrast, organizational knowledge that enables quality and innovation provides a sustainable competitive advantage. Quality may not in itself be sufficient for competitiveness, but it is certainly an indispensable factor. The accumulated knowledge in the field of quality not only has the advantage of being public but also has proven results and is not costly.

This is a timely and well-organized book that examines several cases in which quality techniques and methods are applied. It is timely because many of the recent studies on quality have focused on areas of management and organizational development (soft skills), and the production area has been overlooked. However,

techniques and quality methods enable great improvements to be made and this should not be forgotten. Moreover, the tools and methodologies of quality described and fully illustrated in the book are particularly relevant at this time of economic crisis which has had a devastating effect on organizations.

Indeed, the strong focus on soft areas and the neglect of operational areas have given rise to approaches that favor short- and medium-term results and not long-term. For instance, although the lean and 6 sigma approaches were developed in the field of quality management, they are presented as new alternative approaches.

On the other hand, the easy and quick access to information resulting from new information and communication technologies can lead to the illusion that rapid solutions can be found effortlessly and with little knowledge. However, we know that an understanding of widely used techniques and methods, like quality, is essential before turning to the more elaborated and sophisticated ones that are often decisive in more aggressive competitive environments. Complexity can only be effectively managed by those with the most advanced levels of knowledge and experience.

Even though the horizons of knowledge today are greater than ever before, they sometimes seem beyond reach. Academia must respond to the needs of the business world by making knowledge more concise and accessible so that companies can put theory into practice. This book identifies the ways in which academia and the business world can work together to their mutual advantage.

This book offers managers in the private and public spheres, academics studying organizations, as well as students of engineering not only concepts, thoughts, perspectives and examples of techniques and methods, but also technical and scientific contributions to understanding the deeper relationships between quality management practices and organizational performance.

There is a growing community of academics studying various aspects of quality management and producing a range of interesting and exciting new insights. In early 2013, José Alvarez Garcia took the initiative to organize a book on quality management themes, bringing together academics from several countries and regions whose work addresses different aspects of quality management.

The chapters present the different but complementary points of view necessary for a comprehensive understanding of quality management. The book also embraces a variety of quantitative and qualitative methodological approaches that is desirable in research on organizations but absolutely crucial to improving our understanding of quality management issues.

The chapters cover a wide range of subjects, including relationships between quality management and organization performance; evaluation of service delivery quality; quality and environmental management systems (ISO 9001, 14001, EMAS); management system integration; TQM and EFQM Excellence model; innovative value propositions; process management; active cooperation of employees; quality-related costs; and data treatment, using statistical tools. More technical issues like robot programming and the use of international regulations and standards to ensure the quality of services in information technology companies are also covered, as

well as how the implementation of a quality management system promotes the implementation of High-Involvement Human Resources Management Practices.

I was delighted to be asked to write this foreword and am grateful to the editors for allowing me to be part of this journey. I am sure the reader will enjoy this book and will take away new insights from it.

Setúbal, Portugal António Ramos Pires

Contents

Chapter 1
Quality Management and Performance in the Hotel Industry: A Literature Review

Juan José Tarí, José F. Molina-Azorín, Jorge Pereira-Moliner, María D. López-Gamero, and Eva M. Pertusa-Ortega

Abstract This paper presents a literature review of the quantitative empirical studies that have analyzed the relationship between quality management and performance in the hotel industry. It is based on a search of the databases ScienceDirect, ABI/Inform and Emerald, and it identifies the quality management and performance variables used, the analyses carried out and the main findings. The results show that, in general terms, quality management has positive effects on operational and financial performance, that quality certification leads to positive benefits for many hotels, that specific variables such as the number of stars or the size of hotel could be an influence on this relationship, and that other variables could also help us to understand better the relationship between quality management and performance, for example the motives for certification. Based on these results the paper offers implications for managers and future lines of research.

1.1 Introduction

Quality management helps companies to improve performance and competitiveness. The positive benefits of quality management have persuaded many companies to implement quality management systems and academics to examine the relationship between quality initiatives and performance. The studies examining the effects of quality management on performance in hotels are not so fully developed as those in manufacturing industries (Wilkins et al. 2007; Rubio-Andrada et al. 2011).

J.J. Tarí (✉) • J.F. Molina-Azorín • J. Pereira-Moliner
M.D. López-Gamero • E.M. Pertusa-Ortega
Department of Business Management, University of Alicante
Campus de Sant Vicent del Raspeig, E-03080, Spain
e-mail: jj.tari@ua.es; jf.molina@ua.es; jorge.pereira@ua.es;
md.lopez@ua.es; eva.pertusa@ua.es

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Most of studies are empirical studies, and although there are literature reviews on quality management (Sila and Ebrahimpour 2003; Nair 2006; Molina-Azorín et al. 2009; Heras-Saizarbitoria and Boiral 2013), to best of our knowledge there are no literature reviews on quality management in the hotel industry. A literature review about quality management in hotels is valuable in that it might inform practitioners about the trends in managing quality in hotels and provide information that could inform future research into quality management in hotels.

This chapter presents a literature review that identifies empirical academic studies on the relationship between quality management and performance in hotels. The ScienceDirect, ABI/Inform and Emerald databases were interrogated by means of searches with the following key words: (1) hotels or hospitality, (2) quality management or ISO 9001 or ISO 9000, and (3) performance or competitive advantage or profitability. The references in the papers identified by these searches were also reviewed. The work identifies the dimensions of quality management and performance and the relationships between these variables in a hotel context. It also suggests other variables that can play a role in this relationship.

The remainder of the chapter is organized as follows. First the chapter presents a short overview of quality management and performance. Next the literature review on quality management in hotels is described. The chapter ends with a summary of the main conclusions and implications for future research.

1.2 Quality Management and Performance

Quality management is a management system that includes a set of practices in order to manage an organization. Organizations can develop their own quality programmes or follow academic models or those that exist in the market (e.g., European Foundation for Quality Management model, Malcom Baldrige National Quality Award model, ISO 9001 standard).

Based on quality management studies, the most common quality management practices are: leadership, people management, planning, information and analysis, process management, supplier management, customer/stakeholder focus and design. The literature suggests that these quality management practices may have positive effects on performance and competitiveness.

This relationship between quality management and competitiveness was first analysed from an academic and empirical point of view in the 1990s, with mixed conclusions. While some studies found a positive relationship between these variables (Powell 1995; Easton and Jarrell 1998; Fotopoulos and Psomas 2010), other have shown that this relationship does not always exist, or is not a clear one (Boje and Winsor 1993; Taylor and Wright 2003), probably because employees and/or managers lack the motivation to implement a real quality culture, or the firm implements the system inefficiently, or there is lack of support from the management. The studies examining these relationships have examined both manufacturing and

service firms, although studies have mainly focused on manufacturing firms (Molina-Azorín et al. 2009). Also, regarding the analysis of quality management variables, mention must be made of the studies focusing on the total quality management (TQM) variable, and those considering the ISO 9001 certificate or other quality models as a variable. In turn, within the first group, a distinction should be drawn between those studies measuring the TQM variable as a single construct and those using a multidimensional construct. All these studies show that, in general terms, quality management may have a positive influence on results.

However, the results of the ISO 9001 quality management system are not so clear. Firstly, there are a number of studies pointing out that the ISO 9001 standard improves issues such as efficiency, customer and employee satisfaction, service quality and profitability (Häversjö 2000; Tzelepis et al. 2006; Lee et al. 2009; Mak 2011). According to this group of studies, the ISO 9001 standard has clear operational benefits, such as those related to quality results (e.g., customer and employee satisfaction). A second set of studies indicates that certified firms have improved financial results (Heras et al. 2002; Chow-Chua et al. 2003; Mokhtar and Muda 2012). A third set of studies, which are the most negative, states that certification has no impact on a firm's results (Rahman 2001; Singels et al. 2001; Tsekouras et al. 2002; Martínez-Costa et al. 2009; Lo et al. 2011). These three positions indicate that, in general terms, an ISO 9001 quality management system usually improves quality results, although the effects on financial results are not conclusive.

All these studies suggest that quality management may have positive effects on operational and financial performance. Similarly, quality management may influence competitiveness. Deming (1982) pointed out that quality improves competitiveness, and this idea is also advanced by quality models and scholarly studies. In this regards, some works on quality management show that human issues are the key to explaining competitiveness (Powell 1995), that quality management is related to a firm's differentiation strategy (Prajogo and Sohal 2006) and that ISO 9001 certificate can create competitive advantages (Chow-Chua et al. 2003; Feng et al. 2008).

1.3 Quality Management and Performance in the Hotel Industry

The literature also shows the application of these ideas in hotels in theoretical and empirical studies. The empirical studies, of a qualitative and quantitative nature, include those that analyse the level of implementation of quality management in hotels but do not establish any relationship with operational and financial results and competitiveness (Arasli 2002; Harrington and Keating 2006), and also those dealing with the effects of quality management on hotels' results and competitiveness (see Appendix). Both qualitative and quantitative studies show that hotels may successfully adopt quality management practices or quality models, as has been demonstrated to be the case for manufacturing firms.

The Appendix summarizes the principal empirical studies examining the effects of quality management on performance dimensions in hotels, based on the search carried out. It identifies the variables used to measure quality management, quality/operational performance, and financial performance, as well as the analysis used and the main findings. In this context, those studies focusing only on a specific performance dimension, for example, only on employee satisfaction, were not included (e.g., Sharpley and Forster 2003). In the end, 14 empirical studies examining the effects of quality management on different performance dimensions were identified (see Appendix).

The majority of these studies have used perceptual measures based on surveys (e.g, questionnaires) and a few studies used objective measures. As is common in quality management studies, the studies in the Appendix measured quality management mainly in terms of TQM and the ISO 9001 standard. Seven studies measures quality management using ISO 9001 certification, four used TQM as a multidimensional construct and two used TQM as a single construct. One study used other ratios to measure quality management. Similarly, the effects of quality management initiatives focused on operational/quality performance and financial performance. Operational and/or quality performance measures were usually customer and employee satisfaction, although some studies also used other operational measures such as a reduction in the number of errors or impact on society, among others. Regarding financial performance, the studies focused mainly on market share, sales and other hotel performance measures such as gross profit per room.

These studies analyzed this relationship based on different statistical techniques. Two studies used descriptive analyses, five used significance differences, two applied factor analysis and/or cluster analysis, two used regressions, and three used structural equations.

The main finding of these studies show that the positive benefits are related to customer satisfaction, people satisfaction, the satisfaction of other stakeholders, and improvements in operational performance, efficiency, hotel image, the level of differentiation and financial performance.

This indicates that quality management may improve a hotel's internal functions, which allows it to increase the productivity of both employees and facilities, improve efficiency, and reduce costs and waste when providing a service. In turn, this may have a positive effect on customer satisfaction, which may allow the hotel to increase its sales and market share, create guest loyalty, attract new guests, and improve its image. In this way, quality management may improve the results and the competitiveness of hotels through process standardization, waste reduction, more efficient services and error reduction.

However, the literature also mentions a number of problems in the implementation of quality management which detract from its success, and may even prevent it from yielding positive outcomes for some hotels. In this respect, Breiter and Bloomquist (1998) pointed out that 14 out of the 116 hotels that they analysed which implemented quality management were not successful. Nield and Kozak

(1999) showed that only a few hotels improved customer satisfaction and competitiveness as a result of the implementation of a quality system. This could be due mainly to a lack of managerial commitment (Viada-Stenger et al. 2010) or lack of employee participation (Baldacchino 1995). Alongside these issues, other barriers indicated by the literature, which may hinder the implementation of a quality management system in hotels, are lack of financial resources, employee resistance to change, the fact that employees do not consider quality an important factor, and lack of enthusiasm (Harrington and Keating 2006). Lack of commitment on the part of managers and employees is a key problem, and the two are mutually related: lack of commitment by the management prevents it from delegating responsibility to employees and from giving them sufficient training. In order to improve commitment among employees, the management must promote greater responsibility for quality among employees, allowing them, for instance, to modify certain processes and deal with customers' complaints (Partlow 1993).

The effects of quality management on these issues can be direct or indirect, and other variables could be considered to explain this relationship better. For example, environmental management has parallels with quality management and may possibly mediate the relationship between quality management and performance (Pereira-Moliner et al. 2012). Market orientation may also mediate the relationship between quality management and hotel performance (Wang et al. 2012). Similarly, environmental factors (market turbulence, competitive intensity, technological turbulence) may moderate the relationship between quality management and hotel performance (Wang et al. 2012).

Other variables can play a role in this relationship. For example, some studies have shown that hotels with a higher level of quality management usually have a higher category and are chain-affiliated. Nevertheless, there is no overall consensus on the role of size in the relationship.

Finally, hotels that implement a quality management system can do it for both internal and external reasons. Whether quality certification is sought for internal or external reasons may affect how much it contributes to improving hotel performance (Alonso-Almeida et al. 2012) and that may, in turn, influence the level of adoption of the quality management system, as some studies in manufacturing organizations have shown.

1.4 Conclusions and Future Research

The objective of this chapter is to analyze the main findings on the effects of quality management on different performance dimensions in hotels. Based on the empirical studies listed in the Appendix, it can be said that quality management influences competitive performance, stakeholder satisfaction and other operational measures (e.g., efficiency) and can have positive effects on financial performance.

In this context, quality certificates may also have positive effects on performance. The Appendix also shows how quality management and performance dimensions have been measured in the context of hotels. The category of a hotel and whether or not it is chain-affiliated could lead hotels to show more commitment to quality issues, and these and other variables could be included in research to develop a better understanding of the relationship between quality initiatives and performance. For example, regarding quality certificates, as in other industries, whether the certification is driven by internal or external reasons can influence the implementation of quality systems and, consequently, their benefits. In addition, mediating and moderating factors can play a role in this relationship (e.g., environmental management initiatives, market orientation, and environmental factors).

Based on the empirical studies analyzed in this chapter and other studies about quality management in hotels and in manufacturing organizations, several ideas for future research can be proposed. First, it would be interesting to analyze the effects of quality management on operational performance and the impact of the latter on financial performance. In this context, the quality management measures in Appendix can be used as a guide for the measurement of quality management in hotels in future studies. Second, different mediating and moderating variables could be included to understand better the relationship between quality management and performance. Such mediating variables might include environmental management, environmental turbulence, competitive intensity, culture, category and affiliation. Third, empirical studies about the relationship between quality and environmental management systems, or between quality and environmental certificates, and their impacts on performance could provide interesting insights. Fourth, success factors for effective implementation of quality initiatives are needed. In this context, studies of reasons for certification, internalization and/or other antecedent factors (e.g., leadership, employee involvement, stakeholder pressure) are also needed in order to develop a better understanding of the level of implementation of quality initiatives in hotels and their effects on performance. Obtaining the perceptions of various stakeholders (e.g., employees and customers) could supplement the surveys of managers' opinions that form the backbone of the majority of studies considered here. Finally, longitudinal studies, mixed methods studies (qualitative and quantitative studies) and works from different countries could extend the range of applicability and the richness of the results that have been found in previous studies.

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Appendix

Summary of quantitative studies on the effects of quality management in hotels

Study	Sample	Quality management variables	Quality performance variables	Financial performance variables	Analysis	Main findings
Camisón (1996)	38 Valencian hotels and 250 customers	Leadership, policy and strategy, people management, resources, processes	Customer satisfaction, people satisfaction, social impact	Financial results	Descriptive analysis	Quality management is basic for competitiveness, although there are differences between managers' and customers' perceptions
Breiter and Bloomquist (1998)	230 US hotels	Leadership, customer focus, empowerment, process improvement, fact-based decisions, training, recognition, flexibility, techniques and tools, strategy planning, teams, supplier management, ISO 9000 certification	Successful quality management programme, non-successful quality management programme		Descriptive analysis and significant differences between groups	Most hotels derive benefit from quality and find the obstacles mentioned in the literature on quality in industrial firms
Nield and Kozak (1999)	34 ISO-9001-certified tourist firms (including hotels)	ISO 9000 certification	Operational benefits, people benefits, marketing benefits (customer satisfaction, competitive advantage, image)		Descriptive analysis and interviews with three of the organizations analysed	The ISO 9001 has clear benefits for operational results, medium benefits for marketing results, and results regarding employees. Also, the managers interview pointed out that there seems to be no direct connection with financial results, because customers do not usually seek certification.
Kimes (2001)	1,135 Holiday Inn hotels	The study analysed the ratios in the hotels' quality assurance reports	Number of defects in each hotel area	Income per available room (RevPAR)	Significant differences between hotels with defects and hotels without defects, and between deficient hotels and non-deficient hotels	There is a direct relationship between product quality and financial results. Defects in the exterior, in rooms and bathrooms are critical, whereas problems in other hotel areas do not have an important effect on RevPAR

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Study	Sample	Quality management variables	Quality performance variables	Financial performance variables	Analysis	Main findings
Claver-Cortés et al. (2008)	301 Spanish hotels	Commitment to quality management (managerial commitment, customer satisfaction, cooperation with intermediaries and suppliers, training, motivation, employee involvement, continuous improvement, control)	Customer satisfaction, employee satisfaction	Market share, sales, gross profit per room, etc.	Cluster analysis and regression analysis	Those hotels that develop quality practices to a higher extent have better operational results, improved competitiveness and higher satisfaction among their interest groups (customers and employees). Quality management has an impact on competitiveness and interest group satisfaction
Tarí et al. (2009)	303 Spanish hotels with and without quality certification	Quality certificate	Customer satisfaction, employee satisfaction	Market share, sales, gross profit per room, etc.	Significant differences between groups	Certified hotels have better operational results, although no significant differences are shown regarding the satisfaction of interest groups and financial results
Nicolau and Sellers (2010)	24 quality certificates	Quality certificate		Firm's market value (share price)	Event study and regression analysis	The price of shares reacts positively to the announcement of the certificate
Rubio-Andrada et al. (2011)	111 certified Spanish hotels	ISO 9001 or Q Certificate	Error reduction, improved operations, training, use of new technologies, working conditions, motivation, fewer complaints, customer satisfaction (amongst others)	Income, profits, financial ratio	Factor analysis	The quality certificate has a positive effect on operational and customer results, and also improves financial results

Arasli (2012)	23 hotels in Tehran	Leadership, satisfied customers, fact-based, people-based management, continuous improvement	Business excellence outcomes		ANOVA test	Most managers, chiefs, and employees gave their lowest scores to quality culture practices and business excellence performance
Alonso-Almeida et al. (2012)	162 Spanish hotels certified with the 9001 ISO standard or the Q certificate	Quality certification (ISO 9001 or Q certificate)	Results regarding customers, suppliers and other interest groups, employee results, operational results	Financial results	Structural equations	The reasons for certification have an influence on employee satisfaction, which in turn has an impact on the quality of the services offered. In turn, this has an influence on the results regarding customers, suppliers and other interest groups. Similarly, the quality of services and operations has positive impacts on financial results
Álvarez García et al. (2012a)	186 Spanish hotels with the Q certificate	Q Certificate	Customer results, employee results, society results	Key outcomes	Factor and cluster analysis	Certified hotels with greater concern for internal and external reasons for certification have a higher level of development of quality practices and better results in general
Álvarez García et al. (2012b)	34 companies with the Q for quality certificate	Q Certificate	Customer results, employee results, society results	Key performance results	Student *t* test	The companies studied, including hotels, that have implemented the "Q for quality" have improved their levels of performance

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Study	Sample	Quality management variables	Quality performance variables	Financial performance variables	Analysis	Main findings
Pereira-Moliner et al. (2012)	259 hotels	Quality management (the management is committed to quality, the customers' present and future needs are known by the firm, the firm cooperates with intermediaries in order to improve the product offered in the establishment, the firm cooperates with suppliers in order to improve the product offered in the establishment, the establishment staff receive training in quality-related issues, employee motivation is encouraged, all the staff are involved in the elaboration of the product offered, improvements are identified in the service delivery process, objective compliance is monitored and deviations are corrected, a culture focused on the continuous improvement of the product offered is at work)	Stakeholder satisfaction (customer satisfaction, employee satisfaction)	Financial performance (room occupancy rate, income per room, gross profit per room, wealth creation, capacity to generate profit in times of crisis) Market success (market share gain, success rate at new product launch, average sales growth in the last 5 years)	Structural equations	Quality management influences stakeholder satisfaction, market success and financial performance. In addition, environmental management mediates the relationship between quality management and performance
Wang et al. (2012)	588 hotels in China	Customer focus, internal and external cooperation, continuous improvement leadership, employee commitment, learning, process management	Customer results (loyalty, satisfaction, value, customer retention)	Financial results (market share, sales, sales cost, financial profitability)	Structural equations and discriminant analysis	Quality management has an influence on hotel results, and market turbulence, competitive intensity and technological turbulence moderate the relationship between quality and results

References

Alonso-Almeida MM, Rodríguez-Antón JM, Rubio-Andrada L (2012) Reasons for implementing certified quality systems and impact on performance: an analysis of the hotel industry. Serv Indust J 32:919–936

Álvarez García J, Fraiz Brea JA, Del Río Rama MC (2012a) Análisis de las motivaciones para certificar la marca "Q de calidad turística". Sector de alojamiento. Investigaciones Europeas de Dirección y Economía de la Empresa 18:101–121

Álvarez García J, Fraiz Brea JA, Del Río Rama MC (2012b) The effects of implementing "Q" for quality on the business performance. Eur J Tourism Hospit Recreat 3(1):53–75

Arasli H (2002) Gearing total quality into small-and medium-sized hotels in North Cyprus. J Small Bus Manage 40(4):350–359

Arasli H (2012) Towards business excellence in the hospitality industry: a case for 3-, 4-, and 5-star hotels in Iran. Total Qual Manag Bus Excel 23:573–590

Baldacchino G (1995) Total quality management in a luxury hotel: a critique of practice. Int J Hospital Manage 14(1):67–78

Boje DM, Winsor RD (1993) The resurrection of Taylorism: total quality management's hidden agenda. J Organ Change Manag 6(4):57–70

Breiter D, Bloomquist P (1998) TQM in American hotels. Cornell Restaur Adm Q 39(1):26–33

Camisón C (1996) Total quality management in hospitality: an application of the EFQM model. Tour Manage 17(3):191–201

Chow-Chua C, Goh M, Wan TB (2003) Does ISO 9000 certification improve business performance? Int J Qual Reliab Manag 20:936–953

Claver-Cortés E, Pereira-Moliner J, Tarí JJ, Molina-Azorín JF (2008) TQM, managerial factors and performance in the Spanish hotel industry. Ind Manag Data Syst 108(2):228–244

Deming WE (1982) Quality, productivity and competitive position. MIT Center for Advanced Engineering, Cambridge, MA

Easton GS, Jarrell SL (1998) The effects of total quality management on corporate performance: an empirical investigation. J Bus 71:253–307

Feng M, Terziovski M, Samson D (2008) Relationship of ISO 9001:2000 quality system certification with operational and business performance. A survey in Australia and New Zealand-based manufacturing and service companies. J Manuf Tech Manag 19(1):22–37

Fotopoulos CV, Psomas EL (2010) The structural relationships between TQM factors and organizational performance. TQM J 22(5):539–552

Harrington D, Keating M (2006) Quality management initiatives in Irish hotels-emerging agendas in a changing environment. Tourism Hospit Res 6(4):267–283

Häversjö T (2000) The financial effects of ISO 9000 registration for Danish companies. Manag Audit J 15:47–52

Heras I, Dick GPM, Casadesús M (2002) ISO 9000 registration's impact on sales and profitability: a longitudinal analysis of performance before and after accreditation. Int J Qual Reliab Manag 19(6):774–791

Heras-Saizarbitoria I, Boiral O (2013) ISO 9001 and ISO 14001: towards a research agenda on management system standards. Int J Manag Rev 15:47–65

Kimes SE (2001) How product quality drives profitability. The experience at Holiday Inn. Cornell Hotel Restaur Adm 42(3):25–28

Lee PKC, To WM, Yu BTW (2009) The implementation and performance outcomes of ISO 9000 in service organizations: an empirical taxonomy. Int J Qual Reliab Manag 26:646–662

Lo CKY, Yeung ACL, Cheng TCE (2011) Meta-standards, financial performance and senior executive compensation in China: an institutional perspective. Int J Prod Econ 129:119–126

Mak BLM (2011) ISO certification in the tour operator sector. Int J Contemp Hospit Manag 23:115–130

Martínez-Costa M, Choi TY, Marínez JA, Martínez-Lorente AR (2009) ISO 9000/1994, ISO 9001/2000 and TQM: the performance debate revisited. J Oper Manag 27:495–511

Mokhtar MZ, Muda MS (2012) Comparative study on performance measure and attributes between ISO and non-ISO certification companies. Int J Bus Manag 7:185–193
Molina-Azorín JF, Tarí J, Claver-Cortés E, López-Gamero MD (2009) Quality management, environmental management and firm performance: a review of empirical studies and issues of integration. Int J Manag Rev 11(2):197–222
Nair A (2006) Meta-analysis of the relationship between quality management practices and firm performance-implications for quality management theory development. J Oper Manag 24:948–975
Nicolau JL, Sellers R (2010) The quality of quality awards: diminishing information asymmetries in a hotel chain. J Bus Res 63:832–839
Nield K, Kozak M (1999) Quality certification in the hospitality industry: analyzing the benefits of ISO 9000. Cornell Hotel Restaur Adm Q 40:40–45
Partlow CG (1993) How Ritz-Carlton applies TQM. Cornell Hotel Restaur Adm Q 34(4):16–24
Pereira-Moliner J, Claver-Cortés E, Molina-Azorín JF, Tarí JJ (2012) Quality management, environmental management and firm performance: direct and mediating effects in the hotel industry. J Cleaner Prod 37:82–92
Powell TC (1995) Total quality management as competitive advantage: a review and empirical study. Strat Manag J 16:15–37
Prajogo DI, Sohal AS (2006) The relationship between organization strategy, total quality management (TQM), and organization performance─the mediating role of TQM. Eur J Oper Res 168:35–50
Rahman S (2001) A comparative study of TQM practice and organisational performance of SMEs with and without ISO 9000 certification. Int J Qual Reliab Manag 18:35–49
Rubio-Andrada L, Alonso-Almeida MM, Rodríguez-Antón J (2011) Motivations and impacts in the firm and stakeholders of quality certification: evidence from small- and medium-sized service enterprises. Total Qual Manag Bus Excel 22:833–852
Sharpley R, Forster G (2003) The implications of hotel employee attitudes for the development of quality tourism: the case of Cyprus. Tour Manage 24:687–697
Sila I, Ebrahimpour M (2003) Examination and comparison of the critical factors of total quality management (TQM) across countries. Int J Prod Res 41:235–263
Singels J, Ruël G, van de Water H (2001) ISO 9000 series certification and performance. Int J Qual Reliab Manag 18(1):62–75
Tarí JJ, Claver-Cortés E, Pereira-Moliner J, Molina-Azorín JF (2009) Is it worthwhile to be a quality certified hotel? Evidence from Spain. Int J Qual Reliab Manag 26(9):850–864
Taylor W, Wright G (2003) A longitudinal study of TQM implementation: factors influencing success and failure. Omega 31:97–111
Tsekouras K, Dimara E, Skuras D (2002) Adoption of a quality assurance scheme and its effect on firm performance: a study of Greek firms implementing ISO 9000. Total Qual Manag 13:827–841
Tzelepis D, Tsekouras K, Skuras D, Dimara E (2006) The effects of ISO 9001 on firms' productive efficiency. Int J Oper Prod Manag 26(10):1146–1165
Viada-Stenger MC, Balbastre-Benavent F, Redondo-Cano AM (2010) The implementation of a quality management system based on the Q tourist quality standard. The case of hotel sector. Serv Bus 4:177–196
Wang C-H, Chen K-Y, Chen S-C (2012) Total quality management, market orientation and hotel performance: the moderating effects of external environmental factors. Int J Hospit Manag 31:119–129
Wilkins H, Merrilees B, Herington C (2007) Towards an understanding of total service quality hotels. Int J Hospit Manag 26:840–53

Chapter 2
Two Views for Understanding How TQM Fosters Learning and Value Innovation: Absorptive Capabilities and Action-Based Management

Tomas Gonzalez Cruz, Fernando J. Garrigos-Simon, Sonia Cruz Ros, and Yeamduan Narangajavana

Abstract In the last decade some frameworks have tried to explain how to devise strategies for innovation in value by determining the needs of customers and non-customers, also creating new industries in which competition becomes irrelevant (Hax, The delta model. Reinventing your business strategy. New York: Springer, 2010; Kim and Mauborgne, Blue ocean strategy. Boston: Harvard Business School Press, 2005; Madhok and Marques 2013). These reference frameworks are based on a common set of principles: Value is created through the relationship with the customer (Priem, Acad Manag Rev 23; 219–235, 2007; Vargo and Lusch 2008); Strategy is considered to be a continuous process of exploring new opportunities, through observation of customer behaviour, intuition of opportunities (as a result of inductive reasoning) and the definition of value proposals characterized by being focused, clear, and original (Hax, The delta model. Reinventing your business strategy. New York: Springer, 2010; Kim and Mauborgne, Blue ocean strategy. Boston: Harvard Business School Press, 2005); agility and speed to intuit and capture new opportunities, as well as flexibility to operationalize them through experimentation and subsequent trial and error actions (Madhok and Marques 2013).

T. Gonzalez Cruz (✉) • S. Cruz Ros
Departamento de Organización de Empresas Juan José Renau Piqueras,
Universitat de Valencia, Avda. dels Taronjers, Valencia 46022, Spain
e-mail: tomas.gonzalez@uv.es; sonia.cruz@uv.es

F.J. Garrigos-Simon
Departamento de Organización de Empresas, Universitat Politecnica de Valencia
Camino de Vera, Valencia 46022, Spain
e-mail: fergars3@doe.upv.es

Y. Narangajavana
Department of Management, Walailak University, School of Management,
222 Thaiburi, Thasala, Nakhon Si Thammarat 80160, Thailand
e-mail: nu_awn@hotmail.com

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This approach to strategy is relevant in the case of services with high customer contact, in which the management of the relationship with the customer is at the centre of the process of value creation, and in which the implementation of the principles previously mentioned produces links which lead the customer to perceive the value proposition as valuable, unique and irreplaceable (high switching costs). In this paper we highlight that a substantial part of the above principles are common to those proposed by TQM. The central aim of this essay is to show that organizations which have successfully implemented TQM are in an optimal position to find, define and create innovative value propositions.

2.1 Introduction

TQM has been considered both as a managerial philosophy (Camisón et al. 2006) and as a management innovation (Volverda et al. 2013) which fosters internal knowledge creation (Camisón et al. 2009) and increases internal knowledge transfer (Molina et al. 2004) through basic TQM principles such as continuous improvement and learning. However, only recently has attention been devoted to TQM as an antecedent of the capability of absorbing external knowledge. Fernández-Pérez and Gutiérrez-Gutiérrez (2013) show that TQM improves a CEO's external social network, which results in higher strategic flexibility and improves organizational learning. Likewise, Arumugam et al. (2013) state that TQM practices increase firm and team activities devoted to seeking information from customers and suppliers. Nevertheless, TQM is usually considered at an operational level, as Porter (1996) states, TQM is about operating efficiency, but that is not strategy. Research remains scant, Volverda et al. (2013, p. 11) suggest that few scholars have examined how TQM practices contribute to exploratory processes which lead to strategic innovation.

Departing from the absorptive capability framework (Cohen and Levinthal 1990) which considers both sides of knowledge creation (internal and external), this paper considers TQM from recently proposed strategy models based on Austrian Economics postulates (Roberts and Eisenhardt 2003; Guerras-Martín et al. 2013), which highlight customer-oriented value creation, inductive reasoning, entrepreneurial behavior, strategic flexibility and agile execution (Madhok and Marques 2013). From this point of view, learning produced by TQM is not only useful to reach the productivity frontier as Porter stats (1996), but also has the potential to foster deep customer understanding which leads to value innovation, resulting in the development of new and uncontested markets where competition becomes irrelevant (Kim and Mauborgne 2005).

The rest of the paper is organized as follows: firstly, we develop a brief but complete revision of the absorptive capability framework; secondly, the literature that analyzes the relationship between TQM and absorptive capability is outlined; thirdly, customer-oriented strategic models are considered; and finally some research questions are proposed.

2.2 Absorptive Capacity in the Context of Strategic Management

Strategic management literature in recent decades has focused on two fundamental paradigms, as being the most influential ones: Competitive Positioning, as proposed by Michael Porter (1980), and the Resources and Capabilities-Based View (Wernerfeld 1984; Prahalad and Hamel 1990). Porter's view is that, "the essence of formulating competitive strategy is relating a company to its environment" (Porter 1980, p. 3). On the other hand, the Resources and Capabilities-Based View focuses "on the distinctive competences and the resource and capability assets within the enterprise, as determinant key success factors" (Garrigos and Palacios 2008, p. 85). However, as Coulter (1997, p. 40) points out regarding these two perspectives, "both are important to understand how organizations achieve a sustainable competitive advantage". In the same vein, newer approaches, such as the Dynamic Capabilities perspective, have tackled strategies enabling flexibility and responsiveness to environmental changes (Teece et al. 1997). Moreover, as Posen and Levinthal (2012) stress, the literature increasingly focuses attention on high-velocity markets (Brown and Eisenhardt 1997), and hypercompetition (D'Aveni and Gunther 1994).

In addition, the perspectives centred on internal resources and capabilities agree that the most strategically important resource is knowledge (Kogut and Zander 1996). Thus, "knowledge management has become a line of research attracting much interest" (Palacios and Garrigos 2006), and as Garrigos (2009, p. 2) points out, "the importance of information and knowledge as increasingly key aspects of competitive advantage in the activities of both individuals and organizations, is widely recognized by authors and practitioners".

Following a combined perspective, Cohen and Levinthal (1990, p. 128), labelled the term "absorptive capacity", as "the ability of firms to recognize the value of new, external information, assimilate it, and apply it to commercial ends". "These abilities collectively constitute what we have termed a firm's "absorptive capacity" (Cohen and Levinthal 1989a, 1990, 1994, p. 227). As these authors point out, "A critical factor in industrial competitiveness is the ability of firms to exploit new technological developments. We term this ability a firm's absorptive capacity and argue that such a capability not only enables a firm to exploit new extramural knowledge, but to more accurately predict the nature of future technological advance" (Cohen and Levinthal 1994, p. 227).

2.2.1 Absorptive Capacity: Exploration, Exploitation, and Ambidextrous Firms

As Cohen and Levinthal 1994, p. 227, point out, the capacity to "exploit" outside knowledge is comprised of the set of closely related abilities to evaluate the technological and commercial potential of knowledge in a particular domain, assimilate it, and apply it to commercial ends. The importance of recognizing, assimilating, and

applying new knowledge, as the centre of the absorptive capacity, is also stressed by Andriopoulos and Lewis (2009), who point out the importance of combining exploitation and exploration of knowledge, together with the relevance of ambidextrous firms.

According to Subramaniam and Youndt (2005), and Andriopoulos and Lewis (2009, p. 696) "Innovation denotes intricate knowledge about the management processes of identifying and utilizing ideas, tools, and opportunities to create new or enhanced products or services". The importance of combining exploration and exploitation is crucial, as Andriopoulos and Lewis (2009, p. 708) point out, in essence, the two modes of innovation are mutually reinforcing. But what is exploration and what is exploitation? As Atuahene-Gima (2005), and Andriopoulos and Lewis (2009, p. 696) explain "exploitation hones and extends current knowledge, seeking greater efficiency and improvements to enable incremental innovation", in addition, exploration, "entails the development of new knowledge, experimenting to foster the variation and novelty needed for more radical innovation". Exploration is essential for firms, as Posen and Levinthal (2012, p. 598) stress, "we conceive of strategies as reflecting managerial and organizational attempts to understand the world and act appropriately". However, as Andriopoulos and Lewis (2009, p. 708) point out "Exploitative efforts help transform knowledge into commercial ends, but without exploration a firm's stock of knowledge will wane (e.g., being used repeatedly until a firm is stuck in a specific product or industry niche). Likewise, exploratory efforts help to continuously renew and expand a firm's knowledge base, but without exploitation that knowledge may not be utilized fully (e.g., recombined in varying ways across projects or product iterations)".

Nevertheless, sometimes organizations do not balance these factors appropriately. In the same vein, organizational ambidexterity signifies a firm's ability to manage tensions between the exploration and exploitation (Duncan 1976). Hence, ambidextrous firms are those "capable of simultaneous, yet contradictory, knowledge management processes, exploiting current competencies and exploring new domains with equal dexterity" (Lubatkin et al. 2006; Andriopoulos and Lewis (2009, p. 696). This point was stressed previously by March (1991), who identifies the need to allocate limited resources across both the exploitation of the known and exploration of the novel as a central strategic trade-off, and also highlighted by Gupta et al. (2006) and Posen and Levinthal (2012, p. 587), who point out that "balancing exploration and exploitation is central to a firm's performance".

2.2.2 Antecedents of Absorptive Capacity

However, how can companies enhance these processes? According to Cohen and Levinthal (1994, p. 244) "a firm's absorptive capacity - not only permits firms to exploit new, valuable developments, but also to better envision their emergence".

Similarly, the intention in this chapter is to stress the link between quality management and the use of absorptive capabilities to enhance the exploitation and exploration of knowledge by firms. Let us start by emphasizing the main ways of

developing absorptive capacity. According to Cohen and Levinthal (1994, p. 227), "a firm may develop its absorptive capacity in a variety of ways:

1. " It may do so directly by sending employees for advanced technical training or by encouraging employees to monitor and read the technical literature in their areas of expertise" Cohen and Levinthal (1994, p. 227).
   - First of all, Cohen and Levinthal (1990, p. 128) point out that March and Simon (1958, p. 188) suggest that most innovations result from borrowing rather than invention", so monitoring the external environment, and also the literature is essential.
   - However, and apart from this, "the ability to evaluate and use outside knowledge is largely a function of the level of prior related knowledge" (Cohen and Levinthal 1990, p.128). Moreover, "The premise of the notion of absorptive capacity is that the organization needs prior related knowledge to assimilate and use new knowledge" Cohen and Levinthal (1990, p. 129). According to these authors, prior knowledge is essential as it permits not only the assimilation (*ibid*, p. 135), but also the exploitation of new knowledge (*ibid*, p. 136). Hence, prior knowledge will affect innovative performance in an evolving, uncertain environment (Cohen and Levinthal 1989b; Cohen and Levinthal, (1990, p. 136). Following Cohen and Levinthal (1994, pp. 227–228) "firms develop their absorptive capacities largely through the accumulation of related knowledge that permits them to evaluate and exploit subsequent developments within a field…. To use such knowledge, a firm must typically acquire complementary internal expertise to create what we call absorptive capacity". As Cohen and Levinthal (1990, p. 136) mention, "the possession of related expertise will permit the firm to better understand and therefore evaluate the import of intermediate technological advances that provide signals as to the eventual merit of a new technological development". These postulates are also stressed by Subramaniam and Youndt (2005, p. 453), who point out that "An organization's preserved knowledge influences its propensity to reinforce its knowledge".
   - Thirdly, according to Cohen and Levinthal (1990, p. 129) "the concept of absorptive capacity can best be developed through an examination of the cognitive structures that underlie learning". In addition, this learning depends on individuals, not only on the organization. Cohen and Levinthal (1990, pp. 131–132) postulate that, "An organization's absorptive capacity will depend on the absorptive capacities of its individual members… an organization's absorptive capacity does not simply depend on the organization's direct interface with the external environment. It also depends on transfers of knowledge across and within subunits that may be quite removed from the original point of entry". Likewise, according to Cohen and Levinthal (1990, p. 132), to understand the sources of a firm's absorptive capacity, we must focus on the structure of communication between the external environment and the organization, as well as between the subunits of the organization, and also on the character and distribution of expertise within the organization.

- Moreover, Cohen and Levinthal (1990, p. 130) postulate that "problem solving and learning capabilities are so similar that there is little reason to differentiate their modes of development".
  - Similarly "some psychologists suggest that prior knowledge enhances learning" Cohen and Levinthal (1990, p. 129).
  - In addition, according to Cohen and Levinthal (1990, p. 130) "the literature also suggests that problem-solving skills develop similarly. In this case, problem-solving methods and heuristics typically constitute the prior knowledge that permits individuals to acquire related problem solving capabilities…".
- Hence "the firm invests in absorptive capacity by developing the expertise that subsequently permits evaluation, assimilation, and exploitation of knowledge from the environment" Cohen and Levinthal (1994, p. 230).

2. However, Cohen and Levinthal posited other ways of developing this prior related knowledge, stressing that, "More typically, however, absorptive capacity is developed as a by-product of some other activities such as R&D or manufacturing" Cohen and Levinthal (1994, p. 227).
   - Innovation is the intended outcome of most R&D efforts (Cohen 1995). Cohen and Levinthal (1990) formulate a model in which R&D contributes to a firm's absorptive capacity. As Cohen and Levinthal (1990, p. 229) stress, "absorptive capacity may be created as a by-product of a firm's R&D investment", or as they also highlight, "a firm's ability to exploit external knowledge is often generated as a by-product of its R&D…. we assume that R&D not only generates new knowledge but also contributes to the firm's absorptive capacity" Cohen and Levinthal (1990, p. 138). Likewise, "With regard to R&D….firms which conduct complementary research in-house are better able to exploit contract research…" (Cohen and Levinthal 1994, p. 227).
   - "With regard to manufacturing,…..through direct involvement in the manufacture of a product, a firm is better able to recognize and exploit new information relevant to that particular product market" (Cohen and Levinthal 1994, p. 227). Similarly, Cohen and Levinthal (1990, p. 129) point out that "product experience provides the firm with the background necessary both to recognize the value of and implement methods to reorganize or automate particular manufacturing processes". Moreover, "when organizations harness their preserved knowledge through structured recurrent activities, they deepen their knowledge and further legitimize its perceived value….. Eventually, such processes create a path-dependent trajectory of reinforced knowledge" (Cohen and Levinthal 1990; Subramaniam and Youndt 2005, p. 453).

2.3 TQM as an Antecedent to Absorptive Capacity

The consideration of TQM as a source of knowledge creation is not a new issue (Rose and Ito 1996). TQM principles such as continuous improvement and learning orientation suggest that the deployment of TQM practices would have a positive

impact on internal knowledge creation (Lima et al. 1999) and transfer (Molina et al. 2004). Different tools and assessment practices enable knowledge creation which fosters product and process innovation, and greater customer satisfaction (Camisón et al. 2009). The PDCA cycle and the generalized use of analytical tools throughout the organization contribute to building a shared vision and knowledge base which is continuously renewed (Choo et al. 2007). Likewise, TQM fosters inductive learning through experimentation (Ruiz-Moreno et al. 2005; Martínez-Costa and Jiménez-Jiménez 2008). The most important thing is that learning occurs at all levels of the organization and is related to regular activities.

Equally, TQM principles promote cooperative relationships with suppliers and customers. The entire supply chain is considered in the process of value creation (Powell 1995), and stable trustful relationships are developed. TQM stimulates customer loyalty and satisfaction (Black and Porter 1995; Powell 1995; Tummala and Tang 1996) and promotes the consideration of value from the customer's side. This requires a deep understanding of the customer's explicit and latent needs. Customer Orientation, the first TQM principle, encourages scanning and identifying user's latent and explicit needs (Linderman et al. 2004; Prajogo and Sohal 2001).

Suppliers are as important as customers, considering the entire supply chain enables a long term relationship which makes cooperation and knowledge exchange possible (Ruiz-Moreno et al. 2005; Tarí et al. 2007). As a consequence of such organizational openness, TQM enables the acquisition and assimilation of external knowledge (Arumugam et al. 2013; Martínez-Costa and Jiménez-Jiménez 2008; Ruiz-Moreno et al. 2005; Molina et al. 2007).

According to Moreno-Luzón et al. (2000), TQM develops an extensive and close internal network. Process management and teamwork enables mutual learning and knowledge transfer. In the same line of research, Molina et al. (2004) confirm that ISO standards improve knowledge transferability, while TQM enables internal knowledge transference.

Likewise, TQM promotes the development of multiple communication channels linking the organization to its environment (Fernández-Pérez and Gutiérrez-Gutiérrez 2013). As Moreno-Luzón et al. (2000) show, when this network is decentralized throughout all departments and hierarchical levels, a firm's absorptive capability increases due to the symmetry of experience and expertise between partners. As Cohen and Levinthal (1990, p. 129) state, "some psychologists suggest that prior knowledge enhances learning".

The above paragraphs show a wide body of literature research that clearly demonstrates how TQM promotes internal and external learning. However, this learning is mainly focused on improving the effectiveness and efficiency of the established strategy and its current processes (Birkinshaw et al. 2008; Walker et al. 2011). As Volverda et al. (2013, p. 11) underline, little research is devoted to analyzing how TQM contributes to managerial innovation.

In this regard, we must remember that TQM was developed in the field of operations and its major gurus are mainly engineers (Camisón et al. 2006). During the last decade of the twentieth century, most of the research in the managerial field analyzed TQM from resources and capabilities based views, theoretical frameworks which provide an outside-in focus. In the same vein it is well recognized how TQM increases a firm's resource endowment and learning capabilities. However a strategic

customer-focused view with an inside-out focus (McGrath 2010) is lacking. In the next sections, we propose how recently proposed customer-oriented strategic models, based on Austrian Economics principles, could help Academics and practitioners to better understand how TQM fosters exploratory innovation.

2.4 Action-Based Management

Here we use the term Action-Based Management (ABM) from Madhok and Marques (2013). Under this label we will consider a set of different strategic models based on Austrian Economics principles. Without intending to be exhaustive, we present an outline of the basic and shared axioms characterizing these models:

- **Customer orientation**. The strategy is centred on the customer. Thus, deep customer knowledge becomes paramount (Hax 2010; Kim and Mauborgne 2005; Madhok and Marques 2013). The firm must embark on a continuous search process, looking for present and potential user's needs—what Kim and Mauborgne (2005) label as 'visual exploration' and Hax (2010) terms 'customer segmentation'.
- **Focus on Value Innovation**. This principle is based on theoretical propositions from the field of marketing, namely Service-Dominant Logic (Lusch and Vargo 2006; Vargo and Lusch 2004a, b, 2006, 2008), and from the field of strategy (Priem 2007). Firms can only articulate value propositions because 'value is always uniquely and phenomenologically determined by the beneficiary' (Vargo and Lusch 2004a). A value proposition is innovative when it creates disproportionate value at a low cost (Kim and Mauborgne 2005). Value innovation is a conjunction of creativity, customer understanding and technology (Ibid.) and is the result of an entrepreneurial strategic process (Ireland et al. 2003).
- **Opportunities are created and captured**. Markets are in a constant state of flux (Schumpeter 1942; Kirzner 1997; Jacobson 1992). From this *'reconstructionist' view* of strategy, restrictions on firm behaviour are due to the absence of entrepreneurial knowledge. That is, innovation depends on a cognitive reconstruction of existing data and market elements in a fundamental new way (Kim and Mauborgne 2005). Thus, mature businesses exist only in the minds of mature managers (Baden-Fuller and Stopford 1994) or in a similar way; commodities only exist in the mind of the inept (Hax 2010, p. 11). Therefore, the relevant challenge is not catching a competitor's market share, but creating totally new markets where competition becomes irrelevant (Kim and Mauborgne 2005). In order to capture and capitalize transient opportunities, timing and organizational flexibility are critical success factors (Madhok and Marques 2013).
- **Consider the *extended enterprise***. That is, align the whole system of activities, including those carried out by customers, suppliers and complementors (Hax 2010; Kim and Mauborgne 2005). Creating or reconstructing an industry requires changes in the entire system, and in the way constituents create, deliver and capture value (Zott and Amit 2010). Thus, suppliers and complementors become

partners in the value creation process, and the firm must choose to engage in those activities which constitute the cornerstones of the entire system (Zott et al. 2011).

- **Strategic Planning as a fair process**. The Strategic process requires organizational engagement and open dialog throughout the organization leading to consensus (Hax 2010, p. 12). That is agreement, at least between key executives and everybody's buy-in. Also transparency is important for two purposes: Everyone involved in the new value proposition should understand it and the underlying assumptions behind it; and expectation clarity, that is, everyone understands his new role (Kim and Mauborgne 2005, pp. 175–176).
- **Leadership guides the searching process and promotes change**. Given that the entrepreneurial, strategic process is a 'crossing of the desert' that requires vision and guidance. This model presents a pragmatic leadership focus, the leader concentrates his efforts on the people and activities which have a disproportionate contribution to value creation (Kim and Mauborgne 2005, p. 151).
- **Metrics and experimentation: key success factors for organizational learning**. As Alvarez and Barney (2007, p. 15) state: "rarely will entrepreneurs be able to see 'the end from the beginning'". Thus, intuitive thinking (Kim and Mauborgne 2005, p. 67), experimentation by trial and error and proper assessment and measurement tools, to quantify value created for customers and other constituents (Hax 2010; Madhok and Marques 2013), are key elements for discovery and learning.

These principles sustain an alternative way of carrying out innovation and value creation. The traditional way is based on possessing the proper resource base (knowledge and financial), tight process control (financial risk control), and a top-down elitist focus, where a few (engineers and scientists) create innovations based on the cutting edge of knowledge technology. ABM proposes a different way where resources are secondary, what's really important is sensing and creating new opportunities. The customer is the key, not only today's customers but also underserved customers. Customer contact becomes a cornerstone and, as a consequence the process should be participative in a bottom-up-bottom way. Finally, the process is flexible and recursive, based on intuition, trial and error and learning by doing.

After presenting axioms that make up these entrepreneurial, customer-oriented strategic models we will devote the last section to showing how AMB axioms and TQM principles present relevant coincidences.

2.5 TQM as ABM Enabler

This paragraph looks at the correspondence between TQM principles and ABM axioms (Table 2.1).

As Table 2.1 shows, correspondences are numerous and relevant. TQM principles provide a sound basis for ABM deployment. These similarities indicate that TQM systems could be focused not only toward operational excellence and deliberate planning, assumptions that underlie Business Excellence Models. Alternatively,

Table 2.1 TQM and ABM correspondences

ABN axioms	TQM principles	Degree of matching
Customer orientation	Customer orientation	**Very High**. Both are demand-side/ Customer-oriented focus
Focus on value innovation	Strategic orientation to value creation	**Low**. While TQM fosters traditional deliberated strategic planning, ABM advocates inductive processes where the strategy is shaped by action
Opportunities are created		**Null**. TQM focus on operational excellence and incremental value creation
Consider the extended enterprise	Development of Alliances and External Cooperation	**High**. Both advocate considering the entire supply chain while ABM highlights network effects
Strategy as a fair and open process	Teamwork and Internal Cooperation	**High**. Both require the entire organization's engagement, but role division may differ
Leadership guides searching processes	Visionary Leadership	**High**. Both highlight the need for a leader who leads the way and protects from fear
Metrics and experimentation	Managing by Facts	**Very High**. Both foster experimentation and learning from hard facts through key performance indicators

TQM could be focused on unleashing entrepreneurial strategic processes oriented to create and capture new market opportunities. As Volverda et al. (2013) stress, the relationship between TQM and exploratory innovation remains unexplored, but it seems promising. Here we propose developing future research to examine how TQM contributes to performance in exploration-oriented firms. Likewise, new evidence is required in order to understand how traditional innovation processes and ABM innovation dynamic could be harmonized and generate synergies. Finally, it is necessary to determine the circumstances under which each of the two innovation focuses is more appropriate.

References

Alvarez S, Barney J (2007) Discovery and creation: alternative theories of entrepreneurial action. Strat Entrepren J 26(November):11–26

Andriopoulos C, Lewis MW (2009) Exploitation-exploration tensions and organizational ambidexterity. Organ Sci 20(4):696–717

Arumugam V, Antony J, Kumar M (2013) Linking learning and knowledge creation to project in Six Sigma projects: an empirical investigation. Int J Prod Econ 141:388–402

Atuahene-Gima K (2005) Resolving the capability-rigidity paradox in new product innovation. J Market 69:61–83

Baden-Fuller C, Stopford JM (1994) Rejuvenating the mature business. Harvard Business School Press, Boston, MA, USA

Birkinshaw J, Hamel G, Mol MJ (2008) Management innovation. Acad Manage Rev 33:825–845

Black S, Porter LJ (1995) An empirical model for total quality management. Total Qual Manag 6(2):149–164

Brown S, Eisenhardt K (1997) The art of continuous change: linking complexity theory and time-paced evolution in relentlessly shifting organizations. Adm Sci Q 42(1):1–34
Camisón C, Bornonat M, Villar A, Puig A (2009) Sistemas de gestión de la calidad y desempeño: importancia de las prácticas de gestión del conocimiento y de I+D. Revista Europea de Dirección Y Economía de la Empresa 18(1):123–134
Camisón C, Cruz S, González T (2006) Gestión de la calidad: conceptos, enfoques, modelos y sistemas. Prentice-Hall, Madrid
Choo AS, Linderman KW, Schroeder RG (2007) Method and psychological effects on learning and knowledge creation in quality improvement projects. Manag Sci 53(3):437–450
Cohen WM (1995) Empirical studies of innovative activity. In: Stoneham P (ed) Handbook of the economics of innovation and technological change. Blackwell, Oxford, England, pp 182–264
Cohen WM, Levinthal DA (1989a) Innovation and learning: the two faces of R&D. Econ J 99:569–596
Cohen WM, Levinthal D (1994) A fortune favors the prepared firm. Manag Sci 40(2):227–251
Cohen WM, Levinthal DA (1989b) Fortune favors the prepared firm. Technical Report, Department of Social and Decision Sciences: Carnegie Mellon University
Cohen WM, Levinthal DA (1990) Absorptive capacity: a new perspective on learning and innovation. Adm Sci Q 35(1):128–152
Coulter MK (1997) Strategic management in action. Prentice-Hall, Upper Sanddle River, New Jersey, USA
D'Aveni RA, Gunther RE (1994) Hypercompetition: managing the dynamics of strategic maneuvering. Simon and Schuster, New York
Duncan R (1976) The ambidextrous organization: designing dual structures for innovation. In: Kilman R, Pondy L (eds) The management of organizational design. North Holland, New York, pp 167–188
Fernández-Pérez V, Gutiérrez-Gutiérrez L (2013) External managerial networks, strategic flexibility and organisational learning: a comparative study among non-QM, ISO and TQM firms. Total Qual Manag Bus Excel 24(3–4):243–258
Garrigos F (2009) Interrelationships between professional virtual communities and social networks, and the importance of virtual communities in creating and sharing knowledge. In: Camison C, Palacios D, Garrigos F, Devece C (Eds) Connectivity and knowledge management in virtual organizations. Information Science Reference. pp 1–22
Garrigos F, Palacios D (2008) Influence of industrial structure on managerial knowledge: a new vision of Porter'S five forces scheme. In: Domíngez AL (ed) Global management strategy, challenges and uncertanties. Nova, NY, pp 81–106
Guerras-Martín LA, Madhok A, Montoro-Sánchez A (2013) The evolution of strategic management research: recent trends and current directions. Business Research Quarterly. Disposable at SSRN: http://ssrn.com/abstract=2374845 or http://dx.doi.org/10.2139/ssrn.2374845
Gupta A, Smith K, Shalley C (2006) The interplay between exploration and exploitation. Acad Manage J 49(4):693–706
Hax A (2010) The delta model. Reinventing your business strategy. Springer, New York
Ireland RD, Hitt MA, Sirmon DG (2003) A model of strategic entrepreneurship: the construct and its dimensions. J Manag 29(6):963–989
Jacobson R (1992) The 'Austrian' school of strategy. Acad Manage Rev 17(4):782–807
Kim WC, Mauborgne R (2005) Blue ocean strategy. Harvard Business School Press, Boston
Kirzner IM (1997) Entrepreneurial discovery and the competitive market process: an Austrian approach. J Econ Lit 35(1):60–85
Kogut B, Zander U (1996) What do firms do? Coordination, identity and learning. Organ Sci 7:502–518
Lima KK, Ahmed PK, Zairi M (1999) Managing for quality through knowledge management. Total Qual Manag 10(4–5):615–621
Linderman K, Schroeder RG, Zaheer S, Liedtke C, Choo AS (2004) Integrating quality management practices with knowledge creation processes. J Oper Manag 22:589–607

Lubatkin MH, Simsek Z, Ling Y, Veiga JF (2006) Ambidexterity and performance in small-to-medium-sized firms: the pivotal role of top management team behavioral integration. J Manag 32:646–672
Lusch RF, Vargo SL (2006) The service-dominant logic of marketing: reactions, reflections, and refinements. Market Theor 6(3):281–288
Madhok A, Marques R (2013) Competing on action: business models and the competitiveness of emerging market enterprises. Disposable at SSRN: http://ssrn.com/abstract=2376337 or http://dx.doi.org/10.2139/ssrn.2376337
March JG (1991) Exploration and exploitation in organizational learning. Organ Sci 2(1):71–87
March JG, Simon HA (1958) Organizations, John Wiley & Sons Inc., New York
Martínez-Costa M, Jiménez-Jiménez D (2008) Are companies that implement TQM better learning organisations? An empirical study. Total Qual Manag Bus Excel 19(11):1101–1115
McGrath RG (2010) Business models: a discovery driven approach. Long Range Plann 43(2–3):247–261
Molina LM, Lloréns-Montes FJ, Fuentes-Fuentes MM (2004) TQM and ISO 9000 effects on knowledge transferability and knowledge transfers. Total Qual Manag Bus Excel 15(7):1001–1015
Molina LM, Lloréns-Montes J, Ruiz-Moreno A (2007) Relationship between quality management practices and knowledge transfer. J OperManag 25:682–701
Moreno-Luzón M, Peris FJ, González T (2000) Gestión de calidad y diseño de organizaciones. Prentice-Hall, Madrid
Palacios D, Garrigos F (2006) The effect of knowledge management practices on firm performance. J Knowledge Manag 10(3):143–156
Porter ME (1980) Competitive strategy: techniques for analyzing industries and competitors. The Free Press, New York
Porter ME (1996) What is strategy? Harvard Business Review, November–December, 61–78
Posen HE, Levinthal DA (2012) Chasing a moving target: exploitation and exploration in dynamic environments. Manag Sci 58(3):587–601
Powell TC (1995) Total quality management as a competitive advantage: a review and empirical study. Strat Manag J 16:15–37
Prahalad C, Hamel G (1990) The core competence of the corporation. Harv Bus Rev 68(3):79–91
Prajogo DI, Sohal AS (2001) TQM and innovation: a literature review and research framework. Technovation 21:539–558
Priem RL (2007) A consumer perspective on value. Acad Manage Rev 23(1):219–235
Roberts PW, Eisenhardt KM (2003) Austrian insights on strategic organization: from market insights to implications for firms. Strat Organ 1(3):345–352
Rose EL, Ito K (1996) Knowledge creation through the internal information market: an integration of total quality management. Qual Manag J 3:87–102
Ruiz-Moreno A, García-Morales V, Lloréns-Montes FJ (2005) Learning during the quality management process. Antecedents and effects in service firms. Ind Manag Data Syst 105(8): 1001–1021
Schumpeter J (1942) Capitalism, socialism, and democracy. Harper & Row, New York
Subramaniam M, Youndt MA (2005) The influence of intellectual capital on the types of innovative capabilities. Acad Manag J 48:450–463
Tarí JJ, Molina JF, Castejón JL (2007) The relationship between quality management practices and their effects on quality outcomes. Eur J Operat Res 183(2):483–501
Teece D, Pisano G, Schuen A (1997) Dynamic capabilities and strategic management. Strat Manag J 18(7):509–533
Tummala VM, Tang CL (1996) Strategic quality management, Malcolm Baldrige and European quality awards and ISO 9000 certification. Core concepts and comparative analysis. Int J Qual Reliab Manag 13(4):8–38
Vargo SL, Lusch RF (2004a) Evolving to a new dominant logic for marketing. J Market 68:1–17

Vargo SL, Lusch RF (2004b) The four services marketing myths: remnants from a manufacturing model. J Serv Res 6(May):324–335
Vargo SL, Lusch RF (2006) Service-dominant logic: what it is, what it is not, what it might be. In: Lusch RF, Vargo SL (eds) The service-dominant logic of marketing: dialog, debate, and directions. M.E. Sharpe, Armonk, New York, pp 43–56
Vargo SL, Lusch RF (2008) Service-dominant logic: continuing the evolution. J Acad Market Sci 36(Spring):1–10
Volverda HW, Van Den Bosch FAJ, Heij C (2013) Management innovation: management as fertile ground for innovation. Eur Manag Rev 10:1–15
Walker RM, Damanpour F, Devece CA (2011) Management innovation and organizational performance: the mediating effect of performance management. J Pub Adm Res Theor 21:367–386
Wernerfeld B (1984) A resource-based view of the firm. Strat Manag J 5:171–180
Zott C, Amit R (2010) Business model design: An activity system perspective. Long range planning 43(2-3):216–226. doi:10.1016/j.lrp.2009.07.004
Zott C, Amit R, Massa L (2011) The business model: recent developments and future research. J Manag 37(4):1019–1042

Chapter 3
An Application of SERVQUAL Model in Termas of Chaves

María de la Cruz del Río Rama, José Álvarez García, Carlos Rueda-Armengot, and José Luís Coca Pérez

Abstract The perceived quality of service of users is a necessary concept to be taken into account by the managers of the Termas, due to its capability to guide them on how to improve the service they provide. To make this concept operational, perceived quality is analyzed by applying the SERVQUAL model. The objective of this chapter is to evaluate the service provision model in the Termas of Chaves (Portugal), in order to guide managers on the development of improvements to the present model, considering the weaknesses found. The results show good internal and external validity of the measurement scale, while having high reliability, becoming a tool capable of evaluating the perceived quality of service provided by the Termas de Chaves. In general, users rate the service received in terms of quality with 6.57, on a 7-point Likert scale, detecting safety and empathy as areas to be improved.

M.C. del Río Rama (✉)
Departamento de Organización de Empresas y Márketing, University of Vigo, As Lagoas, Ourense 32004, Spain
e-mail: delrio@uvigo.es

J.Á. García • J.L.C. Pérez
Departamento de Economía Financiera y Contabilidad, University of Extremadura, Avda. Universidad, Cáceres, Extremadura 10071, Spain
e-mail: pepealvarez@unex.es; jlcoca@unex.es

C. Rueda-Armengot
Departamento de Organización de Empresas, Universitat Politècnica de València, Camino de Vera, Valencia 46022, Spain
e-mail: crueda@doe.upv.es

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3.1 Introduction

Nowadays the Termas are being established as an alternative to conventional tourism, due to consumers' change in values "*who get to interpret health as a broader concept than the absence of disease, but as a synonym of quality of life*" (Bonfada et al. 2011), and on the other hand, as an increase in quality of life and greater availability of time that leads consumers to demand leisure and recreation. In this context, the Termas in Portugal "*have returned to add value to the wealth of their natural resource, face the present century with renovated facilities that without losing a shred of the therapeutic character they have shown, are incorporating the modernity needed to satisfy this new public segment that seeks more recreational aspects in hydrotherapy, focused on relaxation and well-being*" (Pacheco and García 2011: 14). Thus, at present these establishments in their process of adaptation to demand have acquired a broader approach; customers come to the thermal baths, either to treat or prevent ailments or to take a break and spend a few days off enjoying a real health holiday.

The aim of health tourism is to recover, improve or maintain health and is a term that encompasses two aspects: therapeutics-medical services and well-being-wellness services (Global Spa Summit LLC 2011), and thermal baths as the main representative of this type of tourism (Artal Tur et al. 2004) brings two different approaches together: medical infrastructures and the combination of rehabilitation and well-being activities. In 1973, thermal tourism was defined by the United Nations World Tourism Organization as "*tourism that is based on the provision of health infrastructures using the country's resources, in particular its mineral waters and climate*" (Mintel 2007).

Thermalists like any other customer, are today much more demanding and informed (Talón et al. 2007). This together with the intensification of market competition has led to the provision of a quality service becoming an element of strategic differentiation, as it is one of the main factors that have an influence on competitiveness (Sureshchandar et al. 2002). In this sense, numerous studies have shown that managing quality has a notable influence on the competitiveness of firms (Kim 1995), so therefore quality becomes at present, one of the priorities for management and improving competitiveness a key strategic objective for establishments.

In this context, thermal baths seek to adapt to customer demand and face the challenge of increasing the level of perceived quality of service by thermalistas. In addition to increasing leisure activities, ie, complementary services (wide range of needs), with the aim of achieving customer satisfaction and therefore loyalty of current customers and increasing the possibility of capturing new customers by word of mouth, in order to survive in an environment in which they have to compete with other tourist products.

To reach this goal, according to Serrano and López (2000), in the first place, it is necessary to measure the level of quality service provided, which involves identifying the key dimensions of the service and evaluating their impact on the client's global satisfaction. Secondly, it is necessary to complement the activities of operational

nature (those that have to do with the performance of the service) with strategic ones, where both internal and external customer satisfaction is the priority objective.

Knowing thermalist expectations on quality service, constitutes a way of focusing and designing the offer in accordance with market requirements and thereby developing programs and actions capable of meeting these expectations, taking into account that the factors that have an influence on quality of service are; the physical aspects that include infrastructures, internal environment, etc., human aspects, ie, staff attitudes and qualities and operational aspects, service performance. All of these aspects are to be considered, since they have a great decisive influence on quality perceived by the thermalist.

One of the greatest challenges faced by thermal establishments to reach and maintain high levels of quality of service is the development and control of the interactions between the company staff, since employees have a direct relationship with thermalists and quality of service is going to depend on how they provide the service, being personnel qualification, attitudes and motivation, fundamental aspects to bear in mind. "*Human resources are the basis of obtaining competitive sales in the tourism sector, due to the fact that their relationship and motivation are strategic elements that influence the quality of service*" (Gutierrez and Rubio 2009: 141).

In summary, taking into account the literature on quality of service, it will provide thermal establishments with great benefits in terms of improved market share and competitiveness, operational performance (productivity and costs), increase in personnel motivation and satisfaction, as well as, increase in customer satisfaction that will allow us to generate a long-term profitable relationship with the client, assuring us their loyalty (Jones and Sasser 1995: 89), differentiation with regard to competition, capturing new clients, amongst others. These benefits are the necessary impetus for quality service management to become a priority strategy for thermal baths, hence the importance of defining and measuring the quality at each establishment.

Taking into account the above, we propose this study with the purpose of evaluating the quality of service offered by a Thermal Centre in Portugal, comparing thermalists' perceptions and expectations, in order to improve the quality of services provided and customer satisfaction. The evaluation will allow us to analyze and interpret quality dimensions and identify gaps, with the aim of proposing actions for improvement.

We proposed this empirical study in the thermal sector for two reasons: (1) the Thermal sector in Portugal has not been a subject of investigation in this area; (2) the boom and importance health tourism is gaining in today's society, that although it is a small market niche, it has great possibilities to grow compared to traditional tourism, motivated by health concern, aging population, impulse of social Thermalism linked to a new younger public segment, that seeks relaxation and well-being.

For the achievement of this goal, we have structured the work into two parts. In the first place, we conducted a literature review and the second part of the paper presents the empirical part, which includes: methodology, validation and reliability of the measurement scale, data analysis and conclusions.

3.2 Literature Review

3.2.1 Concept of Perceived Quality of Services

At present, the quality of service is increasingly being used by many organizations as the main competitive tool, given the difficulty of imitation by competing firms. Following authors such as Grönroos (1982, 1984), Lethinen and Lethinen (1991), Lewis (1993), service quality is a multidimensional concept made up of two dimensions, one related to the technical aspects of provision (technical quality) and the other with the interactions that take place between the client and company staff who provide the service (functional quality).

Although there are many definitions of quality of service, due to its complex and diffuse nature, none are universally accepted, "m*ost agree in considering its subjective nature and the fact that it is determined by customer perception (perceived quality)*" (Laguna and Palacios 2009). Researchers like Koelemeijer et al. (1993), Carman (1990: 33) and Zeithaml (1988) show the different conceptualizations.

Many of these definitions focus on the idea proposed by Parasuraman et al. (1988) "*the quality of service perceived by the client is the customer's global view on the excellence or superiority of the service*", that derives from the comparison made by customers between expectations about the service they will receive and perceptions about the performance of the service received (Grönroos 1984; Parasuraman et al. 1985), so the quality of service depends on the person who evaluates it, and therefore quality turns from something objective to something subjective, where the customer says what it is and what he perceives it to be (Buzzell and Gale 1987), which has been expressed by Zeithaml et al. (1990) "*only consumers judge the quality, all other judgments are essentially irrelevant*".

The key to providing an excellent service is to understanding and responding to customers' expectations, which represent what they expect to receive during the service and constitute an element of judgment or fundamental reference point, when assessing quality (Parasuraman et al. 1985, 1988, 1991; Zeithaml et al. 1993). Since many companies currently implement Quality Management Systems, ie they provide technical quality assurance, they are more likely to exceed customers' expectations through the development of interactions between client and company staff, being this quality the most difficult to achieve and to imitate by competitors.

3.2.2 Relationship Between Quality of Service and Customer Satisfaction

Considering that quality is defined as "customer satisfaction", it is necessary to define both concepts and their relationship. Westbrook and Oliver (1991) and Oliver (1997) define satisfaction in terms of evaluation or judgment made by the customer once the service has been received. This evaluation depends on the client's prior

expectations (Kotler 1991). For Zeithaml et al. (1996) quality of service and customer satisfaction are two similar concepts but to some extent, establishing the difference between them in the fact that satisfaction involves an evaluation by the customer for a specific transaction, which requires previous experience as it is completely experimental (Rust and Oliver 1994); while quality of service may be perceived without the existence of a direct experience with it (Parasuraman et al. 1988).

Many authors claim that there is a relationship between the two concepts (Zeithaml 1988; Parasuraman et al. 1988; Cronin and Taylor 1992; Swan and Bowers 1998), by focusing the debate on the causal relationship between the two concepts, with two clearly differentiated views. Some authors consider that customer satisfaction is an important goal and the way to achieve it is by quality of service (Goode et al. 1996), therefore quality of service is considered the antecedent of satisfaction (Lassar et al. 2000; Jamal and Nasser 2002; Karatepe et al. 2005.), but others like Carman (1990), Patterson and Johnson (1993) and Casado et al. (2004) consider satisfaction as an antecedent of quality of service. In the tourism field, this relationship has also given rise to numerous studies, accommodation (Albacete et al. 2007; Reichel et al. 2000), hotels (Tsaur and Lin 2004; Briggs et al. 2007).

3.2.3 Measurement of Quality of Service: SERVQUAL Model

The measurement of the quality of services is a crucial element, so that organizations can assess the perception of quality of service from the client's point of view, which will enable implementation and monitoring of continuous improvement processes.

However, its measurement is one of the major problems which companies are faced with. On the one hand, due to market variability and on the other hand due to the intrinsic characteristics of the services, which makes it more difficult to assess the quality of a service than that of a tangible product, since the quality of service lies basically on intangible aspects, which are difficult to identify and quantify, besides being susceptible to valuations of very diverse nature by customers (Zeithaml 1988; Rosenbloom 1991; Stanton et al. 1996; Martin 1999). According to Parasuraman et al. (1985: 36), "*the difference between the evaluation of the quality of service and evaluation of a product by a consumer is not in the process, but rather in the nature of the characteristics upon which the assessment is made*".

The first relevant research in the field of measurement of quality of service perceived was developed by Parasuraman et al. (1985, 1988), belonging to the North American school, one of the two great schools of quality research in the service quality field (Brady and Cronin 2001). The North American school, revolves around the contributions made by Parasuraman et al. (1985, 1988), which follow an approach to quality of service considering the customer's viewpoint, which gives rise to the concept of quality of service perceived, being the most used approach in scientific literature, and defined by Parasuraman et al. (1988: 16) "*perceived quality as the global judgment made by the consumer on service excellence or superiority,*

which results from the comparison between consumers' prior expectations on the service and perceptions on the performance of the service received".

Furthermore, the Nordic School (Grönroos 1982, 1983, 1988; Gummesson 1988; Lethinen and Lethinen 1991), focuses on the quality of service from the point of view of the product and claims that one can distinguish two dimensions of quality of service, technical and functional quality, thus interaction among them a is a key factor for the formation of the company's corporate image in terms of quality.

The researcher who form part of the North American school, taking into account its approach, undertook three basic aspects of perceived quality of service: the definition of quality of service and identifying the dimensions of the quality of service concept used by customers when it comes to evaluating services.

Furthermore, given the absence of objective measures that enable the evaluation of the quality of service (as opposed to the quality of goods that can be measured by specific indicators), they established that a good approximation is on the one hand, measuring quality of service perceived by the client creating a model for it called Servqual scale (quality measuring instrument), defined as "*a summarized multi-scale instrument, with a high level of reliability and validity that companies can use to better understand customers' expectations and perceptions regarding a service*".

And finally, a quality of service model was developed, based on the existence of gaps, which explains the differences between the expected and received service, called Model of Deficiencies or Gaps, which aims to identify the causes of a poor service (Parasuraman et al. 1985).

In order to develop the measurement model, a qualitative exploratory study was performed, carried out in different types of services, which enabled them to develop an instrument to measure perceived quality of service, which as we have seen, defines quality of service as a gap between prior expectations and perception of the service provided, which can be measured by the difference between both. The larger the difference between the perception and expectations of the service, the higher the quality.

Initially, in their research, they determined an initial list of ten aspects which they considered fundamental in providing the service and that have an impact on perception (Zeithaml et al. 1993: 24–25). In the statistical analysis of the ten criteria, high correlations between some of them were found, which motivated their grouping, leaving a final list of five attributes (Zeithaml et al. 1993): tangible elements, reliability, response capacity, security (which includes professionalism, courtesy, credibility and security) and empathy (including accessibility, communication and comprehension of the user).

Since quality of service is dependent on the difference between perceptions and expectations, managing both is essential. For their understanding, these authors examined which ones were the main factors in the formation of expectations and concluded that prior expectations are conditioned by mouth-ear communication, personal needs, prior expectations and external communication carried out by the company providing the service, usually through advertising or promotional activities.

With the aim of performing the measurement, the SERVQUAL model proposes a questionnaire that collects the expectations prior to consumption and post-consumer perception, using a Likert scale of 1–7. The customers determine their degree of adjustment with a series of questions that measure the five key elements

of quality of service. Each of the model's attributes can range from −6 to +6 with three possibilities (Zeithaml et al. 1993, in Santomá et al. 2008: 100):

1. The difference is positive (P>E) and therefore the perception is superior to the expectation. In this case, the quality is positive.
2. The difference is negative (P<E) and is therefore a situation in which the expectation exceeds the perception, causing a poor quality situation.
3. Both values are equal (P=E) and is therefore a situation where the client receives what he expected.

At present, this is the most used approach of measuring the quality of service in the business field (Bigné et al. 1996) and is an obligatory point of reference in the study and management of service quality. Thus, Schiffman and Lazar (2001) consider this model as a powerful, in-depth marketing research technique, which enables measuring the quality level of any type of service company, enabling to know what expectations the customers have, and how they appreciate the service; also globally diagnosing the service process studied.

3.3 Methodology

The instrument used to comply with the proposed objective is the multidimensional SERVQUAL scale (Parasuraman et al. 1985), dividing the survey into four distinct parts; respondent's profile, expectations about the service received (22 items), perceptions after receiving the service (22 items) and finally they were asked about the global assessment on the Thermal Center (Table 3.1).

Two interviews were conducted to thermalists, the first one when arriving at the Thermal Centre, before receiving the service in which they were requested to assess their expectations on the service they were going to receive, and the other one on the departure day with the purpose of knowing their opinion about the service they had received. A pretest of the questionnaire was previously performed, with the purpose of validating its content and improving the wording of the questions, where necessary. Table 3.2 shows technical information of the field work.

Once designed the research and collected the data, the next step was to check the reliability and validity of the measuring instrument and the unidimensionality of the proposed scales. The analysis of the expectations scale (expected quality), perceptions scale (perceived quality) and the quality measurement were performed separately, ie perceptions minus expectations. We applied the exploratory factor analysis (Spss v.17), which allows you to evaluate whether the proposed scales measure the construct in a consistent and stable manner, and if they are free of systematic and random errors.

To calculate reliability, we used the internal consistency method or Kunder Richardson method, the most used according to Sánchez and Sarabia (1999). With the aim of testing the reliability of the scale, the following tests are performed: we check that all the scale items have acceptable values of item-total correlation (above 0.3), and analyze the α Cronbach (1951) and Standardized Cronbach α, checking that they exceed the minimum limit of 0.7. With this process we delimit the number of items that measure each concept (Table 3.3).

Table 3.1 Dimensions and items of the instrument of measurement of the perceptions and expectations scale

Dimension	E	P	Item
Tangible elements	ET1	PT1	The equipment is modern
	ET2	PT2	The facilities are visually appealing: simple and cozy decor, comfortable facilities, mobility facilities (transport)
	ET3	PT3	The appearance of employees is cared for and professional
	ET4	PT4	The tangible elements are attractive: natural surrounding area, clean facilities, well-located thermal center
Reliability	EF1	PF1	They perform the service without errors
	EF2	PF2	The employees help thermalists solve their problems (they know the business)
	EF3	PF3	When thermalists have problems the thermal center solves them.
	EF4	PF4	The service is made within the stipulated period
	EF5	PF5	The service provided is of trust
Response Capacity	EC1	PC1	The employee is communicative: explains exactly how the service is provided
	EC2	PC2	The employees offer fast service to thermalistas
	EC3	PC3	The staff is never too busy to solve thermalists' queries
	EC4	PC4	There is permanent medical care
Security	ES1	PS1	Employees are prepared to respond to thermalists' questions
	ES2	PS2	The mineral and medicicinal spring is of good quality and is in perfect condition
	ES3	PS3	The employees transmit confidence to thermalistas
	ES4	PS4	Employees are prepared to respond to questions from thermalistas
Empathy	EE1	PE1	They provide individualized attention to the thermalist (polite and friendly)
	EE2	PE2	The schedules are convenient for thermalistas
	EE3	PE3	Employees' attention is personalized
	EE4	PE4	The employees take into account thermalists' needs
	EE5	PE5	Thermalists' problems are always solved

E Expectation, *P* Perception

Table 3.2 Technical information of study

Technical data	
Target Population	Thermal Center (Termas of Chaves)
Geographical Location	Portugal
Population	Thermalistas in the months of collecting information
Sample size	100
Response rate	59.17 %
Sampling error	+−6.39 %
Confidence level	95 % Z = 1,96 p = q = 0,5
Method of data collection	Personal interview
Date of collection period	February–April 2012

By analyzing the item-total correlation in the measurement scales, we see that there is an item on the P-E scale, with item-total correlation below the recommended minimum of 0.3 (Nurosis 1993) which was removed and therefore improved Cronbach's alpha.

Table 3.3 Reliability analysis of measurement scales

		Correlation Item-Total				Alpha if Item is removed				Coefficient α of Cronbrach		
Item		E	P	P-E		E	P	P-E		E	P	P-E
Tangible elements	T1	0.564	0.579	0.217	----	0.741	0.868	0.821	----	0.781	0.849	0.821
	T2	0.600	0.816	0.689	0.720	0.728	0.749	0.609	0.742			
	T3	0.552	0.642	0.657	0.693	0.744	0.828	0.621	0.740			
	T4	0.662	0.796	0.682	0.677	0.700	0.783	0.621	0.777			
Reliability	F1	0.493	0.457	0.786		0.824	0.947	0.886		0,819	0.896	0.909
	F2	0.716	0.906	0.900		0.749	0.840	0.861				
	F3	0.752	0.885	0.901		0.737	0.840	0.860				
	F4	0.561	0.780	0.682		0.797	0.865	0.907				
	F5	0.584	0.812	0.645		0.797	0.865	0.916				
Response Capacity	C1	0.584	0.888	0.709		0.912	0.942	0.963		0.887	0.955	0.939
	C2	0.926	0.926	0.953		0.781	0.930	0.888				
	C3	0.848	0.903	0.917		0.816	0.937	0.900				
	C4	0.687	0.848	0.866		0.879	0.953	0.917				
Security	S1	0.567	0.753	0.728		0.937	0.930	0.974		0.900	0.926	0.946
	S2	0.874	0.824	0.977		0.833	0.906	0.895				
	S3	0.906	0.860	0.958		0.820	0.893	0.902				
	S4	0.782	0.886	0.871		0.869	0.884	0.930				
Empathy	E1	0.831	0.834	0.888		0.899	0.968	0.871		0.923	0.966	0.912
	E2	0.881	0.910	0.918		0.889	0.958	0.863				
	E3	0.938	0.931	0.936		0.876	0.952	0.859				
	E4	0.860	0.952	0.806		0.893	0.950	0.888				
	E5	0.501	0.897	0.477		0.954	0.958	0.972				

E expectation, *P* perception, *P-E* perception-expectation

To confirm the unidimensionality of the proposed scales, we conducted an Exploratory Factor Analysis of principal components with varimax rotation to identify the underlying dimensions in each of the constructs, by sharing the variance among the different factors.

As a preliminary step to carrying out the factor analysis, it is necessary to specify that the data obtained through the questionnaire are suitable for factor analysis. This requires examining the correlation matrix and checking whether indeed it is appropriate to continue with it. In this way: (1) we check that the correlation matrix between all variables available has a significant number of high correlations (>0.5), and also that the determinant of the correlation matrix takes a value close to zero in all scales; (2) Bartlett Sphericity Test, in our case, we can reject in all the scales this hypothesis because the test value is high and is associated with a significance level less than 0.05; (3) test of Kaiser-Meyer-Olkin (KMO), in our case has a value greater than 0.7; (4) The MSA index is unacceptable for values below 0.5; it has a value greater than 0.7 (Table 3.4).

The application of factor analysis did not involve removing any items, in all cases the loadings are greater than 0.5, not considering factor loadings below 0.3 as significant (Hair et al. 1999). In all scales, the cumulative percentage of explained variance is greater than 50 % (Table 3.5).

Table 3.4 Indicators of the degree of association between variables

Indicator **Escale**		Correlation matrix	Determinant of correlation matrix	Bartlett Test of sphericity	Measure of sample adequacy	KMO index
Tangible elements	E	V. correlated	0.308	114.045 sig. 0.000	(0.796–0.712)	0.744
	P		0.111	212.889 sig. 0.000	(0.842–0.742)	0.778
	P-E		0.311	113.345 sig. 0.000	(0.698–0.745)	0.722
Reliability	E	V. correlated	0.044	549.194 sig. 0.000	(0.553–0.550)	0.594
	P		0.009	452.555 sig. 0.000	(0.688–0.925)	0.832
	P-E		0.003	212.889 sig. 0.000	(0.817–0.692)	0.733
Response Capacity	E	V. correlated	0.046	297.640 sig. 0.000	(0.783–0.814)	0.726
	P		0.012	465.060 sig. 0.000	(0.892–0.926)	0.869
	P-E		0.008	212.889 sig. 0.000	(0.857–0.942)	0.790
Security	E	V. correlated	0.037	320.280 sig. 0.000	(0.867–0.783)	0.771
	P		0.033	331.687 sig. 0.000	(0.917–0.775)	0.835
	P-E		0.003	575.952 sig. 0.000	(0.756–0.891)	0.761
Empathy	E	V. correlated	0.007	447.476 sig. 0.000	(0.873–0.853)	0.857
	P		0.001	672.991 sig. 0.000	(0.883–0.907)	0.849
	P-E		0.001	657.296 sig. 0.000	(0.898–0.839)	0.840

Table 3.5 Unidimensionality study

		Weight of each variable in the factor			Percentage of explained information			Coefficient α fof Cronbrach		
Item		E	P	P-E	E	P	P-E	E	P	P-E
Tangible elements	T1	0.750	0.734	eliminado	61.408	71.332	75.115	0.781	0.849	0.821
	T2	0.787	0.915	0.881						
	T3	0.762	0.811	0.864						
	T4	0.833	0.905	0.855						
Reliability	F1	0.655	0.580	0.855	59.216	74.872	74.012	0.819	0.896	0.909
	F2	0.828	0.953	0.934						
	F3	0.863	0.945	0.934						
	F4	0.752	0.900	0.801						
	F5	0.733	0.893	0.764						
Response Capacity	C1	0.733	0.937	0.818	74.700	88.243	84.684	0.887	0.955	0.939
	C2	0.965	0.960	0.975						
	C3	0.923	0.947	0.954						
	C4	0.817	0.913	0.925						
Security	S1	0.714	0.550	0.832	76.941	82.236	86.682	0.900	0.926	0.946
	S2	0.936	0.903	0.987						
	S3	0.955	0.926	0.975						
	S4	0.883	0.941	0.922						
Empathy	E1	0.898	0.891	0.947	76.536	88.289	79.452	0.923	0.966	0.912
	E2	0.931	0.943	0.974						
	E3	0.965	0.958	0.980						
	E4	0.916	0.970	0.906						
	E5	0.619	0.934	0.587						

Therefore we can conclude that the proposed scales are highly reliable, being therefore random error-free and capable of providing consistent results. Besides this, all measurement scales are unidimensional.

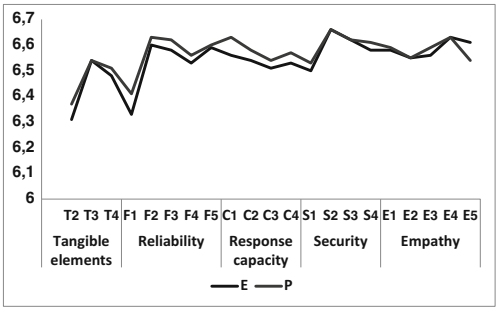
3.4 Data Analysis

Before analyzing the results obtained, the most relevant characteristics of the sample are collected in the Table 3.6.

In the analysis of expectations and perceptions in the graph, considering that we have used a 7-point Likert scale ranging from 1—strongly disagree to 7—strongly agree, we observe that perceptions are above expectations for most parts of the items, so we can say that the thermalist gets a superior service to what was expected. Analyzing the gaps we can see that the positive gaps of higher value are: response capacity and tangible elements, and there is a negative gap in the empathy dimension, ie the thermalist for this dimension had greater expectations than what was received (Fig. 3.1).

Table 3.6 Sample characteristics

Gender	**Age**	**Place of residence**	**Duration of the stay**
Male 32 %	24–44 18 termalistas	Northern Portugal 38	From 3 to 5 days 2
Female 68 %	45–64 25 termalistas	Central Portugal 27	1 week 11
Marital status	> 65 57 termalistas **Studies**	Southern Portugal 4	More than 1 week 63
Single 10	No education 3	Spain 5	Resident 24
Married 66	Primary Studies 36	France 5	**Professional status**
Divorced 6	Secondary education 30	**Monthly Income**	Self-employed 9
Widower 18	Undergraduate 31	Up to 500 € 15	Businessman 9
		From 501 € to 1000 € 11	Unemployed 1
		From 1001 € to 1.500 € 13	Retired 59
		More 1501€ 31	Other 22
		No answer 22	



Dimensions	**E**	**P**	**E-P**
Tangible elements	6.44	6.47	0.030
Reliability	6.53	6.56	0.029
Response capacity	6.54	6.58	0.045
Security	6.59	6.61	0.015
Empathy	6.59	6.58	-0.006
Global average	6.54	6.56	

Fig. 3.1 Perception vs. expectation

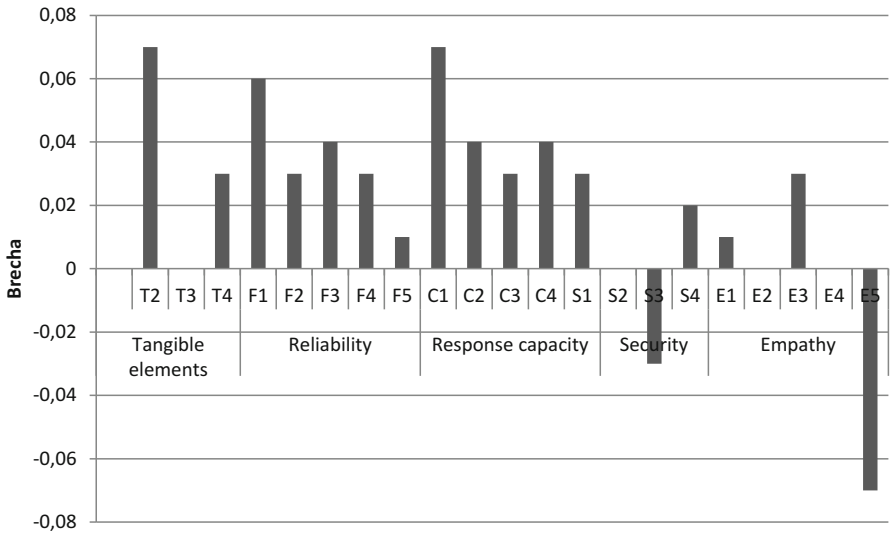


Fig. 3.2 Gaps per items (P-E)

If we analyze the gaps taking into account the items, we observe a negative gap for two items E5—thermalists' problems are always solved and S3—employees transmit confidence to thermalistas, ie their expectations are superior to the service received. Therefore, managers should establish improvement actions for these two items (Fig. 3.2).

To finish, thermalistas evaluated the service provided in terms of quality with 6.33 on a 7-point Likert scale and consider the service provided as excellent with a score of 6.38, less than that obtained from the average of each of the attributes which is 6.54.

3.5 Conclusions

The designed questionnaire contains the dimensions of quality of service provided by the Termas de Chaves and has allowed us to measure their quality level, for which we have divided the empirical research into two distinct sections; reliability analysis, validity and unidimensionality of the measurement scales and data analysis. The research results allow us to make the following conclusions:

The instrument used to comply with the proposed objective has good levels of reliability and validity (Alpha of Cronbach analysis) for both expectations, perceptions, as for the instrument resulting from subtracting the expectations from the average perceptions for each of the quality dimensions considered.

The valuation of the quality service dimensions is very heterogeneous, evaluating thermalists satisfactorily (general satisfaction level) the quality level of the service they received for all dimensions, except for the empathy dimension

(negative gap-lower satisfaction level). It has been detected that the staff of the thermal baths does not respond effectively to the thermalists' requirements; solving problems faced by a thermalist during his/her stay and transmitting greater confidence when providing the service by employees.

Thermalists' expectations are very high (6.54 on average), expecting a good service from the thermal baths. Regarding the service, their valuation also has a very high average of 6.57 above expectations, being security the best rated aspect.

We propose as business implications:

- The regular use of the measurement model used, in order to have a statistical evolution of the dimensions after the implementation of improvement actions necessary at each moment, as well as identifying needs for improvement in each of the areas and detecting possible changes of the customers.
- It is recommended to improve the confidence transmitted from employees to thermalistas, as well as the ability of employees to respond to the problems posed by thermalistas. In that regard, we consider necessary to propose improvement actions aimed at more training and professionalization of the thermal bath personnel, which will improve the quality of service provided.

References

Albacete CA, Fuentes MM, Lloréns FJ (2007) Quality of service measurement in rural accommodation. Ann Tourism Res 34(1):45–65

Artal Tur A, García Sánchez A, Ruiz Belijar J (2004) El turismo de salud, características de la demanda: implicaciones y consecuencias para el tegido empresarial de la región de Murcia. I Jornadas de Economía del Turismo, Mallorca

Bigné J, Camisón C, Martínez C, Miquel M, Belloch A (1996) Las Agencias de Viajes: Factores de Calidad e Implicaciones de Marketing. V Congreso Nacional de Economía, Las Palmas de Gran Canaria, España, pp 189–210

Bonfada PLB, Bonfada MRH, Alén E, Gandara JMG (2011) El turismo de salud y el uso terapéutico del agua. Estudios y Perspectivas en Turismo 20:462–477

Buzzell R, Gale BT (1987) The PIMS principles. The Free Press, Nueva York

Brady M, Cronin JJ (2001) Some new thoughts on conceptualizing perceived services quality: a hierarchical approach. J Market 65:34–49

Briggs S, Sutherland J, Drummond S (2007) Are hotels serving quality? Anexploratory study of quality of service in the Scottish hotel sector. Tour Manage 28(4):1006–1019

Carman JM (1990) Consumer perceptions of quality of service: an assessment of the SERVQUAL dimensions. J Retail 66(1):33–35

Casado AB, Más FJ, Azorín A (2004) Atribución, satisfacción, calidad percibida e intención de conducta en encuentros de servicio fracasados. Revista Europea de Dirección y Economía de la Empresa 13(1):45–62

Cronin JJ, Taylor SA (1992) Measuring quality of service: a reexamination and extension. J Market 56(3):55–68

Global Spa Summit Llc (2011) *Wellness Tourism and Medical Tourism: Where Do Spas Fit?*. New York: Global Spa Summit. (http://www.leadingspasofcanada.com/files/file/Business%20Tools/spas_wellness_medical_tourism_report_final.pdf)

Goode MMH, Moutinho LA, Chien C (1996) Structural equation modeling of overall satisfaction and full use of services for ATMs. Int J Bank Market 7:4–11

Grönroos C (1982) Strategic management and marketing in the service sector. Swedish School of Economics and Business Administration, Helsinki
Grönroos C (1983) Seven key areas of research according to the Nordic school of service marketing. Emerging Perspectives on Services Marketing. Proceedings Series. American Association. 108–110
Grönroos C (1984) A quality of service model and its marketing implications. Eur J Market 18(4):36–44
Grönroos C (1988) Quality of service: the sixcriteria of good quality of service. Review of business. St. John's University Press, New York
Gummesson E (1988) Quality of service and product quality combined. Rev Bus 3(invierno):14–19
Gutierrez S, Rubio M (2009) El factor humano en los sistemas de gestión de la calidad del servicio: un cambio de cultura en las empresas turísticas. Cuadernos de Turismo 23:129–147
Hair J, Anderson R, Tathaman R, Black W (1999) Análisis multivariante, 5th edn. Prentice Hall, Madrid
Jamal A, Nasser K (2002) Customer satisfaction and retail banking: an assessment of some of the key antecedents of customer satisfaction in retail banking. Int J Bank Market 20(4):146–160
Jones TO, Sasser WE (1995) Why satisfied customers defect. Harv Bus Rev 73(6):88–99
Karatepe OM, Yavas U, Babakus E (2005) Measuring quality of service of banks: scale development and validation. J Retail Consumer Serv 12:373–383
Kim JS (1995) Strategic discoveries trough manufacturing lessons from the 1994. International Manufacturing Futures Survey. Proceedings Annual Conference, Strategic Management Society
Kotler P (1991) Marketing management - analysis, planning, implementation and control. Prentice Hall, Inc, Englewood Cliffs, NJ
Koelemeijer K, Roest H, Verhallen T (1993) An integrative framework of percieved quality and its relations to satisfactions/dissatisfaction, attitude and repurchase intention. A multinivel approach. European Marketing Academy *(EMAC)*. Proceedings, Barcelona, ESADE 25–28. 683–699
Laguna M, Palacios A (2009) La calidad percibida como determinante de tipologias de clients y su relación con la satisfacción: aplicación a los servicios hoteleros. Revista Europea de Dirección y Economía de la Empresa 18(3):189–210
Lassar WM, Manolis C, Windsor R (2000) Quality of service perspectives and satisfaction in private banking. Revista de Empresa 9:78–86
Lethinen U, Lethinen J (1991) Two approaches to quality of service dimensions. Serv Ind J 11(3):287–303
Lewis BR (1993) Quality of service: recent developments in financial services. Int J Bank Market 11(6):19–25
Martín Armario E (1999) Marketing. Barcelona, Ariel Economía
Mintel International Group Ltd (2007) Spa tourism en travel & tourism analyst, No. 9. London
Nurosis MJ (1993) SPSS. Statistical data análisis. SPSS Inc.
Oliver RL (1997) Satisfaction: A behavioral perspective on the customer. New York
Pacheco T, García R (2011) Región de Porto y Norte de Portugal 23:14–15
Patterson PG, Johnson LW (1993) Disconfirmation of expectations and the gap model of quality of service: an integrated paradigm. J Consumer Satis Dissatis Complain Behav 6:90–99
Parasuraman A, Zeithaml VA, Berry LL (1988) SERVQUAL: a multiple– item scale for measuring customer perceptions of quality of service. J Retail 64(1):12–40
Parasuraman A, Zeithaml VA, Berry LL (1985) A conceptual model of quality of service and its implications for future research. J Market 49(4):41–50
Parasuraman A, Zeithaml VA, Berry LL (1991) Refinement and reassessment of the SERVQUAL scale. J Retail 67(4):420–450
Reichel A, Lowengart O, Milman A (2000) Rural tourism in Israel: quality of service and orientation. Tour Manage 21:451–459
Rosenbloom B (1991) Marketing channels. A management view, 4th edn. The Dryden Press, Orlando, E.E.U.U

Rust RA, Oliver RL (1994) Quality of service. New directions in theory and practice. Sage, California

Sánchez Pérez M, Sarabia Sánchez FJ (1999) Validez y fiabilidad de escalas. En: Sarabia, FJ (coord) Metodología para la investigación en marketing y administración de empresas, Ed. Pirámide, Madrid, pp 363–393

Santomá R, Batallé P, Rovira X, Costa G, Vila M (2008) Determinación de los aspectos de gestión que llevan a la cadena hotelera a mejorar la calidad de su servicio. Revista de Circulación Internacional (14)

Schiffman L, Lazar L (2001) Comportamiento delconsumidor. Editorial Prentice Hall, México

Serrano AM, López MC (2000) Dimensions and measurement of quality service in hotels. Actas del I World Conference on Production and Operations Management. CD ROM ISBN 84-8009-103-7

Stanton WJ, Etzel MJ, Walker BJ (1996) Fundamentos de marketing, 10th edn. Méjico, McGraw-Hill

Sureshchandar GS, Rajendran C, Anantharaman RN (2002) The relationship between management's perception of total quality service and customer perceptions of quality of service. Total Qual Manage 13(1):69

Swan JE, Bowers MR (1998) Services quality and satisfaction: the process of people doing things together. J Serv Market 12(1):59–72

Talón P, González L, Figueroa C (2007) La nueva realidad del sector hotelero español. In: Idoeta C (ed) Empresa global y mercados locales. XXI Congreso Anual AEDEM, Madrid

Tsaur SH, Lin YC (2004) Promoting quality of service in tourist hotels: the role of HRM practices and service behaviour. Tour Manage 25:471–481

Westbrook RA, Oliver RL (1991) The dimensionality of consumption emotion patterns and consumer satisfaction. J Consumer Res 18:84–91

Zeithaml VA (1988) Consumer perceptions of price, quality and value: a means-model and synthesis of evidence. J Market 52(3):2–22

Zeithaml VA, Parasuraman A, Berry LL (1990) *Delivering quality service: balancing customer perceptions and expectations*. New York: Simon and Schuster.

Zeithaml VA, Parasuraman A, Berry LL (1993) Calidad Total en la Gestión de Servicios. Díaz de Santos, Madrid

Zeithaml VA, Berry LL, Parasuraman A (1996) The behavioural consequences of quality of service. J Market 60:31–46

Chapter 4
Management by Processes: An Effective Tool for Employee Motivation

Maria Moreno-Mas, Sofia Estelles-Miguel, Jose Maria Merigo, and Encarnación González-Vázquez

Abstract This article shows, through different case studies, how the introduction of Management by Processes methodology not only has contributed to improve quality services and efficiency at different type of organizations, but it has also reinforced team spirit, achieving high levels of employee motivation. When a radical change is needed in a company, and a "process management culture" is named to substitute the "function culture", the "Management by process" concept becomes an effective way of introducing behaviour changes. Innovation is generally defined as the development or use of new products, services, production, processes, organizational structures or administrative systems that are new to the adopting. And Management by Processes is a kind of innovation. It has been verified that explaining and involving employees in the process from the beginning, by means of training and communicating, from the first steps, the methodology, skills and techniques that are involved in the "Management by Processes Approach", encourages employees to cooperate actively in the whole process.

M. Moreno-Mas • S. Estelles-Miguel (✉)
Departamento de Organización de Empresas (DOE), Universitat Politècnica de València, Camino de Vera, València, València 46022, Spain
e-mail: maramoreno39@gmail.com; soesmi@aimme.es

J.M. Merigo
Manchester Business School, University of Manchester, Booth Street West, Manchester, Manchester M156PB, UK
e-mail: jmerigo@ub.edu

E. González-Vázquez
Departamento de Comercialización e Investigación de Mercados, Universidad de Vigo, Facultad de Ciencias Económicas y Empresariales de Vigo, Campus de Lagoas-Marcosende, Vigo, Pontevedra 36200, Spain
e-mail: egzlez@uvigo.es

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4.1 Introduction

The current chapter will show how the Management by Processes approach, in two distinct types of organization, leads to the same results with regard to the behavior of the organization management and the actual workers, moving them towards more unity and the recuperation of the concept of the organization as a single group.

To this end, two organizations belonging to different sectors (one industrial and one services) were studied; both had more than 50 employees, and had differing business and management focus but had both just undergone a change in senior management (the retirement of the Managing Director in both cases). Innovation is generally defined as the development or use of new products, services, production, processes, organizational structures or administrative systems that are new to the adopting (Damanpour and Aravind 2011).

For reasons of confidentiality the names and locations of the companies have been omitted.

The current chapter is organized as follows, Sect. 4.1. Introduction and explication of the chapter organization, Sect 4.2. introduction of Management by Processes, Sects. 4.3. and 4.4. two real cases, studied by the authors of this article are presented and finally Sect. 4.5. will present the conclusions.

4.2 Management by Processes

Managing its processes is one of the major tasks an organization has to perform in order to maintain its competitiveness. The main objective of process managements is to find the most efficient and effective way to transform customer requirements into customer satisfaction (Jedlitschaka et al. 2010).

Market relations have passed from supply to demand, thus converting the client, ever more demanding, into the raison d'etre of any business. Process studies center on how and why things arise, develop and grow, as well as finish over time. They can also show the underlying dynamic in the maintenance of stability (Langley et al. 2013). Management by processes allows a total focus on the external client, opening up to their requirements with the goal of satisfying their expectations. It can also be defined as a method structured towards performance improvement, firmed up by disciplined design and careful execution of all the processes at the company (Hammer and Champy 1994). Process management assures that all the company's activities are thought of, designed and executed within a process framework. When employees recognize that their individual activities are part of something bigger they align themselves to the greater goal: the general strategy of the company and customer satisfaction (Hammer 2002).

The implementation of Quality Management (QM) tools and the use of ISO 9001 had received a high degree of attention in extant literature. Several research papers

attribute superior firm performance to adoption of QM practices, and while there have been doubts about QM's return on the investment, more recent research found that effective implementation of QM practices will contribute to better financial, marketing, and even innovation performance by improving quality performance and/or operational performance (Nair 2006).

The organizations (the systems) are as efficient as their processes (Prajago 2006). Departmental organizations, power niches and their excessive inertia against change need to be transformed, empowering the concept of the process, with a common focus and working with a vision of the customer objectives (Chang 1996).

Traditional management has been orientated towards objectives, profit (the goal), forgetting the principal immediate motive, to keep customers happy and loyal. Each person concentrates their efforts on their assigned task, dealing with it according to the instructions and specifications received, but with limited information as regards the final result of the work. It is still not uncommon in the manufacturing sector for a worker to not know, or at least not clearly, how they contribute to the final product. In administrative and management jobs this is even more common.

The fragmentation of natural processes, product of the Taylorian division of work and posterior grouping of resultant specialized tasks in functional areas or departments, facilitated the formation of feudal powers by department, thus obligating the management to frequently intervene in overall processes. This is due to the fact that many departments or areas with distinct responsibilities and objectives take part in a given process, which only the senior management can succeed in coordinating (Player and Lacaerda 2002).

It consists of reunifying the activities surrounding the processes that had previously been fragmented as a consequence of a series of deliberate decisions as well as an informal evolution. This leads us to recognize that the processes come first, and after the organization needed to make them operative. This is to see the process as the natural form of work organization. The structure can or not coincide with the process, given that in one workplace various different roles (not functions) can be undertaken for different processes.

In process management, attention is concentrated on the result of the processes and not on the tasks or activities. There is information about the final result and everyone knows how their individual effort contributes to the global process; this translates into a responsibility for the overall process and not just for their personal task (Purvis et al. 2013).

The following stages can be seen in the two cases that will be commented upon in Sects. 4.3. and 4.4:

- Sensitization to process management workshop.
- Evaluation of the current solution.
- Everybody works on the ideal process.
- Creation of improvement teams and action plans.
- Monitoring of the above.

4.3 Development of the Industrial Company Case

The first organization is a family company, part of the tissue of the Valencian industrial sector, working in the metallurgy sector. Owing to the imminent retirement of the Managing Director and founder of the company, the new senior management team, composed of members of the family, decided to push forward with a process of reorganization and the introduction of Management by Process. This followed the confirmation that in the prior 2 years the company had grown rapidly and many departments had specialized which meant that the majority of the middle management had lost a global vision of the organization, something which is very important in a family business.

The firm, which is a leader in its sector, produces steel parts which are distributed to wholesalers in Spain and other Mediterranean counties.

The firm is characterized by its close relationship with its customers (the majority being distributors, with not many clients being the end customer). They make made to measure products very quickly thanks to a strong design department, which marks them out from their closest competitors who only make standard dimension products.

The company has five production centers with big spaces and warehousing for the products, something which allows them to offer their clients the possibility to produce the goods (in general very large) and keep them in the factory's warehousing until they are needed, with storage times of less than a month.

The company does not distribute the products, it is the customer which organizes the collection of the goods from the company's loading bays.

The profile of the outgoing Managing Director, who managed the company and production for 20 years, is one of a charismatic strong willed man who formed a large company from a small metallurgy workshop. The Managing Director in all his years at the head of the firm never delegated the day to day supervision of the production, maintaining direct contact with the workers and management of each production center.

As the company grew, the work became more specialized and new factories, offices and warehousing were acquired. New products were added to the catalogue, with made to measure products standing out. Customers would make an enquiry, discuss the requirements with the technical department and the specification and requirements would be agreed. In the early years, production was scaled back to a catalogue of standard products, with made to measure comprising only 10 % of turnover.

To win market share, the departing Managing Director, 2 years before his retirement, decided to increase the range of made to measure products (thus increasing the turnover on this sort of product to 40 % of the overall turnover), but this also increased the complexity of production. He also decided to mix standard products (generally available from stock) with made to measure products (with special lead times) in single client orders.

To this end the company, over only 2 years, acquired two new production centers which it set up, investing in new production machinery and new industrial processes

(painting and drying processes which prior to the acquisition had been subcontracted). This notably increased the variety of products that the company was able to offer its clients, as well as the complexity of managing this offer.

The organization immediately began to have problems regarding coordination between senior management from the different factories about ex works delivery dates. Until some months before undertaking the new investments each production center produced and delivered their products in an independent manner in such a way that the customers had to place separate orders which were delivered with differing leadtimes. One of the major problems was that each fabric knew only a certain part of the global picture which produced certain internal tensions.

The new Company Management, upon seeing the circumstances, decided to look to the implantation of a Process Management System which would allow them to organize the production and transmit a global vision of the business to the employees, thus improving internal communications and empowering teamwork.

To this end they contracted a consultant who would undertake an initial 3 month period, basically to diagnose the situation. This initial work led to the creation of a Quality and Process Department, inexistent up to that point.

The starting point found by the consultant was one of a certain reticence from some senior and middle managers who did not understand the type of work that the consultant as going to do, and also of some general resistance to change. Another problem was between the senior managers of differing production centers. Three of them opposed any changes in management style, whilst the others considered it necessary to undergo a reorganization of production, which in itself led to problems between them.

The differences in management style of each of the production center managers, added to the fact that they had stopped having direct contact with the new Managing Director (he did not visit the factories on a daily basis to supervise production as the previous Managing Director had done), led to a certain lack of coordination in the production of orders which then led to delivery delays with the subsequent loss of face with the customers.

The work plan of the consultant was as follows:

- During the first three working months, the consultant planned, together with the senior management, two work meetings with all the administrative department directors (commercial, financial, HR, purchasing, design) and the five managers of the production plants.
  - *This type of meeting had never been organized before, thus it was the first time that many managers, new as well as those who had been in the company for many years, had met at a meeting. Some of them hardly knew each other.*
- After an initial presentation, in which the fundamentals of Management by Processes (Pérez Fernández 2010) and (Salgueiro 1999) was explained to all those present, a plan of actions was approved. This consisted of three phases:
  - *Phase I: First meeting between the consultant and each one of the departments, and compilation of information regarding the tasks each department undertook. The objective was to familiarize the staff to the presence of the consultant.*

The consultant was aware at every level in the business, any confusions or questions needed to be cleared up. The consultant was in the company on a daily basis during this phase.

- *Phase II: Formation of the Process Map of the company. Once initial reservations about Management by Process had been overcome, the consultant presented the Process Map to the management team who analyzed, revised and completed it. This phase lasted a month.*
- *Phase III: Formation of the Process Improvement Proposal. Using the Process Map as a starting point, improvements and modifications were put forward, starting from indicators and targets that had been proposed for each of the processes. This task took a month, and begun with those processes than contained critical point tasks and/or bottlenecks.*

- After 3 months of work, there had been success in motivating the management and supervisors, who saw applicable solutions within their work processes, as well as having a global vision of the company and the products produced, which they had not had until that time. The incorporation of proposals put together from the point of view of the customer regarding products and leadtimes were especially motivating, given that before this time the changes requested by the commercial team had not always been understood by production managers. Internal communication between the two areas improved substantially as well as the coordination between the different production centers.
- At the end of the work, a new Quality and Process Department was formed. It began with the implantation of a Quality Management System.

Similar processes can be found in Figuera 2007.

4.4 Development of Case 2: Health Centre

The second case is one of a Health Centre belonging to the Valencian public health system. It has more than 50 people working there, including medical staff (doctors, University trained nurses and nursing auxiliaries) working under a recently announced Center Director, who had been named as the replacement of the previous holder of the position, also a doctor, who had recently retired.

This type of organization undergoes regular changes in management, under institutional guidelines. The internal organization of personnel and resources, even if coordinated by the Center Director, does not depend upon him, at least in terms of rostering and HR. The general services such as maintenance, IT and provision of health and administrative materials are assigned by a Health Department Manager. With the materials provided Center and patient needs must be covered.

The provision of health services is a very complicated activity that requires excellent planning skills, especially in moments of crisis.

Unexpected staff shortages are not uncommon, especially in holiday periods (when absences can admittedly be predicted to an extent). These can combine with

unexpected increases in patient numbers (for example when there is a flu epidemic, or an accident near the center).

The new Center Director, interested in the Management by Process methodology, decided to put forward the idea of a Process Work Group to the senior managers of the different medical specialty areas to provide answers for the gaps detected that were causing a poor perception on the part of the patient in relation to the delays in the assignation of appointments, or in the waiting times within the center itself.

An increase in the number of patient complaints had been detected and the administrative staff asked for a change in the management of appointments.

Additionally, in recent months an IT program for patient management had been installed, with which the medical staff were not familiar (before this time, only paper records were kept). The idea, at least from the senior health management, was to move away from paper records and to move towards electronic retention of patient records which could be updated during the patient visit. Some doctors rejected the abandonment of the traditional method of taking notes on preset formulated sheets.

This is to say that the new Director found himself in a center undergoing a substantial change in its work methods, especially in reference to the documentation generated during patient visits. All of this, without being able to take decisions regarding the timeframe of the implantation of the new IT system, nor with respect to the resources available for this change.

The Director made contact with an expert in Management by Process from outside the health area and planned a series of meetings with the different senior managers in the different specializations as well as with representatives of the university trained nursing staff, administrative auxiliaries, nursing auxiliaries and porters.

The meetings took place every 2 weeks over a 3 month period. During these meetings, and following a Training and Work Group Plan, the consultant helped them answer a series of activities that had been previously put forward and communicated to the participants.

The first sessions were for training. On one hand the assistants were familiarized with the methodology and nomenclature of the Processes (Beltrán Sanz et al. 2012) and (Galloway 1998). One the other, the consultant familiarized himself with the activity of the center during the most complicated part of the day, that of the morning when the majority of the patients attended the center.

Flow diagrams of some of the patient care processes were drawn, from different treatment areas selected by the Process Group.

The rapid identification of points for improvement in the succession of represented activities motivated the Group members. They went to the meetings with interesting consultations and work proposals.

The results and solutions set out during the meetings were immediately implanted by the Center Director which resulted in a visible improvement in the work environment and staff relations. Although a positive response was not unanimous, it was sufficiently widespread to allow smaller and more specific work groups in some medical specialties.

The general impression was that despite the fact that the implementation of the new IT system would bring welcome modernization in the near future, the initial faults as much as the fact that the lack of specific IT knowledge amongst the majority of the Center's staff meant they were unable to resolve problems caused by the constant system failures (the Center did not have an IT worker amongst its staff) meant a poor reaction to the new system. For this reason the medical staff rejected it and resisted the abandonment of paper records in consultations.

The health department's senior management was informed about the Process Group's advances and proposals, since minutes were taken at every meeting. The consultant completed the information in the notes with support documents used for the meetings.

Three months after the beginning of the work, an IT technician was sent to the center and undertook the monitoring "in situ".

The news that some of the problems detected by the group were being solved inspired other health centers to take on the Management by Processes initiative.

The experience was presented to the senior health management. Some of the participants of the successive Process Groups published articles specific to Management by Process in Patient Service.

4.5 Conclusions

Independent of the sector in which it is working, its size, the type of organization or the management style, it has been shown that the introduction of the Management by Processes methodology is a very useful tool, as well as having a motivating effect on the personnel when introducing changes to the organization paradigm.

On many occasions the workers do not feel that they are part of the process, since they only know and see a small part of it (Taylorian vision). When they know the whole process and feel a part of it, they are motivated, something which has a positive repercussion for the company.

Some authors have published specific pieces about the importance of the people in successful process management in organizations (González and Hervás 2009).

The principal conclusion of this article is that the Management by Process methodology is a powerful tool in terms of staff motivation. With this in mind, it is fundamental to communicate well, and with all the staff, the type of work that is going to be undertaken, forming a process team in which everyone is represented. People must be informed about the advances that are occurring within the organization. An important part of this is the sensitization stage, and at times the training on Management by Process.

A correct and well-judged introduction to the Management by Process tool does not only give a global vision of the organization and the work undertaken in it, but also has a positive repercussion on the atmosphere in the work environment, contributing to the relaxation of tensions between departments or areas that are not closely interrelated in this business.

This is especially demonstrable in organizations that are very orientated towards the customer, who immediately perceives improvement in their relationship with the organization.

References

Beltrán Sanz J, Carmona Calvo MA, Carrasco Pérez R, Rivas Zapata MA, Tejedor Panchon F (2012) Guía para una gestión basada en procesos. Fundación Valenciana de la Calidad y Generalitat Valenciana

Chang R (1996) Mejora Continua de Procesos: Guía práctica para mejorar procesos y lograr resultados medibles. Ediciones Granica S.A

Damanpour F, Aravind D (2011) Managerial innovation in organizations: conceptions, processes and antecedents. Manag Organ Rev 8(2):423–454

Figuera Vineu P (2007) Optimización de Productos y Procesos Industriales. Ediciones Gestión 2000

Galloway D (1998) Mejora Continua de Procesos: Cómo rediseñar los Procesos con Diagramas de Flujos y Análisis de Tareas. GESTIÓN 2000

González C, Hervás M (2009) El Papel de las Personas en la Gestión por Procesos. Revista de la AEC. Julio-Septiembre Nº2 2009. pp 32–43

Hammer M (2002) Bajo el mismo paraguas. Revista Gestión Bogotá 5(4):38–48

Hammer M, Champy J (1994) Reingeniería. Editorial NORMA. Bogotá

Jedlitschaka A, Salo O, Bomarius F (2010) Process management. J Software Mainten Evol: Res Pract Mayo 22(5):325–328

Langley A, Smallman C, Tsoukas H, Van de Ven A (2013) Process studies of change in organization and management: unveiling temporality, activity and flow. J Acad Manag 56(1):1–13

Nair A (2006) Meta-analysis of the relationship between quality management practices and firm performance implications for quality management theory development. J Oper Manag 24(6):948–975

Pérez Fernández de Velasco JA (2010) Gestión por Procesos. ESIC

Player S, Lacaerda T (2002) Gerencia Basada en Actividades. Andersen McGraw-Hill, Colombia

Prajago DI (2006) The relationship between innovation and business performance a comparative study between manufacturing and service firms. Knowledge Process Manag 13:218–225

Purvis L, Naim MM, Towill D (2013) Intermediation in agile global fashion supply chains. Int J Eng Sci Technol 5(2):38–48

Salgueiro A (1999) Cómo mejorar los procesos y la productividad. AENOR

Chapter 5
Eco-Management and Audit Scheme: Effects on the Profitability of Their Adherence

Natalia López-Mosquera García, Marta Peris-Ortiz, and José Álvarez García

Abstract The environmental behavior of companies is one the principal measures that the European Union has promoted in recent years. In this sense, Community Regulation for Eco-Management and Audit Scheme (EMAS) is the main tool to promote and improve environmental behavior, being a voluntary adherence. The objective of this chapter is to identify the main motivations, barriers of certified companies. Additionally, the influence of these factors on the profitability of their accession will be analyzed by using a structural equation model. To achieve the objectives proposed, we use a sample of 114 of the 255 companies certified EMAS Autonomous Community of Galicia in 2012. The results obtained allow us to identify important implications for managers, which will help them establish management strategies in the future and carry out an environmental planning.

5.1 Introduction

Companies receive many pressures in order to cope with the impact they are having on the environment, by adopting environmental policies, implementing new practices to reduce environmental impact (Shrivastava 1995) and conducting environmental audits and tests. Pressures exerted by different stakeholders (Berry and Rondinelli 1998), such as consumers who are increasingly aware of

N. López-Mosquera García • J. Álvarez García (✉)
Departamento de Economía Financiera y Contabilidad, University of Extremadura
Avda. Universidad, Cáceres, Extremadura 10071, Spain
e-mail: nmosquera@unex.es; pepealvarez@unex.es

M. Peris-Ortiz
Departamento de Organización de Empresas, Universitat Politècnica de València
Camino de Vera s/n, Valencia 46022, Spain
e-mail: mperis@doe.upv.es

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prioritizing the preservation of natural resources related to economic growth (Mainieri et al. 1997; Eurobarometer 58.0 2002), NGOs, governments that through increasingly severe environmental regulations exert great pressure on the production system and stockholders and investors who are increasingly reluctant to take environmental risks (Waddock et al. 2003).

Nowadays, companies are adopting Environmental Management Systems (EMS) and obtaining certification in response to these pressures, which show the need for firms to start a process of adaptation to changing times; characterized in developed countries by high economic growth, which in turn leads to high consumption rates of natural resources; so it is necessary to ensure sustainability and the generation of large amounts of waste (González-Benito and González-Benito 2005) whose removal should be managed by companies.

The EMS "is part of the general management system which includes the organizational structure, planning of activities, responsibilities, practices, procedures, processes and resources for developing, implementing, carrying out, reviewing and maintaining the organization's environmental policy" (EMAS III 2009). The basis for the implementation of an EMS is the environmental analysis by the organization of its activities, identifying and quantifying the environmental aspects it can control and those which it can only exert an indirect influence on (Petrosillo et al. 2012:264).

For the development and implementation of an EMS we can opt for two widely accepted standards, which in turn can be certified ensuring the recognition by stakeholders; such as the ISO 14001 standard, created by the International Organization for Standardization (ISO) and Regulation 1221/2009, relating to voluntary participation in the European Environmental Management and Audit System known as EMAS-Eco-Management and Audit Scheme (European Commission 2009).

The implementation of the EMAS III (Eco-Management and Audit Scheme) has two implications within the company, on the one hand, the emergence of new costs and on the other hand, some benefits associated with its implementation due to consumption reduction, improved image, compliance with legislation, enhanced environmental performance, etc. In summary, many authors claim that it helps to improve both its environmental performance (Potoski and Prakash 2005; Link and Naveh 2006) and financial performance (Trung and Kumar 2005; Heras-Saizarbitoria et al. 2011). It also helps to improve its competitive advantage as a result of improving the internal efficiency of the organization (Kollman and Prakash 2002).

Studies aimed at studying the relationships between the motivations and benefits of certification of an EMS are scarce, just like the relationship between the barriers and benefits. Therefore, we propose this study in order to fill this gap by analyzing the relationship between the motivations for implementing an EMS and the barriers encountered in the whole process with the perceived benefits associated with the implementation of the system.

The present paper is organized as follows: first we briefly describe the reference scheme EMAS III for the implementation of an EMS, then the theoretical framework used to conduct research and from the theoretical review, a theoretical model and hypotheses are established. In the following section the methodology used is described, while the third one includes the analysis of the results. The final section gives the main conclusions and implications of the work.

5.1.1 What Is EMAS III?

The first Community Eco-management and Eco-auditing Regulation (Regulation (EC) No. 1836/1993) called EMASI (Eco-Management and Audit Scheme) was published in 1993 and allowed companies of the industrial sector to voluntarily adhere to a Community system of environmental management and auditing. With time, it has proved to be an effective tool to promote continuous improvement of the environmental performance of companies and two reviews of the Regulation have been conducted with the aim of expanding the scope of the system to all types of organizations that wish to improve their environmental performance; EMAS II published in 2001 (Regulation (EC) No 761/2001) was open to any organization, unlike the first regulation which was restricted to industrial sector organizations and EMAS III in 2009 (Regulation (EC) No 1221/2009) applicable to all types of organizations, both at Community and non-EU level.

In the Regulation (EC) Nº 1221/2009, Eco-Management and Audit Scheme (EMAS) is defined as "a system at the disposal of organizations that voluntarily wish on the one hand, to evaluate and improve their environmental performance and on the other hand, to disseminate any information regarding their environmental management to both the public or other stakeholders" and we are told that "the goal is to promote continuous improvement of environmental performance of organizations, through the establishment of environmental management systems, evaluation of such systems, requirement of legal compliance, dissemination of information on environmental performance and dialogue with stakeholders, as well as, the active involvement of employees in the organization to improve environmental performance and ensuring their environmental training" (European Commission 2009).

The current EMAS III Regulation came into effect on January 11, 2011, with some important new points; the participation of organizations both at Community and non-EU level is authorized, it ensures compliance with the existing environmental legislation to date promoting the work of the verifier, measures to reduce administrative burdens and create incentives are established, procedures for accreditation and verification are defined and complemented in an attempt to harmonize the rules of the Member States through the simplification of the registration process and the use of logos.

EMAS III is still based on the Environmental Management System foreseen in the ISO 14001, which is similar in its components and requirements (Ridolfi et al. 2008) and in this latest version the ISO 14001 standard (European Commission 2010a) was adopted entirely. We should note that the objectives of both reference standards are different, "EMAS was designed to achieve changes in environmental performance, while ISO 14001 was designed to improve management by providing guidelines that can be implemented by any organization in any country" (Morrow and Rondinelli 2002:162).

In this latest revision of the Regulation, certain differentiating elements are reinforced like demonstrating that they comply with the effective legislation in the first EMAS registration and there are stricter requirements for submission of environmental reports, in which nine basic indicators on energy efficiency, material and resource consumption, waste, emissions and land use (European Commission 2010b) must be collected, which measure the direct environmental aspects that must

be taken into account and are related to each activity carried out by the organization (European Commission 2009).

To adhere to EMAS III, any company should abide by the following norms: conduct a previous environmental analysis of its activities, implement an Environmental Management System, perform environmental audits, prepare an Environmental Declaration, obtain verification by an independent EMAS verifier and register in a Competent Body of a Member State.

From 1997 to 2014, in Spain there has been a steady increase in the number of adhesions to the Regulation, reaching in January 2014, a total of 1,299 work centers and 1,095 organizations, strengthening its leadership position in environmental management in Europe, being the second country in the European Union with more organizations and EMAS certified centers behind Italy, with 9 % in 2014 of total European workplaces with EMAS (European Commission 2014). At regional level, Galicia (21.97 %), Catalonia (20.9 %) and the Community of Madrid (19.54 %) make up for over 60 % of all workplaces with EMAS (OSE 2011).

5.2 Theorethical Framework

5.2.1 Motivations

The implementation of EMS has proved to provide many benefits which should be sufficient to motivate the management of organizations to implement this system, since both the motivations and the benefits of implementing an EMS are the same, what differs is the context in which they operate. The former are prior to implementation/certification, while the benefits are generated once the system is implemented.

From the review of the literature, we observe that the main motivations for implementing an EMS like EMAS III are: the satisfaction of pressures from customers and to ensure that suppliers are operating in a responsible manner on environmental issues by requiring them (Woodside 2000) to meet current legal requirements, which are increasingly stricter and tougher (Harrington and Knight 1999; Woodside 2000; Morrow and Rondinelli 2002), money savings for companies due to efficiency increase and improvement and reduction of costs: materials, energy, fines and penalties (Harrington and Knight 1999; Woodside 2000; Morrow and Rondinelli 2002), environmental performance enhancement (Umweltbendesamt 2000; Andrews et al. 2001; Morrow and Rondinelli 2002), improvement of the image that the company offers its customers (Umweltbendesamt 2000; Morrow and Rondinelli 2002; Schylander and Martinuzzi 2007) and becoming an advertising tool and favoring the possibility of receiving state aid and gaining a competitive advantage (Kirkpatrick and Pouliot 1996; Morrow and Rondinelli 2002).

Quazi et al. (2001), through a review of the literature on environmental management and quality have identified eight possible factors driving organizations to adopt the ISO 1400 standard. Along the same lines, Bansal and Roth (2000) identified three groups of motivations; (1) ethical motivations, which arise from the company's

concern for its social obligations and values, that is, a response to the sense of ecological responsibility of the company, (2) competitiveness reasons that arise from the search for competitive advantages, which respond to the objective of improving profitability, and (3) relational motivations where the company implements environmental practices in an attempt to adapt its performance to the standards and seeks to establish cordial relations through its environmental practices with its stakeholders.

For Neumayer and Perkins (2005) there are two major groups of reasons, which are internal reasons related to efficiency (performance enhancement, productivity and profitability) and external or institutional reasons, related with stakeholders' social pressure. In Heras-Saizarbitoria et al. (2011:195), a summary of the empirical literature on the motivations to adopt ISO 14001 can be seen.

5.2.2 Benefits

There are many benefits, both tangible and intangible or economic and organizational that can be attributed to the implementation of EMS. In Zutshi and Sohal (2004), in appendix A, a detailed review of the literature on the benefits of EMS can be seen, together with the review made by Claver et al. (2005) on benefits that drive organizations to start the implementation of environmental systems.

These authors summarize them in: cost reduction and savings derived from waste minimization, recycling and saving in the use of energy, water, gas and raw materials; improvement in the exploitation processes as a consequence of both savings from the use of raw materials and increased security. The following can also be generated: an increase in employee motivation, improved communication throughout the organization resulting from the use of the same terminology related to EMS, improved corporate image leading to better relationships with stakeholders, increase in insurances of financial institutions, improvement of long-term relationships with suppliers and reduction of fines for compliance with the current legislation (Zutshi and Sohal 2004:339). In Heras-Saizarbitoria et al. (2011:198), a survey of the empirical literature on the benefits of implementing and certifying ISO 14001, can be viewed.

5.2.3 Motivations-Profitability

The implementation of an EMS can be seen as the first solid step to achieve better output (performance/finance), because a framework is established in which the different environmental initiatives can be developed in a coordinated or controlled way (Bansal and Bogner 2002). In the last few years, there have been empirical studies that support a positive relationship between the implementation of an EMS and economic development and operational performance of the company (Christmann 2000; Morrow and Rondinelli 2002; Álvarez Gil et al. 2001; Gerald et al. 2004; among others), stating in numerous studies that the stronger the motivations, either internal or external, the greater the degree of perceived benefits by organizations (Hillary 2000;

Darnall et al. 2001; Kitazawa and Sarkis 2000; Molina-Azorín et al. 2009; Heras-Saizarbitoria et al. 2011). For these reasons we propose the following hypothesis:

H1. Companies with strong motivations to implement EMAS have profited more from its implementation.

5.2.4 Barriers-Profitability

Like any other quality management system, EMAS III is not exempt of barriers or internal resistance, which the organization will have to face, during and after the implementation process. The main drawbacks mentioned by critics of ISO 14001 mainly derive from the lack of understanding of the standard and the wide scope and ambiguity of the standard. In Zutshi and Sohal (2004), in appendix B, a detailed review of the literature on the barriers that organizations can encounter in the process of implementation of the EMS, can be viewed.

Zutshi and Sohal (2004:339) make a summary of them: costs required for their implementation and certification (training, audit fees, audits), in addition to maintenance costs; a lack of available resources and external collaboration (technical or economic), obtained either from subsidies or aid for SMEs, unclear guidelines for implementation in companies with non-regular workers, like in the construction sector; a lack of established guidelines for the establishment of goals and objectives and degree of employee involvement, suppliers and other stakeholders; a lack of guidelines on how to bring continuous improvement; interpretation of standard terms. However, the costs incurred in implementing the EMAS certification are recovered once the Environmental Management System is activated.

Iraldo et al. (2009:9) classify the external barriers (economic, low consumer awareness and interest, lack of recognition and incentives by public institutions) and internal barriers, broad and heterogeneous category which goes from lack of resources to the difficulty of understanding and perception of the EMAS.

Zutshi and Sohal (2004:216) state that it would be "beneficial for organizations to try to reduce and if possible remove as many obstacles as possible before starting the implementation process". There is no doubt that the barriers that companies have to face when implementing their system will affect the perception of managers on the profitability of its implementation, which leads us to consider the following hypothesis:

H2. Companies that have found more barriers when implementing EMAS have profited less from its implementation.

To summarize, in Fig. 5.1 a sequence diagram or "path diagram" is shown with all the first-order latent variables, including the hypotheses to be contrasted, which make up the theoretical model to be tested in this research.

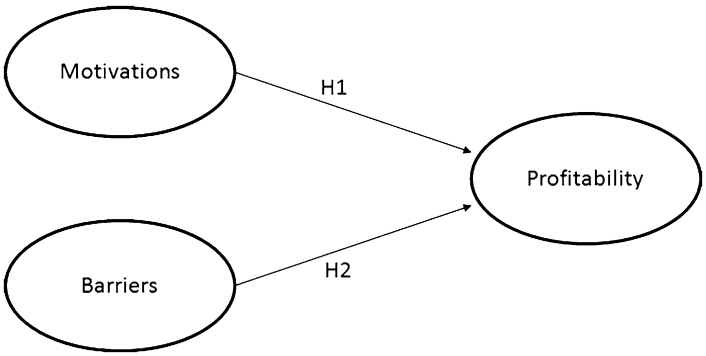

Fig. 5.1 Study model. Impact of motivations and barriers on profitability

5.3 Metodology

5.3.1 Sample and Survey Process

The sample used is constituted by companies certified EMAS III in Galicia (Spain). The source used to select the companies studied was the website of the Ministry of Agriculture, Food and Environment (MAGRAMA, http://www.magrama.gob.es/es). Through this site, only certified companies in EMAS III were selected, which led to the elimination of several companies from the final database. Thus, the initial number was reduced from 286 to 255 companies. Out of the 255 companies surveyed, only 140 agreed to cooperate in this investigation.

Prior to the survey, a pilot study was carried out on a sample of 20 subjects to ensure the validity and user-friendliness of the questionnaire. The pilot study was developed and administered in a series of meetings and interviews with experts and focus groups that helped us make minor adjustments. Once the pilot study was carried out, we proceeded to carry out the survey process aimed at the managing directors or quality managers of Galician companies certified EMAS III. Data were collected between April and May 2012 via three different means: mail, telephone and personal interviews, obtaining a total of 140 surveys. On average, respondents took 10–15 min to complete the questionnaire with the interviewers' assistance. The final total of usable questionnaires was 114 with 26 refusals. Thus, the acceptance rate was 81.4 %. On the basis of the final sample, it can be seen that the sample obtained was made up of 47 % of the province of A Coruña (47 % population), 36 % Pontevedra (36 % population), 9 % Lugo and 6 % Ourense. If we consider the company sectors in the sample, 69 belong to the service sector, 38 to the secondary sector and 7 to the primary sector.

Table 5.1 Reliability and confirmatory factor analysis for the model

Scales[a]	Mean	SD[b]	β	CR	AV
Motivations ($\alpha = 0.76$)				0.77	0.30
By customers' requirements	2.44	1.23	0.31		
By providers'/suppliers' requirements	2.00	0.98	0.30		
Integrating environment in corporate strategy	4.04	1.07	0.58		
Maintaining leadership in the environmental management field	3.86	1.26	0.80		
Compliance with legislation	3.85	1.15	0.53		
It was a strategic decision of the organization	4.28	0.91	0.53		
Improve image and marketing	4.18	0.81	0.59		
Anticipating competitors	3.60	1.24	0.63		
Barriers ($\alpha = 0.77$)				0.85	0.50
Lack of human and material resources	3.50	1.21	0.58		
Lack of staff involvement, difficulties to involve	2.63	1.28	0.81		
Uncertainty about the benefit of implementation of the system	3.91	0.91	0.69		
Lack of commitment from top management	3.91	0.88	0.74		
Little concern for environmental management by the company	3.95	0.84	0.88		
Excessive documentary load of the process and excessive bureaucracy	3.11	1.18	0.44		

SD Standard deviation, *β* Standard regression weight, *α* Reliability (Cronbach's α), *CR* Composite reliability, *AV* Average variance

[a]The items listed in this table have been summarized for ease of presentation and comprehension

The questionnaire that was developed to obtain the necessary data for the current chapter comprised three sections. Part 1 contained questions about general information of the company and the General/Quality manager (name, post, e-mail, employees…) and about the implemented quality systems. Questions regarding motivations, barriers and profitability in the implementation of EMAS III make up the second part of the questionnaire (Table 5.1). All the scales used were adapted from the literature (Darnall et al. 2000; Fryxell et al. 2004; Zutshi and Sohal 2004; González-Benito and González-Benito 2005; Chan and Wong 2006; Schylander and Martinuzzi 2007; Gavronski et al. 2008; Salomone 2008) to measure motivations (1 = not at all important, 5 = very important) and barriers (1 = very easy, 5 = very difficult) on a 5-point Likert scales. Profitability was measured by a dichotomous variable, where respondents had to indicate whether or not the company had made the implementation of EMAS III profitable. Thus, this variable will be our dependent variable in the model study, which was coded 1 if the company did not make EMAS III profitable and 2 when it made EMAS III profitable. The last part of the questionnaire was designed to measure general questions about the implementation of EMAS III, such as the time it had taken the company to implement it or its satisfaction with the regulations.

5.3.2 Structural Equation Models

The present chapter uses the SPSS 19.0 and AMOS 20 programs to analyze the data under the maximum likelihood algorithm. Following Anderson and Gerbing (1988), first the measurement model is estimated using confirmatory factor analysis (CFA)

to ensure that the preset items that reflect the same latent construct are highly correlated with each other and are therefore reliable. In addition, Cronbach's alpha (1951) is used to evaluate the internal consistency of the items, where alpha must be greater than 0.7 and the correlation between the items should exceed 0.3 (Nunnally 1978). The adequacy of each multi-item scale to capture its respective construct will be discussed below. Thus, the internal validity of the measurement model is evaluated by calculating the compound reliability, which must have a greater value than 0.6 (Bagozzi and Yi 1988) and through the extracted variance be equal to or greater than 0.5 (Hair et al. 1998).

After evaluating the adequacy of the measurement models, structural equation models (SEM) are used to check the causal relationships proposed in the study hypotheses. The SEM results are interpreted in terms of significance of individual coefficients and in terms of goodness of fit. The following fit indices were calculated to determine how the model fitted the data: χ^2 (chi-square); CFI (comparative fit index), GFI (goodness fit index) and IFI (incremental fit index) indices should be close to 1.0 and the RMSEA (robustness of mean squared error approximation) should ideally lie between 0.05 and 0.08.

5.4 Results

5.4.1 Measurement Model

We initially performed a CFA including the two latent variables (motivations and barriers), as can be seen in Table 5.1. Overall, the measurement model exhibited good psychometric properties ($\chi^2 = 121.39$, df = 75, GFI = 0.88, CFI = 0.91, IFI = 0.91, RMSEA = 0.07) and all standardized regressions coefficients in the measurement model were significant at the 0.01 level. Additionally, all the scales satisfied the internal consistency using Cronbach's alpha coefficient (above 0.7), composite reliability tests (above 0.7) and the average variance extracted values (equal to or above 0.5), showing that all scales had moderate to high reliability. Thus all the tests carried out show the reliability and validity of the proposed measurement model.

5.4.2 Hypothesis Testing

The structural model has an acceptable model fit ($\chi^2 = 154.19$, df = 88; RMSEA = 0.08, GFI = 0.85, CFI = 0.89, IFI = 0.90). All the structural coefficients are significant ($p < 0.01$). Motivations ($\beta = 0.22$, $t = 1.83$, $p < 0.10$) positively impact on profitability, confirming H1. Additionally, barriers ($\beta = -0.24$, $t = -2.35$, $p < 0.05$) negatively impact on profitability, which leads to the acceptance of H2. The determinants, motivations and barriers explain 11 % of the variance in profitability (Fig. 5.2).

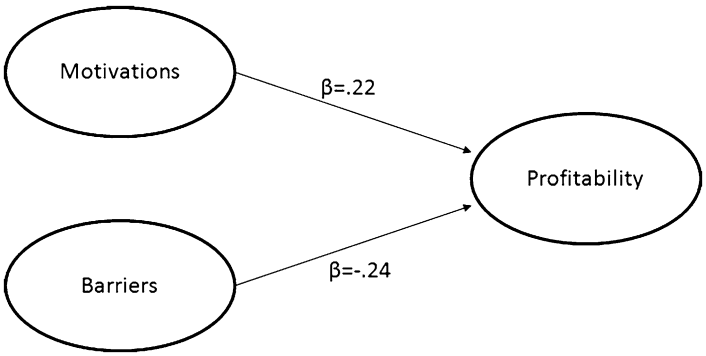

Fig. 5.2 Structural model of profitability based on motivations and barriers. **β**: Standard regression weight. All the coefficients are significant

5.5 Conclusions and Implications

Model results confirm the two hypotheses raised. It was found that there is a positive relationship between the motivations when implementing an EMS and the perception of managing directors or quality managers about whether they have made their implementation profitable and the relationship is negative in the case of barriers, i.e. the higher the level of barriers encountered, the lower their perception of profitability of implementation.

This study not only has important implications for the academic field, but also for organizations and public administrations. For organizations that wish to implement Environmental Quality Management seeing that it provides on the one hand, evidence that organizations should keep in mind, that is, knowing and understanding the barriers which they are going to face, before implementing the system, so that they are positioned in a better position to anticipate and resolve problems that may arise and thus increase their chances of success by decreasing the barriers. On the other hand, evidence shows that companies that have implemented the system have made it profitable and it has satisfied their expectations, being a major reference point for companies that still have doubts about the benefits that EMS would have for their organization.

In the public administration field, the investigation provides evidence that an important motivational job should be done among organizations in order to promote and encourage the implementation of EMS, with emphasis on obtaining significant competitive advantages, compliance with current legislation, improved image and enhanced environmental performance which will have an important impact on perceived financial and operational benefits. On the other hand, the removal of barriers should be promoted.

Finally, Zutshi and Sohal (2004:349) "Top management´s commitment, leadership, vision and motivation are required to successfully implement and maintain any system, including the EMS".

The first limitation of this research is derived from conducting the study and the specific characteristics of the geographical area where the study was conducted "Autonomous Community of Galicia – Spain". The generalization of its conclusions must be analyzed with caution and always from a previous analysis of the characteristics of the population to be studied. A second limitation is related to the cross section thereof, as this paper has analyzed the relationship at a specific moment in time, so to overcome this limitation, it would be necessary to carry out longitudinal studies over time, so as to assess and observe environmental motivations at different points in time.

The last limitation is derived from the methodology used to obtain the data. In this regard, Heras-Saizarbitoria et al. (2011:208) claim that "even though it is fairly conventional and similar to approaches that have generally been accepted, it does have limitations". The information comes from the perception of managing directors or quality managers who have participated in the implementation process so it is likely to be biased (Yin and Schmeidler 2009). This limitation can be resolved by involving all the human resources of the organization (middle managers, staff) in the collection of data.

References

Álvarez Gil MJ, Burgos Jiménez J, Céspedes Lorente JJ (2001) An analysis of environmental management organizational context and performance of Spanish hotels. Omega 29: 457–471

Anderson JC, Gerbing DW (1988) Structural equation modeling in practice: a review and recommended two-step approach. Psychol Bull 103:411–423, Copyright 1988 by the American Psychological Association

Andrews RNL, Darnall N, Gallagher DR, Keiner ST, Feldman E, Mitchell ML, Amaral D, Jacoby J (2001) Environmental management systems: history, theory and implementation research. In: Coglianese C, Nash J (eds) Regulating from the inside: can environmental management systems achieve policy goals? Resources for the Future Press, Washington, DC, pp 31–60

Bagozzi RP, Yi Y (1988) On the evaluation of structural equation models. J Acad Market Sci 16(1):74–94

Bansal P, Bogner W (2002) Deciding on ISO 14001: economics, institutions, and context. Long Range Plann 35(3):269–290

Bansal P, Roth K (2000) Why companies go green: a model of ecological responsiveness. Acad Manage J 43(4):717–736

Berry MA, Rondinelli DA (1998) Proactive corporate environmental management: a new industrial revolution. Acad Manage Exec 12(2):38–50

Chan ES, Wong SC (2006) Motivations for ISO 14001 in the hotel industry. Tour Manage 27(3):481–492

Christmann P (2000) Effects of "best practices" of environmental management on cost advantage: the role of complementary assets. Acad Manage J 43(4):663–680

Claver-Cortés E, Molina-Azorín JF, Tarí JJ, López-Gamero MD (2005) Environmental management, quality management and firm performance: a review of empirical studies. In: Sharma S, Aragón-Correa JA (eds) Corporate environmental strategy and competitive advantage. Edward Elgar, Cheltenham, pp 157–182

Darnall N, Gallagher DR, Andrews R, Amaral D (2000) Environmental management systems: opportunities for improved environmental and business strategy. Environ Qual Manage 9(3):1–9

Darnall N, Gallagher DR, Andrews RNL (2001) ISO 14001: greening management systems. In: Sarkis J (ed) Greener manufacturing and operations. Greenleaf, Sheffield, pp 179–190

EMAS III (2009) Regulation (EC) No 1221/2009. Voluntary participation by organisations in a community eco-management and audit scheme (EMAS)

Eurobarometer 58.0 (2002) The attitudes of Europeans towards the environment, The European Opinion Research Group, Directorate-General Environment, European Commision

European Commission (2009) Regulation (EC) N. 1221/2009 of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organisations in a community eco-management and audit scheme (EMAS), repealing regulation (EC) N. 761/2001 and Commission Decisions 2001/681/EC and 2006/193/EC. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:342:0001:0045:EN:PD.F

European Commission (2010a) What are the differences between ISO 14001 and EMAS. http://ec.europa.eu/environment/emas/tools/faqen.htm#Toc259178108

European Commission (2010b) What are environmental core indicators. http://ec.europa.eu/environment/emas/tools/faqen.htm#Toc259178093

European Commission (2014) Reports and statistics. Disponible en http://ec.europa.eu. [fecha consulta 01/01/2014]

Fryxell GE, Lo CWH, Chung SS (2004) Influence of motivations for seeking ISO 14001 certification on perceptions of EMS effectiveness in China. Environ Manage 33(2):239–251

Gavronski I, Ferrer G, Paiva EL (2008) ISO 14001 certification in Brazil: motivations and benefits. J Clean Prod 16(1):87–94

Gerald EF, Chung SS, Carlos WH (2004) Does the selection of ISO 14001 registrars matter? Registrar reputation and environmental policy statements in China. J Environ Manage 71:45–57

González-Benito J, González-Benito O (2005) An analysis of the relationship between environmental motivations and ISO14001 certification. Brit J Manage 16(2):133–148

Hair JF, Anderson RE, Tatham RL, Black WC (1998) Multivariate data analysis, 5th edn. Prentice Hall, Upper Saddle River, NJ

Harrington HJ, Knight A (1999) ISO 14000 implementation—upgrading your EMS effectively. McGraw-Hill, New York

Heras-Saizarbitoria I, Arana G, Molina-Azorín JF (2011) Do drivers matter for the benefits of ISO 14001? Int J Oper Manag 31(2):192–215

Hillary R (2000) EMS: environmental protection the voluntary way. Health Safety Pract 18(4):52–54

Iraldo F, Testa F, Frey M (2009) Is an environmental management system able to influence environmental and competitive performance? The case of the eco-management and audit scheme (EMAS) in the European Union. J Clean Prod 17(16):1444–1452

Kirkpatrick D, Pouliot C (1996) Environmental management, ISO 14000 offers multiple rewards. Pollut Eng 28(6):62–65

Kitazawa S, Sarkis J (2000) The relationship between ISO 14001 and continuous source reduction programs. Int J Oper Prod Manage 20(2):225–248

Kollman K, Prakash A (2002) EMS-based environmental regimes as club goods: examining variations in firmlevel adoption of ISO 14001 and EMAS in UK, US, and Germany. Policy Sci 35(1):43–67

Link S, Naveh E (2006) Standardization and discretion: does the environmental standard ISO 14001 lead to performance benefits? IEEE Trans Eng Manage 53:508–519

Mainieri T, Barnett EG, Valdero TR, Unipan JB, Oskamp S (1997) Green buying: the influence of environmental concern on consumer behavior. J Soc Psychol 137(2):189–204

Molina-Azorín JF, Claver-Cortés E, Pereira-Moliner J, Tarí JJ (2009) Environmental practices and firm performance: an empirical analysis in the Spanish hotel industry. J Clean Prod 17(5):516–524

Morrow D, Rondinelli D (2002) Adopting corporate environmental management systems: motivations and results of ISO 14001 and EMAS certification. Eur Manage J 20(2):159–171
Neumayer E, Perkins R (2005) Uneven geographies of organizational practice: explaining the cross-national transfer and adoption of ISO 9000. Econ Geogr 81(3):237–259
Nunnally JC (1978) Psychometric theory. McGraw-Hill, New York
OSE (2011) Informe de Sostenibilidad en España. Observatorio para la Sostenibilidad en España. Disponible en http://www.sostenibilidades.org/sites/default/files/Informes/anuales/2011/sostenibilidadenespana2011.pdf
Petrosillo I, De Marco A, Botta S, Comoglio C (2012) EMAS in local authorities: suitable indicators in adopting environmental management systems. Ecol Indic 13(1):263–274
Potoski M, Prakash A (2005) Covenants with weak swords: ISO 14001 and facilities' environmental performance. J Policy Anal Manage 24(4):745–769
Quazi HA, Khoo YK, Tan CM, Wong PS (2001) Motivation for ISO 14000 certification: development of a predictive model. Int J Manage Sci 29(6):525–542
Ridolfi R, Andreis D, Panzieri M, Ceccherini F (2008) The application of environmental certification to the Province of Siena. J Environ Manage 86:390–395
Salomone R (2008) Integrated management systems: experiences in Italian organizations. J Clean Prod 16(16):1786–1806
Schylander E, Martinuzzi A (2007) ISO 14001–experiences, effects and future challenges: a national study in Austria. Bus Strat Environ 16(2):133–147
Shrivastava P (1995) The role of corporations in achieving ecological sustainability. Acad Manage Rev 20(4):936–960
Trung DN, Kumar S (2005) Resource use and waste management in Vietnam hotel industry. J Clean Prod 13(2):109–116
Umweltbendesamt (2000) EMAS in Germany, systematic environmental management: report on experience 1995 to 1998. Federal Environmental Agency, Berlin
Waddock SA, Bodwell C, Graves SR (2003) Responsibility: the new business imperative. Acad Manage Exec 16(2):132–148
Woodside G (2000) ISO 14001 auditing manual. McGraw-Hill, New York
Yin H, Schmeidler PJ (2009) Why do standardized ISO 14001 environmental management systems lead to heterogeneous environmental outcomes? Bus Strat Environ 18(7):469–486
Zutshi A, Sohal A (2004) Environmental management system adoption by Austalasian organisations: part 1: reasons, benefits and impediments. Technovation 24:335–357

Chapter 6
An Integrated View of the Use of Quality Cost Information, the Improvement of the Quality Management System and Effects on Performance: A Study in Portuguese Companies

Jorge Novas and Margarida Saraiva

Abstract The literature focusing on quality costs has placed great importance on issues related to identifying, measuring and reporting quality cost information. Less attention has been paid to how this information is used in the management process and how it can enhance internal capabilities and thereby improve company performance. In addition to addressing this question, we analyse how the extensive use of quality costs can boost organisational learning and innovation in organisations' internal processes, thus leading to an overall improvement in the quality management system that is reflected in financial and non-financial performance. The conceptual model developed involves these relationships and has been tested using the structural equation modelling technique. To this end, a questionnaire survey was conducted in Portuguese companies with the ISO 9000 certification. The results shed light on the causal links between the variables, and thus validate the conceptual model indicating that the use of quality cost information has a positive effect on both the development of quality management systems and performance.

6.1 Introduction

The literature focusing on quality costs (QC) has placed great importance on issues related to identifying, measuring and reporting quality cost information (QCI). Less attention has been paid to how this information is used in the management process

J. Novas (✉)
Management Department and CEFAGE-UE, University of Évora
Largo dos Colegiais, 2, 7000-803 Évora, Portugal
e-mail: jlnovas@uevora.pt

M. Saraiva
Management Department and BRU-UNIDE/ISCTE-IUL, University of Évora,
Largo dos Colegiais, 2, 7000-803 Évora, Portugal
e-mail: msaraiva@uevora.pt

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and how it can enhance internal capabilities and thereby improve company performance. In addition to addressing this question, we analyse how the extensive use of QC can boost organisational learning and innovation in organisations' internal processes, thus leading to an overall improvement in the quality management system (QMS) that is reflected in financial and non-financial performance. The conceptual model developed involves these relationships and has been tested using the structural equation modelling technique. To this end, a questionnaire survey was conducted in Portuguese companies with the ISO 9000 certification. The results shed light on the causal links between the variables, and thus validate the conceptual model indicating that the use of QCI has a positive effect on both the development of QMS and performance. The chapter is structured as follows: the next section begins with a discussion of the relationship between the use of QCI, the development of QMS and the impacts on performance, and then introduces the conceptual model; Sect. 6.3 describes the variables and develops research hypotheses; Sect. 6.4 presents the methodological issues; Sect. 6.5 sets out the main results of the statistical analysis; finally, Sect. 6.6 discusses the results and presents the conclusions of the study.

6.2 QC and the Development of a QMS

The importance of QCI to continuous improvement processes is widely acknowledged in the literature. Significant benefits may be obtained from quality costing, because the resulting information converts quality into a measurable concept and thus makes its impact on the organisation more understandable (Crosby 1979). As a result, the literature has become greatly focused on QC, notably on their identification, measurement and reporting. However, as Sansalvador and Brotons (2013) state, despite the importance of implementing a system that provides information about the distinct components of QC, the full benefit can only be derived if the information obtained is analysed in detail. Moreover, the way this information is applied in the management process may determine the momentum and expected results of that process. The mere existence of information on QC does not necessarily mean that companies are applying it in their management processes, and routines must therefore be created to use the information. Sower et al. (2007) noted that quality costing programs alone do not lead to improved quality. Regardless of the adequacy of the quality costing system implemented, its effectiveness will be intrinsically associated to and dependent upon the way in which the QMS uses the resulting information to improve quality. The extensive and systematic use of QCI is a prerequisite for the development of the QMS. Quality cost should not be seen as solving a problem with a unique definition; there is a whole range of reasonable notions of quality improvements, and that these notions can be seen as actionable guidelines (Jajua et al. 2009). The extensive use of QCI is thus likely to increase both the level of knowledge and awareness of quality, and foster an organisational understanding of quality issues (organisational learning) and innovativeness. Quality improvement initiatives should result in higher levels of (financial and non-financial) performance. We therefore propose the conceptual model depicted in Fig. 6.1.

Fig. 6.1 Conceptual model

6.3 Variables and Hypotheses

6.3.1 Use of QCI

For the purposes of this work, a quality costing system is broadly defined as a system conveying useful information to the QMS. The literature has largely ignored the ways in which information provided by the quality costing system is used. However, analysing profiles of the use of information not only allows us to evaluate how the management process relies on that information, but also the effects of this use. This work adopts a structure proposed by Simons that distinguishes between diagnostic and interactive control systems. This structure has been widely used to analyse the profile of use of management accounting and control systems, and the information systems they provide (cf. e.g. Abernethy and Brownell 1999; Hartmann and Vaassen 2003; Lukka and Granlund 2003; Roberts 2003; Henri 2006; Naranjo-Gil and Hartmann 2006; Kominis and Dudau 2012).

The diagnostic and interactive notions of control proposed by Simons are part of a broader conceptual framework that the author explained extensively in Levers of Control (Simons 1995). Diagnostic systems are formal systems that managers use to monitor results and correct deviations from pre-established performance standards (Simons 1995). They are associated to the traditional notion of management control because they are described in terms of the ability to measure the outputs of processes and by the existence of standards through which achievements may be compared, so that decisions can be taken to correct deviations verified. Diagnostic systems permit the close control of the critical variables of organisational performance without the constant intervention of managers; attention is focused on negotiation and goal setting, on periodic reports that inform about ongoing actions, and on sporadic interventions when a critical variable is out of control (Simons 1995). They are systems that limit the search for innovative solutions and the identification of opportunities because they focus on the critical variables of performance. In contrast, interactive systems stimulate the interactive exploration of innovative solutions and learning, allowing new strategies to grow as participants interact, debate and dialogue in response to perceived opportunities and threats. However, research dedicated specifically to the use of diagnostic information has led to new perspectives. Specifically, it is maintained that the use of this type of information may not constitute an end in itself, but is a necessary means to start and support interactive use of information that favours strategic dialogue and communication among the parties, i.e. diagnostic use constitutes a pre-requisite for interactive use (Haas and Kleingeld 1999).

6.3.2 Organisational Learning

Organisational learning is the process by which new knowledge and ideas are developed by organisations (Slater and Narver 1995); it enables companies to acquire, interpret, disseminate and store information and the results of the organisational experience with a view to making continuous improvements (Gilley and Maycunich 2000; Tippins and Sohi 2003; Chenhall 2005). Organisational learning is a personal skill that can generate changes in employees' behaviour; it focuses on routines, processes, practices and organisational standards through the sharing of information and institutionalisation of knowledge between individuals, and it therefore plays a specific role in the development of other skills at the strategic level (Zoolo and Winter 2002).

6.3.3 Innovativeness

Innovativeness is the capacity to innovate. Innovation is the process of recombining or generating new ideas for the development and improvement of products and organisational processes; when successful, it creates competitive advantage (Hurley and Hult 1998; Van de Ven and Engleman 2004; Grant 2008). It is therefore the process of renewing not only products and/or services, including operational processes within the production, distribution and marketing, but also business processes such as new forms of organisational design or management (Sundbo 2001). On the other hand, from an institutional perspective widely linked to continuous improvement, innovation is the process of developing and implementing new ideas that come from employees (Van de Ven and Engleman 2004). Innovation may have exogenous origins, e.g. technological, political and regulatory changes, or demographic and social changes, but also endogenous motivations caused by organisational structure that facilitate the development of innovative ideas and the adoption of innovation as a permanent organisational value (Shane 2003; Grant 2008).

6.3.4 Performance

Performance is used herein as a broad concept and is defined as a complex variable with a multiplicity of factors contributing to the overall level of performance at any point of time (Perera et al. 1997). Although the major source of information continues to be a combination of internal-quantitative data expressed in financial and accounting terms (Smith 2005), not all organisational complexities can be expressed within a quantified frame of reference (Bromwich and Bhimani 1996). As a result, performance measurement should take both financial and non-financial perspectives into account.

6.3.5 Hypotheses

There is widespread acknowledgement of the importance of using QCI as a vehicle for the continuous improvement of quality-related processes. Many companies that develop and implement costing systems make extensive use of QCI; it is used for planning and control purposes and to foster organisational learning and explore innovative solutions. Quality costing must be understood not only as a mechanism for managers to evaluate and monitor the economics, effectiveness and efficiency of quality activities in their organisation but also as a bridge between line and top management (Vaxevanidis et al. 2009). Thus, quality costing systems are used as "answer machines" as well as "learning machines" (See Burchell et al. 1980). According to Simons' (1995) framework, the extensive use of quality costing systems and the resulting information enable companies to focus on the importance of balancing the inevitable tensions between the need for control and achieving pre-established objectives on one hand, and the organisational need for learning and innovation on the other (Kominis and Dudau 2012). We thus formulate the following hypothesis:

H1 (a, b): The extensive use of QCI is positively related with the development of (a) organisational learning and (b) innovativeness, thus contributing to the development of the QMS.

QCI fosters communication about the general control of quality within the organisation (Prickett and Rapley 2001). According to Yang (2008), the implementation of quality costing can produce significant benefits. The most important is that organisations are able to focus on the areas that require improvement. This capacity to improve falls between organisational learning and innovation, i.e. it is the ability to learn and the knowledge generated by this that permits the identification of needs and the opportunities for improvement which, in turn, leads to the development of innovation processes. Accordingly, organisational learning is a pre-requisite for innovativeness. Thus, we formulate the following hypothesis:

H2: QCI has an indirect positive effect on innovativeness through the development of organisational learning.

Organisations without a quality costing system often develop insular ways of maintaining control over each area of responsibility. This gives rise to uncoordinated information gathering, reporting, and management as well as the need for multiple re-drawing and re-keying of information (Jafari and Rodchua 2014). QC enable organisations to concentrate on low performance areas that need improving whilst also making continuous improvements and planning how to raise quality (Prickett and Rapley 2001). In addition to enabling organisations to focus on areas that require improvement, quality costing increases awareness (within the organisation) of the potential effects of poor quality on overall business results (Prickett and Rapley 2001; Makhopadhyay 2004; Yang 2008). We therefore formulate the following hypothesis:

H3 (a, b): Greater (a) organisational learning and (b) innovativeness, which contribute to the development of the QMS, are positively related with performance.

6.4 Research Method

6.4.1 Sampling Procedure

This study uses primary data obtained through a questionnaire survey applied to Portuguese companies with the ISO 9001:2008 certification. Focus is given to certified companies as they are more aware of quality issues and the importance of managing quality variables, including QC, even though they are not required to implement or certify formal quality cost systems. The companies were selected from the last edition of the Quality & Certification Yearbook, published in 2011. A random stratified and systematised sample procedure was adopted to obtain a broad picture of Portuguese certified companies. Given the objectives of the study, only certified companies with a staff of 20 or more were considered because management accounting systems in larger companies tend to be more developed and better structured (Lal and Srivastava 2009).

Every fourth company in the Quality & Certification Yearbook was selected with the aim of surveying 25 % of all companies. If a company did not meet the staff size criteria, the next company fulfilling the criteria was selected. Our sample comprised 1,272 companies and we obtained a response rate of 25.4 %, corresponding to 323 validated questionnaires, which is consistent with the response rate of other similar studies (cf. e.g. Henri 2006).

A pre-test was performed in ten companies and led to some small modifications to the original questionnaire. The questionnaire was addressed to the boards of directors who decided who would answer it. Of the 323 validated questionnaires, 200 (61.9 %) were answered by the quality manager, 97 (30.0 %) by administrators/directors and the remainder by other staff members.

In terms of the representativeness of the final sample, there were no significant differences in the distribution of firms by sector and by size (in accordance with the number of employees). In fact, 50.5 % of companies employed 20–49 persons, 16.1 % employed 50–99, 19.2 % employed 100–249 and 14.2 % more than 249. In terms of sales volume, 54.8 % of companies reported a volume of up to €5 million, 14.2 % reported between €5m and €15m, 4.3 % between €15m and €25m, 8.7 % between €25m and €40m and 18.0 % over €40m.

6.4.2 Measurement of Variables

The literature was used to construct the data collection instrument. The first question was based on a section of a questionnaire developed by Naranjo-Gil and Hartmann (2006); some adaptations were made that allowed us to measure the profile of the use of QCI provided by the system (see Appendix 1—Panel 1). The variable was measured on a five-point Likert scale (1—Not used; 5—Used extensively). The second question addresses the extent of organisational learning and

innovativeness (see Appendix 1—Panel 2). Although the structure of this question is supported by the extensive bibliography and some empirical research, it does not reproduce any instruments used in previous studies. The variable was measured on a five-point Likert scale (1—Completely disagree; 5—Completely agree). The third question deals with the degree of compliance with a set of company objectives. We used a slightly modified version of the Scott and Tiessen (1999) instrument for exploring the incidence and importance of measuring the performance of management teams. The original structure of the questionnaire was simplified and respondents were asked questions on three financial categories (cost, sales and profitability) and five non-financial categories (productivity, quality, service, innovation and human resources). Respondents were asked to rate the level of achievement of each target over the previous 3 years, thus allowing for a dynamic view of performance measurement and simultaneously providing a mechanism to prevent circumstantial effects on the process (see Appendix 1—Panel 3). The variable was measured on a five-point Likert scale (1—Much lower than expected; 5—Greater than expected).

6.4.3 Preliminary Analysis

Companies that collect information on costs of quality do not necessarily use that information extensively in the management process. Thus, the data collected were first analysed to identify significant differences in the way companies used the information on activities described in Question 1 (see Appendix 1—Panel 1). This procedure also enables us to identify companies with broad-scope costing systems and which make effective and extensive use of their QCI. To that end, we performed a cluster analysis to identify groups of companies with different use profiles for the QCI provided by the system. The cluster analysis is an exploratory multivariate analysis technique that groups subjects based on the existing information; as a result, the subjects belonging to a group are as similar as possible and always more similar to members of their group than to those of the remaining groups (Hair Jr. et al. 2010). The objective is to maximise the homogeneity within each group as well as the heterogeneity among groups. Data was analysed using IBM SPSS Statistics 21 software.

6.4.4 Estimation and Analysis of the Proposed Model

A structural equation modelling procedure with AMOS (version 21) was used to test the proposed model. The recommended two-step approach (Anderson and Gerbing 1988) was followed. Before estimating the structural model, which describes the causal relationships between constructs and their relative explanatory power, we assessed the relationships between observable indicators in order to

evaluate the reliability and validity of the measurement instruments. The advantages of this procedure have been extensively discussed by Anderson and Gerbing (1988), and are associated with the possibility of acquiring a body of knowledge about the variables that comprise the final model.

A reliability analysis—Cronbach Alpha—was performed on the set of indicators for each construct to assess the consistency of the measurements of variables (see Appendix 1). The results showed all Cronbach Alpha coefficients exceeded the recommended value of 0.7 (Hair Jr. et al. 2010), indicating good internal consistency and thus assuring the reliability and unidimensionality of measurement scales (Blunch 2008).

6.4.5 Confirmatory Factor Analysis (Measurement Model)

Two confirmatory factor analysis models were considered (see De Ruyter and Wetzels 1999): one comprised of exogenous constructs (Model A) and another consisted exclusively of endogenous constructs (Model B). The aim is to analyse the set of relations between observable indicators and latent variables, and evaluate the relationships between them. Model fit was assessed using indices from various categories of fit criteria (see e.g. Blunch 2008; Byrne 2009), thus overcoming the problem associated with the best index to evaluate the fit of the model (Fan et al. 1999; Byrne 2009).

6.5 Results

As noted above, the analysis began by identifying companies with broad-scope costing systems that make effective and extensive use of QCI. To this end, we performed a cluster analysis to identify groups of companies with different profiles of the use of the system's QCI. The analysis led to the identification of two heterogeneous groups of companies in terms of profiles of use of QCI. Table 6.1 shows the average scores for the initial sample (n = 323) and the mean scores for each group extracted in the cluster analysis. Marked differences were identified between the two groups. Group 1 consists of 112 companies that make more limited use of the information about QC. The mean scores of this group are lower than the mean scores for all companies (n = 323) with regard the use of QC for all actions reported in Table 6.1. In contrast, companies in Group 2 seem to make extensive use of information provided by the system. Group 1 is composed of 72.7 % of companies with under 100 employees (90.9 % have less than 250 employees). The turnover of about 79 % of companies does not exceed €15m. Information on QC is essentially prepared in the quality departments (48.8 %), the accounting departments (27.4 %) or both (19.0 %). QCI is mostly prepared annually (53.5 %), which explains the less extensive use of this information and also

Table 6.1 Use of information about QC

	All companies (n = 323)		Groups (mean scores)	
Actions	Mean	SD	Gr. 1	Gr. 2
Signalling key strategic areas	3.16	1.19	2.35	4.05
Implementing new ideas and ways of doing tasks	3.19	1.16	2.35	4.10
Setting targets and objectives	3.67	1.14	2.45	4.48
Negotiating targets and objectives	3.43	1.14	2.39	4.26
Debating data assumptions and action plans	3.45	1.10	2.40	4.32
Following up significant exceptions and deviations	3.59	1.08	2.41	4.36
Following up pre-set plans and goals	3.64	1.04	2.46	4.37
Aligning performance measures with strategic goals	3.77	1.05	2.58	4.45
Involvement in permanent coordination with others	3.49	1.03	2.53	4.21
Developing, implementing and operating evaluation and control systems	3.50	1.05	2.58	4.20
Learning tool	3.25	1.09	2.56	4.01
Allowing the company to focus on the critical factors for success	3.44	1.05	2.69	4.19

that it is not such an important support in the management process. Only 22.1 and 18.6 % of companies prepare monthly and quarterly information on QC, respectively. Group 2 consists of 211 companies. These companies are larger than those of Group 1, both in terms of number of employees and sales volume. About 64 % of companies have less than 100 employees (83.5 % have less than 250 employees and 93.4 % less than 500 employees). The turnover of 76.8 % of the companies is below €40m (69.2 % have a turnover of less than €25m and 65.6 % less than €15m). In these companies, the QCI is mainly prepared in the quality departments (61.3 %). Information is prepared in the accounting department in 15.7 % and by both departments in 14.2 % of the companies. QCI is issued monthly and quarterly in 32.7 and 30.1 % of companies respectively. This information is prepared twice a year in 11.7 % and annually in 25.5 % of companies. This group of companies therefore makes more extensive and recurrent use of QCI, which suggests it is a useful support for the management process.

Our next step was to detect significant differences between the two groups of companies in relation to the use of QCI. T-test showed statistically significant differences between the two groups in relation to the use of QCI for all actions presented in Table 6.1. Given the purposes of this study, we then estimated the model using only the companies in Group 2.

As mentioned above, two models were initially considered for a confirmatory factor analysis to evaluate and validate the measurement model. Model A is a recursive model, since the variables in this model are not influenced by others. An admissible solution was obtained from the estimation process and allowed for an acceptable fit. The value of χ^2/df was 2.150, below the recommended maximum of 3.00. TLI, NFI and CFI indices range from zero (poor fit) to one (perfect fit), with

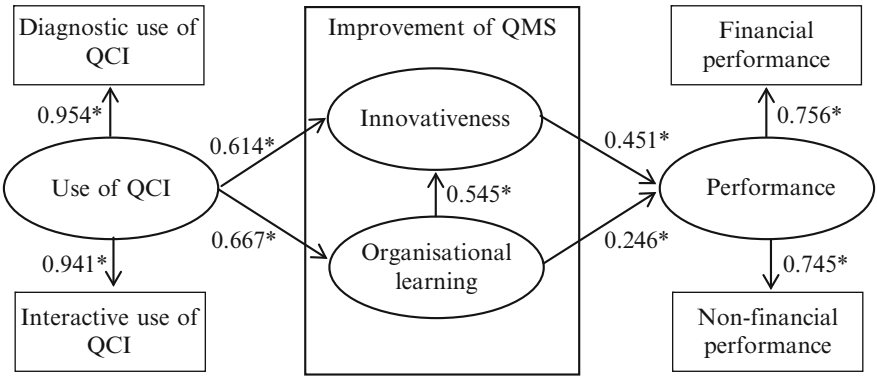

Fig. 6.2 Extended conceptual model

an acceptable minimum level of 0.90 (Hair Jr. et al. 2010). All indices were above the minimum recommended levels, indicating that the hypothesised model fits the data to a reasonable degree: NFI = 0.937; TLI = 0.906; CFI = 0.944. The RMSEA value was 0.07. Values below 0.05 indicate good fit and values less than 0.08 are acceptable values (Hair Jr. et al. 2010). The associated confidence interval (which ranges from 0.060 to 0.077) indicated the RMSEA value had a good level of accuracy in replicating the model in the population. Model B consists of the endogenous constructs. The estimation process also resulted in an acceptable solution, since the fit quality measures are below the minimum recommended levels: $\chi^2/df = 1.945$; NFI = 0.920; TLI = 0.945; CFI = 0.954; RMSEA = 0.055.

Once the structure inherent in the measurement model was confirmed and validated, we proceeded to the estimation of the conceptual model to test the research hypotheses. Figure 6.2 shows the results after the estimation process, suggesting that the hypothesised model has a reasonable fit with the data. Factor loadings (standardised regression weights) are also presented and represent statistically significant relationships. Each value refers to the increase in the dependent variable in standard deviation units due to the variation of one unit of standard deviation in the independent variable.

Notes: $\chi^2/df = 1.833$; NFI = 0.935; TLI = 0.955; CFI = 0.945; RMSEA = 0.065. Standardised values; Statistically significant at *p < 0.001 level.

6.6 Discussion and Conclusion

The main objective of this study is to analyse the relationship between the use of QC, improvements in the QMS (through the development of organisational learning and innovativeness) and organisational performance. We claimed that extensive use

of QCI is likely to foster organisational learning and the capacity to innovate. This means that it is being used in a diagnostic fashion to motivate and guide organisations towards achieving goals by focussing on and correcting deviations from pre-set performance standards (Henri 2006); it is also used interactively to expand opportunity seeking and learning by focussing attention and fostering dialogue throughout the organisation (Henri 2006).

As noted above, companies that make effective and extensive use of QCI (i.e. that are using this information diagnostically and interactively) were selected. Diagnostic use of information acts as a negative force as it constrains innovation and opportunity-seeking to ensure the achievement of goals set (Simons 1995). However, it is also seen as a prerequisite to interactive use (Haas and Kleingeld 1999). Thus, the diagnostic and interactive styles of use are formative elements of the "use of QCI" construct. The estimation process showed that the extensive use of QCI had a positive and statistically significant effect on improving the QMS through the incremental effect on organisational learning and innovativeness; this means that the information provided by the quality costing system is being used by companies to balance tensions between the need for control and the achievement of pre-established objectives—which is the traditional focus of quality costing processes—and the need for learning and innovation (Kominis and Dudau 2012).

Our hypothesis that a positive causal relationship existed between organisational learning and innovativeness was also supported. This is consistent with theoretical assumptions that organisational learning constitutes a major component of innovative ability. Organisational learning fosters knowledge and the associations among past actions, the effectiveness of these actions, and future actions (Fiol and Lyles 1985). The organisation's capacity to use this knowledge for the continuous improvement of quality related processes is an innovative capability.

The causal relationship between organisational learning and the ability to innovate was also positive and statistically significant. This is relevant in that it shows how the improvements in the QMS impact performance. In light of the positive and statistically significant direct effect of the use of QCI on improving QMS noted above, it is concluded that the extensive use of QCI may have an indirect positive effect on performance, in keeping with previous research.

This chapter highlighted the issue of using QCI to promote the development of QMS through the improvement of organisational learning and innovation. Companies have developed and implemented quality costing systems to provide information to support quality management processes. However, many of these companies do not make extensive use of this information, thus limiting the benefits that can be obtained in terms of the development of organisational capabilities, such as organisational learning and innovativeness. More research is needed and additional efforts must be made to highlight this issue and to encourage managers to use QCI to promote participation, dialogue and involvement of all participants and not just to control the accomplishment of predetermined objectives.

Appendix 1: Questionnaire and Results Extracted from the Statistical Analysis

Panel 1: Profile of Use of Information About Costs and Other Quality Indicators Provided by the Information System

Indicate in which way the information provided by the information system about costs and other quality indicators is used for the following actions: (1—Not used; 5—Used extensively)

Diagnostic use	*Interactive use*
Setting targets and objectives.	Signalling key strategic areas.
Negotiating targets and objectives.	Implementing new ideas and ways for doing tasks.
Following up significant exceptions and deviations.	Debating data assumptions and action plans.
Following up pre-set plans and goals.	Developing, implementing and operating evaluation and control systems.
Aligning performance measures with strategic goals.	
Involvement in systematic contact with employees.	Learning tool.
	Allowing the company to focus on the critical factors for success.

Diagnostic profile of use: Cronbach's alpha = 0.957; Interactive profile of use: Cronbach's alpha = 0.939

Panel 2: Improvement of QMS

Indicate the degree of agreement with the following statements: (1—Completely disagree; 5—Completely agree)

Innovativeness
There is a culture of innovation and therefore a predisposition to innovate and to deal with the risks and uncertainties associated with innovation processes.
The company encourages and values the innovation processes (emergence of new ideas, improving current processes, etc.) of its employees.
The ideas and innovation processes suggested by people in the company are often implemented.
The company is on the "front line" in terms of developing new products, processes, techniques, etc.
There are routines in the company to exploit and/or consult the market with the aim of identifying opportunities to develop new products /services and /or improve existing products /services.
Senior managers develop and communicate a vision focused on continuous quality improvement.
In the company there are routines that involve members from several areas (marketing, production, quality, etc.) in the development of new products/services and/or improvement of existing products/services.

(continued)

(continued)

The company encourages the participation of people in the development processes of new products/services and/or in the improvement of existing products/services.
Organisational learning
Learning as a way of taking action to improve is one of the company's core values.
The ability to learn is a key factor for improvement actions in the company.
Learning is understood as a basic capacity that ensures the company's future.
In-company learning is seen as an investment.

Innovativeness: Cronbach's alpha = 0.936; Organisational learning: Cronbach's alpha = 0.866

Panel 3: Performance

With reference to the last 3 years, how do you evaluate the degree to which the following organisational goals were attained: (1—Much lower than expected; 5—Greater than expected)

Financial performance
Cost (e.g. implementing policies to reduce costs; reaching target costs for the period; etc.).
Sales (e.g. meeting the figures forecast for sales/services or market share).
Profitability (e.g. reaching the expected levels for indicators such as profitability, contribution margin, net income, etc.).
Non-financial performance
Service (e.g. ensuring the performance of products/services, adapting them to customer requirements; assessing the level of consumer satisfaction and meeting deadlines with clients).
Quality (e.g. significantly decrease the percentage of defective products; meet the desired standards of services provided; assessment and the monitoring of QC, etc.).
Productivity (e.g. elimination of waste, productivity of raw materials and human resources).
Human resources (e.g. improvement in indicators such as employee satisfaction, absenteeism, learning, professional and academic training, development of technical capabilities, etc.).
Innovation (e.g. improve levels of sales/services by placing new products/services in the market; expansion into new markets; rate of introduction of new products and/or services; evolution of these indicators in comparison with competitors).

Financial performance: Cronbach's alpha = 0.784; Non-financial performance: Cronbach's alpha = 0.861

Appendix 2: Regression Coefficients in the Final Causal Model

Independent variables	Dependent variables	Estimate	Standardized estimate	Standard errors	Critical ratio	*P*
Use of QCI	Organisational learning	0.618	0.667	0.038	3.331	***
Use of QCI	Innovativeness	0.525	0.614	0.051	3.225	***
Organisational learning	Innovativeness	0.481	0.545	0.071	2.340	***
Organisational learning	Performance	0.213	0.246	0.077	4.664	***
Innovativeness	Performance	0.430	0.451	0.056	4.267	***

Note: ***Significant at the $p < 0.001$ level (two-tailed)

References

Abernethy M, Brownell P (1999) The role of budgets in organizations facing strategic change: an exploratory study. Account Org Soc 24(3):189–204

Anderson J, Gerbing D (1988) Structural equation modeling in practice: a review and recommended two-step approach. Psychol Bull 103(3):411–423

Blunch N (2008) Introduction to structural equation modelling using SPSS and AMOS. SAGE Publications, London

Bromwich M, Bhimani A (1996) Management accounting: pathways to progress. Chartered Institute of Management Accountants Publishing, London

Burchell S, Clubb C, Hopwood A, Hughes J, Nahapiet J (1980) The roles of accounting in organizations and society. Accoun Org Soc 5(1):5–27

Byrne B (2009) Structural equation modeling with AMOS: basic concepts, applications, and programming, 2nd edn. Taylor & Francis Group, New York

Chenhall R (2005) Integrative strategic performance measurement systems, strategic alignment of manufacturing, learning and strategic outcomes: an exploratory study. Accoun Org Soc 30(5):395–422

Crosby P (1979) Quality is free. Mc-Graw-Hill, New York

De Ruyter K, Wetzels M (1999) Commitment in auditor–client relationships: antecedents and consequences. Accoun Org Soc 24(1):57–75

Fan X, Thompson B, Wang L (1999) Effects of sample size, estimation methods, and model specification on structural equation modeling fit indexes. Struct Equ Model 6(1):56–83

Fiol C, Lyles M (1985) Organizational learning. Acad Manage Rev 10(4):803–813

Gilley J, Maycunich A (2000) Organizational learning, performance and change. Perseus Publishing, Cambridge, MA

Grant R (2008) Contemporary strategy analysis. Blackwell Publishers, Oxford

Haas M, Kleingeld A (1999) Multilevel design of performance measurement systems: enhancing strategic dialogue throughout the organization. Manage Account Res 10(3):233–261

Hair J Jr, Black W, Babin B, Anderson R (2010) Multivariate data analysis – a global perspective, 7th edn. Pearson Prentice Hall, Upper Saddle River, NJ

Hartmann F, Vaassen E (2003) The Changing Role of Management Accounting and Control Systems. In: Bhimani A (ed) Management accounting in the digital economy. Oxford University Press, Oxford, pp 112–132

Henri J-F (2006) Management control systems and strategy: a resource-based perspective. Accoun Org Soc 31(6):529–558

Hurley R, Hult G (1998) Innovation, market orientation, and organizational learning: an integration and empirical examination. J Market 62:42–54

Jafari A, Rodchua S (2014) Survey research on quality costs and problems in the construction environment. Total Qual Manag Bus Excel 25(3–4):222–234

Jajua S, Mohantyb R, Lakhe R (2009) Towards managing quality cost: a case study. Total Qual Manage 20(10):1075–1094

Kominis G, Dudau A (2012) Time for interactive control systems in the public sector? The case of the Every Child Matters policy change in England. Manage Account Res 23(2):142–155

Lal J, Srivastava S (2009) Cost accounting, 4th edn. Tata McGraw-Hill, New Delhi

Lukka K, Granlund M (2003) Management and Control in a New Economy Firm. In: Bhimani A (ed) Management accounting in the digital economy. Oxford University Press, Oxford, pp 239–259

Makhopadhyay A (2004) Estimation of cost of quality in an Indian textile industry for reducing cost of non-conformance. Total Qual Manag Bus Excel 15(2):229–234

Naranjo-Gil D, Hartmann F (2006) How top management teams use management accounting systems to implement strategy. J Manage Account Res 18(1):21–53

Perera S, Harrison G, Poole M (1997) Customer-focused manufacturing strategy and the use of operations-based non-financial performance measures: a research note. Accoun Org Soc 22(6):557–572

Prickett T, Rapley C (2001) Quality costing: a study of manufacturing organizations. Part 2: main survey. Total Qual Manage 12(2):211–222
Roberts H (2003) Management Accounting and the Knowledge Production Process. In: Bhimani A (ed) Management accounting in the digital economy. Oxford University Press, Oxford, pp 260–283
Sansalvador M, Brotons J (2013) Quality costing analysis: a case study of a Spanish organisation. Total Qual Manag Bus Excel 24(4):378–396
Scott T, Tiessen P (1999) Performance measurement and managerial teams. Accoun Org Soc 24(3):263–285
Shane S (2003) A general theory of entrepreneurship: the individual-opportunity nexus. Edward Elgar Publishing, Northampton, MA
Simons R (1995) Levers of control: how managers use innovative control systems to drive strategic renewal. Harvard Business School Press, Boston, MA
Slater S, Narver J (1995) Market orientation and the learning organization. J Market 59(3):63–74
Smith M (2005) Performance measurement & management – a strategic approach to management accounting. SAGE Publications, London
Sower V, Quarles R, Broussard E (2007) Cost of quality usage and its relationship to quality system maturity. Int J Qual Reliab Manage 24(2):121–140
Sundbo J (2001) The strategic management of innovation: a sociological and economic theory. Edward Elgar Publishing, Cheltenham, UK
Tippins J, Sohi R (2003) IT competency and firm performance: is organizational learning a missing link? Strategic Manage J 24(8):745–761
Van de Ven A, Engleman R (2004) Central problems in managing corporate innovation and entrepreneurship. In: Shepherd A, Katz J (eds) Corporate entrepreneurship. Elsevier, Amsterdam, pp 47–72
Vaxevanidis N, Petropoulos G, Avakumovic J, Mourlas A (2009) Cost of quality models and their implementation in manufacturing firms. Int J Qual Res 3(1):27–36
Yang C (2008) Improving the definition and quantification of quality costs. Total Qual Manage 19(3):175–191
Zoolo M, Winter S (2002) Deliberate learning and the evolution of dynamic capabilities. Organ Sci 13(3):339–351

Chapter 7
Processes Approach, Quality Management and Key Business Results

Rafael Periañez-Cristobal, Arturo Calvo-Mora, and Antonio Navarro-García

Abstract A great deal of research has shown how quality management (QM) can help organizations to improve their performance. The indispensable elements for QM to produce the desired effect are called critical factors. Among those, process approach is considered a management principle and a fundamental requirement in QM implementation framework. In Europe, the most frequently used frameworks are the international family of standards, ISO 9000, and the EFQM excellence model. In this context, the paper aims to (1) describe the practical implications of process management system; (2) analyse the impact of implementation actions on classical schemes of management and the structural design of organizations; and, (3) provide evidence of how process management is positively related with key organizational business results. For this purpose, the study uses a sample of 225 Spanish firms which have been subjected to complete assessment processes according to the EFQM model.

7.1 Introduction

The connection between the application of the principles and techniques of quality management and obtaining results has been an important object of research for years. The subject has evident importance as the implementation of quality systems (with all the implications it entails regarding cultural change, production of documentation, implementation of new working methods, investments in R&D,

R. Periañez-Cristobal (✉) • A. Calvo-Mora • A. Navarro-García
Departamento de Administración de Empresas y Márketing, Universidad de Sevilla
Avda.Ramón y Cajal 1, Sevilla 41018, Spain
e-mail: rafacris@us.es; schmidt@us.es; anavarro@us.es

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permanent analysis of the market, implementation of new technologies and management techniques, continuous improvement activities, etc.) involves assuming costs which must be seen to be compensated by obtaining results that are clearly differentiated, with respect to organizations which orient their management systems in other directions.

Nevertheless, the different ways in which researchers interpret the true significance and practical implications of adopting a TQM strategy, together with the existence of some research which question the importance of quality management as an instrument for the achievement of excellent results, has brought about a knowledge gap that obliges new evidence on the matter to be sought (Kim et al. 2010). It becomes necessary, therefore, to start with an approach that characterizes the key elements of a reliable quality management, based on a generally recognized scheme or model, from which to define those variables which most precisely determine a TQM system and the results that might be expected from it.

Among the models with greater prestige within the organizational world, that proposed by the European Foundation for Quality Management (EFQM) undoubtedly stands out. Without detracting importance from the use of other approaches which are more focused on the design of management systems and quality assurance (ISO 9000, for example), it is evident that the EFQM Model approaches the implementation of quality management under the premise of "Excellence", which grants it a broader and more ambitious character in terms of expected results. It is also more in accordance with what would be expected of a modern, economically and socially profitable organization, aware of the impacts that its activity exerts on multiple stakeholders whose expectations and levels of satisfaction must be properly managed.

Starting from these considerations, the present work approaches the empirical verification of the relationship between those organizations which base their management on the premise of excellence according to the EFQM model, and the achievement of key results at both operational and strategic levels. Within this general framework the study assumes that, within the multiple facets which characterize quality management, the implementation of process management systems constitutes a necessary, although insufficient, condition to be able to properly speak of true excellence. However, this understanding is not exclusive to the management approaches based on models of excellence. In fact, all the internationally recognized management schemes (from those which seek excellence to those which limit their objectives to achieving high levels of quality assurance in products and services) assume that without process management it becomes impossible to hope to achieve excellent results.

To achieve the proposed objectives, the chapter has been structured in the following manner. Firstly, the theoretical framework is presented, defining the key concepts of process management, its different stages, and the EFQM model. The theoretical framework allows the establishment of the research hypothesis which will be examined. Secondly, the research methodology is defined from an empirical study with a sample of 225 companies which apply the EFQM model. Thirdly, the data are analysed and the results are obtained, to finally offer the main conclusions of the work.

7.2 Theoretical Background

7.2.1 Processes Management Methodology

When an organization has designed its hierarchy and its departmental structure, it has already established a consistent reference framework based on coordination by means of direct supervision to make decisions and to confront certain recurrent problems. Nevertheless, the compartmentalization of organizational activity into jobs and differentiated departments can generate serious coordination problems. Internally this causes the organization to suffer losses of efficiency through non-quality costs and the client is affected by receiving products and services that do not always satisfy their expectations (Çiflikli and Kahya-Özyirmidokuz 2012).

Process management links the activities of the posts and the departments by means of a standardized working system that specifies the actions to seek maximum possible efficiency, whilst obtaining predictable results to satisfy client expectations. When a process management is designed and implemented it is necessary to adopt a horizontal and dynamic view of the organization that is clearly different from the strictly vertical and static nature, indicated by its organizational chart (Armistead et al. 1999). The complete commissioning of a process management system obliges a series of well-defined stages to be followed:

- Process identification. Classification, sequencing and analysis of interactions. Process mapping.
- Process prioritization. Description and standardization of key processes.
- Process monitoring and control systems: Indicators.
- Process improvement.

7.2.1.1 Processes Identification. Classification, Sequencing and Analysis of Interactions. Process Mapping

The processes of the organization exist prior to the implementation of the system. In this first stage, an analysis is made of what is already done, and homogenous and coherent sequences of activities (processes) are located which allows the analysis of the work of the organization (Çiflikli and Kahya-Özyirmidokuz 2012). There is no infallible technique for the identification of the processes, although some general guidelines can be given. If an organization specifies the mission, identifies the targets of its work, and clarifies its sustainable competitive advantage, it will also know how its activity is realized and who it affects or has a legitimate interest in it. The organization's products or services are the result of chains of activities that can be analysed one by one. A simple reflection on the stages that lead to obtaining each product or service, and on the elements upon which the competitive advantage of the organization are based, will allow most of the so-called "key" or "operational" processes to be identified (Singh 2012). Clearly, those are not its only activities, and

all the others will also have to be identified and analysed in homogenous blocks whenever they lead to obtaining results with sufficient weight to be considered as "processes". Once all the processes have been identified (including the sub-processes of lesser weight that they might contain) they will be classified and placed in the most suitable position within the process map (as "key", "strategic" or "support" processes) (Pardo-Álvarez 2012).

It is logical that all, or a good part, of them are interconnected. When the process map is compiled and each process is put in its corresponding position, it will be necessary to consider the most important relationships that occur among them. The activities which comprise each process are of course related, but the processes are also related to each other. Although the identification of each process already supposes the establishment of a series of interdependences between the activities that compose it, some interdependences between differentiated processes can be very important for the correct operation of the organization (Palmberg 2010). Identifying them, and later reflecting on the best way to handle them, must also be an important part of the process management system.

7.2.1.2 Processes Prioritization. Description and Standardization of Key Processes

Converting a process of certain complexity into a standardized procedure can involve considerable work if it is required to be done with rigour. If it were to be done with all the processes of the organization, the task would be enormous and the effort-benefit ratio would probably not be profitable. There must be scrupulous selection of the processes to be standardized and of those which will not. Only those processes which exert a special control on both the development and the results of the organization will be subjected to this standardization mechanism (Shahin and Mahbod 2007).

Consequently, the identified processes must be prioritized. The criteria to be considered in each case in order to carry out this task will depend on the circumstances of the organization, the characteristics of its work, the way it performs such work (its know-how), and on the hierarchical and departmental configuration that has been decided to be used in its structure. As a minimum, the "key" processes, the results of which ultimately impact directly on the client, would have to be standardized (Repa 2011). This does not exclude the application of different criteria to select other processes, whether supporting or strategic. Among other criteria, organizations often use some of the following:

- Emergencies posed by the process
- Resources consumed in its execution
- Possible demands of legality
- Level of predictability of the actions and the results
- Need for restructuring due to the application of new technologies or working methodologies
- Feasibility of accomplishing the standardization
- Impact on interested third-parties, etc.

When the organization has decided on the processes to be standardized, it will have to make a detailed analysis of how each is undertaken to be able to describe them exhaustively. All the resulting information will shape its Procedures Manual (Bell and Omachonu 2011), the writing of which will have completed one of the most important parts of that organization's quality system documentation. For each process that is standardized the following information, at least, will have to be specified:

- Code and name of the process.
- Current edition and date of entry into force.
- Mission or objective that the process pursues.
- Scope (interval of activities that the process includes).
- Organizational units linked to the execution of the process activities.
- Proprietor of the process. This will be the person who is assigned the responsibility of catalysing all the activities that comprise the process, with independence from the department that executes them in each case.
- Regulations (of a strictly legal character, or dictated by the organization itself) which must be generally considered when executing the process.
- Detailed and sequential description of the activities of the processes, indicating the positions and departments which execute them. The technical instructions which could be associated with some of those activities will be included.
- Records associated with the execution of the process. They will serve as proof of the way in which the process has been developed and to thus have primary data for continuous improvement.
- Clients and Suppliers (internal and external) of the process.

7.2.1.3 Processes Monitoring and Control Systems: Indicators

The monitoring and control of a process requires the previous establishment of sensors that can alert to the appearance of anomalous situations. The process indicators fulfil this purpose (Kronz 2006). An indicator is any magnitude (absolute or relative) obtained from primary data that allows the characteristics of a given situation to be known, described or evaluated. To speak of indicators is to speak of measurement, and, for that reason, it is essential that all those that are established are reliable (must be consistent and credible) and valid (it must be shown that they actually measure what is desired to be measured). The indicators are measures that summarize important situations whose evolution over time is of interest. They are constructed from the information available and are designed to give answers to concrete questions formulated for a specific context. They are the product of a selection and must be produced from the possibilities offered by the data extracted from the operation of the process (Parmenter 2010).

All processes must be associated with their corresponding indicators, and the possibility of obtaining them with available means, must be ensured (feasibility). It is not a question of calculating an enormous amount of indicators, nor of conducting complex mathematical operations or calculations devoid of practical use for control and improvement. Formulas must be sought that can be applied without great

difficulties, or because the data are easily accessible, or because there are other data that are easily deduced from information the organization already handles, even though it may be for another purpose. In short, it must be ensured that there are information systems that effectively allow the proposed indicators to be calculated with normality (Fanning and Centers 2013).

For each selected indicator the following elements, at least, would have to be specified:

- Code and name
- Mathematical formula
- Regularity and circumstances in which it will be calculated
- Limiting value/s, which will alert to the moment the process is out of control and requires rapid action
- Objective value/s, indicative of the desired or optimal values of the indicator
- Those responsible for the taking of data, measurement, monitoring of the results and liaising with the decision centres on the data obtained.

7.2.1.4 Processes Improvement

Process management must represent a permanent systematic performance and not a sporadic way of acting to manage the work of the organization. Process management attempts to improve the coordination and the operation of the organization, not as an aim in itself but as the instrument that must allow the permanent improvement of efficiency and the best service to the client. To summarize, it is a system that attempts to make the reduction of costs (by avoidance of failures) compatible with the increase in market satisfaction levels, all by means of a fluid operation of the structural design (Trkman 2010).

Looking at the problem from this perspective, it is evident that mechanisms must be implemented to permanently advance in the two directions: improvement of efficiency and of the products/services offered to the market. Assuming that perfection does not exist, it is a matter of using the available information to find what does not appear satisfactory and to act consequently through gradual improvements. The base information for this improvement will be given, fundamentally, by the values obtained from the indicators and by the nature of the records or evidence that remain after the execution of the process. Those which give clues about the failures will be those which will allow reflection on the best way to avoid their repetition (Neely et al. 2000).

The best way to approach this systematic improvement is to constantly pose elementary questions relative to different aspects of the execution of each process: what is really pursued with each action; is it certain that each activity is being undertaken by the most appropriate position; can we be completely sure that the times at which the tasks are undertaken are the correct ones, etc. The improvement of efficiency and the generation of added value must be basic criteria in process improvement. As a general rule, it is possible to clearly state that all those activities which do not contribute value (the concept of "value" as understood beyond its mere economic meaning) must be eliminated (Zellner 2011).

From a quality standpoint, process improvement must be considered as a gradual process of team-work in which the ideas of all the members of the organization can have a place. In an optimal situation, the improvement process will assume the existence of certain starting situations that cannot be radically changed overnight. It is as unrealistic to propose improvement as a mere theoretical speculation abstract from the existing reality, as it is to take everything that exists as good. The implementation of technological improvements and the innovation stemming from the creativity of the people, must coexist harmoniously so that process management is consolidated as a dynamic system, and is constantly evolving to become ever more adapted to the improvement of efficiency and to the expectations of the clients (Ahire and Dreyfus 2000).

As a summary, it could be said that process management involves, to a certain extent, the introduction of the perspective of using the market to evaluate the suitability of the work developed by the organization into its daily management. Contrary to a management based exclusively on the departmental compartmentalization of tasks (and which are taken directly from the organizational chart), process management works with complete sequences of activities which, finally, materialize in what the client receives, perceives and values. Concern for each of the stages of a process understood in isolation does not always lead to an efficient whole that is in line with market demands. One of the functions of the proprietor of each process will be to ensure the coordination of its activities from a global perspective (Rummler and Brache 2013). The benefit of this global perspective (which, to a certain degree, is not concerned with means, but only with ends) will be evident later when the client judges the quality of the work of the organization and its conformity with their expectations.

7.2.2 Processes Management and the EFQM Model

7.2.2.1 The EFQM Excellence Model

The aim of the EFQM model is to support organizations to achieve business excellence through continuous improvement, learning, innovation and the deployment of key processes. Furthermore, it is a basis for the use of a language and a way of thinking that is common in European organizations. The model presents a non-prescriptive work framework that analyses the relationships between what an organization does, and the results that it is able to attain, assuming that there are different approaches to attaining excellence.

The EFQM model includes eight *fundamental concepts of excellence* and nine *criteria.* The fundamental concepts outline the foundation for achieving sustainable excellence in any organization. They can be used as the basis to describe the attributes of an excellent organizational culture. The criteria that the model proposes represent the indicative elements of the degree of progression that a certain organization follows to achieve excellence. These criteria, or dimensions, are

specified in five key implementation factors or enablers (what the organization "does and how it does it"), and the four remaining dimensions reflect the results that the organization attains, concerning their customers, employees, society and other key results.

The logic of the model is based on the fact that achieving excellent results in the four former management areas (customers, employees, society and strategy) is directly related to the leadership capacity, the strategy quality and its deployment through people, partners, resources and processes (EFQM 2012). Moreover, the EFQM model has a dynamic nature. It indicates that activities such as innovation, learning or creativity, boost and empower the impact that the model's agents have on the results. This refers to the system's continuous improvement in the search for excellence.

7.2.2.2 Processes Management in the EFQM Model

Criterion 5 of the EFQM Model (EFQM 2012) is reserved for analysing the way an excellent organization manages its processes. It specifically states that "*Excellent organizations design, manage and improve their processes, products and services to generate ever greater value for their clients and other interest groups"*. To contribute greater detail to this generic statement, EFQM Model 2003 established 5 differentiated sub-criteria (Club Gestión de Calidad 2005). Two of them (5a and 5b) deal generically with the systems of design, management, innovation and improvement of the organization's processes, without differentiating between their characteristics. The other three (5c, 5d and 5e) are reserved for dealing specifically with the processes termed operational or key because of the way they affect the basic elements of the value chain of the organization: development of products and services, production delivery and ancillary services, and, finally, relationships with the clients (EFQM 2012).

The conceptual scheme followed by the EFQM Model is perfectly consistent with the systematic of implementing the process management raised in the previous point. It starts with the identification of all the processes inherent to the work of the organization; these are classified taking into account their particular nature towards fulfilling the mission; and the pertinent responsibilities are assigned within the hierarchy to ensure effective coordination of activities. As has been noted, only those processes which display a special criticality will be formalized or standardized to ensure, as far as possible, that predictable results are attained. Among these processes worthy of special analysis are, without a doubt, those most bound to the basic activities of the value chain of the organization. Their correct management and control will enable high levels of client satisfaction to be attained. The effective implementation of process management necessarily entails the start-up of continuous improvement systems which enable learning from experience, improvement of results and, ultimately, to provide the market with the products and services which satisfy its needs and at prices that match its expectations.

7.2.3 *Processes Management and Key Business Results*

Process management is a key factor for effective quality implementation that has the greatest consensus in the TQM literature (Curkovic et al. 2000). The EFQM model establishes process management as being the nexus between the remaining key implementation factors and the measurements of the results. Therefore, Claver et al. (2003) point out that organizations act more effectively in achieving their aims and in obtaining better results when all their activities are systematically developed, administered and improved through processes.

In the industrial area, process management implies the development of activities such as the management, control and improvement of all the phases of design and manufacturing, the preventative maintenance of teams, the statistical control of processes, and the reduction of inspections or process variability (Fotopoulos and Psomas 2010). These aspects are positively related to productivity or economic efficiency (Flynn et al. 1994; Curkovic et al. 2000). To compete in the markets, firms must back the prevention of errors and a key process management that leads them to fulfil customers' requirements and specifications and the achievement of excellent results (Murat et al. 2004). In the services area, process management is associated with service provision (Prajogo 2005). This is the determining factor of how clients perceive its quality and, therefore, their satisfaction level. Perception is assessed via tangible elements, reliability, security, empathy, and response capacity (Parasuraman et al. 1994).

In fact, process management is a broad concept that includes the design of products, services and organizational processes which fulfil the expectations of the clients and others stakeholders, the prevention of errors, control and continuous improvement, the search for zero-defects, cycle time reduction and innovation (Sila and Ebrahimpour 2003). These aspects have a direct impact on the operational and economic results of any type of business (Kaynak 2003). From the aforementioned, we can put forward the following hypotheses:

H1: The companies which manage their processes more in accordance with the EFQM model obtain better key strategic results than those that do not.
H2: The companies which manage their processes more in accordance with the EFQM model obtain better key operational results than those that do not.

7.3 Methodology

7.3.1 *Sample*

The sample is composed 225 Spanish companies that have undergone self and external assessment processes on the basis of the EFQM Excellence Model between 2003 and 2010. The sample includes large companies, as well as small and medium

Table 7.1 Sample characteristics

	Frequency	Percentage
Ownership of Capital		
Private	188	83.5
Public	37	16.5
Total	225	100
Company size		
Small and medium	146	64.8
Large	79	35.2
Total	225	100
Type of business		
Services	161	71.5
Manufacturing and construction	45	20
Agriculture and mining	19	8.5
Total	225	100

sized companies (SMEs), according to the definition by the European Commission (Recommendation of the European Commission 96/280/EC). In addition, as can be seen in Table 7.1, the sample also includes companies of the main sectors of activity (primary, secondary and tertiary), as well as privately and publically owned companies.

7.3.2 Measures

The variables and their respective measurement indicators were obtained from the EFQM Model (EFQM 2003). Specifically, *Processes* and the measurement of results which refer to *Key results* are analysed (Table 7.2).

7.3.3 Data Analysis and Results

Data analysis was performed on the available information. Firstly, the reliability of the measurement scales was verified. Thus, Cronbach's alpha values were obtained, both for the process management indicators (0.911) and for the key results (0.900), which can be considered excellent following the recommendations of George and Mallery (2003), as they exceed the value of 0.9. Therefore, the scales associated with process management and key results are reliable.

Next, the sample companies were differentiated according to the process man - agement developed and key results attained. This involved calculating, in each company, the process management aggregate index, defined by the average value of the process management indicators. Subsequently, the average value of the process management index, as well as the key results, were calculated for the total of the companies. Comparing the individual value of the indices, of processes and results,

Table 7.2 Measures

EFQM Criteria
Criteria 5 → Processes
5a. Systemic design and management of the processes
5b. Introduction of the necessary improvements via innovation, in order to fully satisfy the customers and other interest groups, increasingly generating a greater value
5c. Design and development of the products and services based on the needs and expectations of the customers
5d. Production, distribution and attention service of the products and services
5e. Management and improvement of the relationships with customers
Criteria 9 →Key results
9a. Key performance outcomes. These measurements include:
(1) Economic and financial results: (a) General data → sales volume, share or dividend prices; (b) Aspects related to profitability → gross margins, share profits, profits before interests and taxes or operating margin; (c) Information about investments and assets → profitability of invested capital, of net assets, of capital used, etc.
(2) Non-economic results: Market share, time of launching new products, success indices, processes performance, etc.
9b. Key performance indicators. These measurements include:
(1) Economic and financial measurements: treasury, depreciation, maintenance costs, credit qualification, etc.
(2) Non-financial measurements: (a) Processes → performance, assessments or innovations; (b) External resources → performance of suppliers, nº and added value of partnerships, nº and added value of joint improvements attained with partners; (c) Buildings, teams and materials → indices of defects, inventory rotation, use; (d) Technology → rhythm of innovation, value of intellectual property, patents, royalties; (e) Information and knowledge → accessibility, integrity, value of intellectual capital.

Table 7.3 Contingency table

	Key performance outcomes				Key performance indicators			
	0		1		0		1	
Independent (Processes)	n	%	n	%	n	%	n	%
0 = below average	71	31.5	33	14.6	76	33.7	28	12.5
1 = above average	33	14.6	88	39.3	38	16.9	83	36.9

in each company with the total average of the sample, differentiation was made between those companies that undertake process management more (or less) in accordance with the EFQM model and/or obtain better (or worse) results than the average. Thus, the group catalogued as 1 includes companies that are above average, and group 0 includes those below average, in process management or in key results. This allowed the sample to be divided into 4 sub-groups and thus for each of the key results considered (Table 7.3).

Against this background, Table 7.3 reflects that the proportion of companies that obtain better than average results, as much in strategic terms as operational, are those which tend to undertake process management in their organization more in accordance (above the average) with the EFQM model.

Table 7.4 Chi-Square test for contingency tables

	$\chi 2$	Degrees of freedom	p-value
H1: Processes—Key performance outcomes	37.816*	1	0.000
H2: Processes—Key performance indicators	38.856*	1	0.000

Note: * $p<0.05$

Table 7.5 Analysis of the corrected standardized residuals for contingency tables

	Key performance outcomes		Key performance indicators	
Processes	0	1	0	1
0 = below average	6.149*	−6.149*	6.233*	−6.233*
1 = above average	−6.149*	6.149 *	−6.233*	6.233*

Note: * $p<0.05$ (standardized residuals in absolute value greater than 1.96)

Chi-Square test was used to compare averages, and the results shown in Table 7.4 confirm the existence of significant differences ($p<0.05$) in terms of key, operational and strategic results, based on the process management undertaken in the organization.

The analysis of the corrected standardized residuals (Table 7.5) confirms, in the proposed direction, the mooted research hypotheses. Thus, in the group of companies with process management in accordance with the EFQM model, the frequencies observed in relation to the key results, both strategic (6.149) and operational (6.233) are significantly greater than the expected frequencies. The opposite occurs with those companies whose process management is below average, whose observed frequencies are significantly smaller than those expected for both key results (−6.149; −6,233). Therefore, hypotheses H1 and H2 are confirmed.

In summary, the obtained results confirm the hypothesis of the existence of a positive, and statistically significant, relationship between the development of process management more in accordance with the EFQM model and the achievement of superior key results, both in strategic and operational terms.

7.4 Conclusions

This work shows that the conceptual scheme followed by the EFQM Model is perfectly consistent with the systematics of process management implementation. It can generate a positive and direct impact on the strategic and operational results of the organization. It must be taken into account that the aim of the EFQM model is to support organizations to achieve business excellence, through continuous improvement, learning, innovation and the deployment of key processes.

Process management in relation to the EFQM model enables standardizing actions, increasing the effectiveness and efficiency of human resources, and the use of technology, increasing the probabilities of satisfying the expectations of the client.

It generates value in the supply of the organization's products and services, increasing the probability of obtaining key results that are superior to the competition.

The results obtained corroborate the hypotheses that those companies which undertake process management in accordance with the principles of the EFQM model obtain better key results, in strategic and operational terms, than those that do not. For that reason, it is advisable that the companies which follow the EFQM model systematize the processes undertaken in their organizations, as soon as possible, as this will have positive effects on the results of the activity in the medium to long term.

References

Ahire SL, Dreyfus P (2000) The impact of design management and process management on quality: an empirical investigation. J Oper Manag 18:549–575

Armistead C, Pritchard JP, Machin S (1999) Strategic business process management for organizational effectiveness. Long Range Plann 32(1):96–106

Bell M, Omachonu V (2011) Quality system implementation process for business success. Int J Qual Reliab Manag 28(7):723–734

Çiflikli C, Kahya-Özyirmidokuz E (2012) Enhancing product quality of a process. Ind Manag Data Syst 112(8):1181–1200

Claver E, Tarí JJ, Molina JF (2003) Critical factors and results of quality management: an empirical study. Total Qual Manag 14(1):91–118

Curkovic S, Vickery S, Dröge C (2000) Quality-related action programs: their impact on quality performance and firm performance. Decis Sci 31(4):885–905

Club Gestión de Calidad (2005) Interpretando el Modelo EFQM de Excelencia, CGC, Madrid

EFQM (2003) EFQM excellence model. European Foundation for Quality Management, Brussels

EFQM (2012) Modelo EFQM de Excelencia. European Foundation for Quality Management, Madrid

Fanning K, Centers DP (2013) Intelligent business process management: hype or reality? J Corp Account Financ 24(5):9–14

Flynn B, Schroeder RG, Sakakibara S (1994) A framework for quality management research and an associated measurement instrument. J Oper Manag 11(4):339–366

Fotopoulos CV, Psomas EL (2010) The structural relationships between TQM factors and organizational performance. Total Qual Manag Bus Excel 22(5):539–552

George D, Mallery P (2003) SPSS for Windows step by step: a simple guide and reference. 11.0 update, 4th edn. Allyn & Bacon, Boston

Kaynak H (2003) The relationship between total quality management practices and their effects on firm performance. J Oper Manag 21:405–435

Kim DY, Kumar V, Murphy SA (2010) European foundation for quality management business excellence model: an integrative review and research agenda. Int J Qual Reliab Manag 27(6):684–701

Kronz A (2006) Managing of process key performance indicators as part of the ARIS methodology. In: Scheer AW et al. (eds) "Corporate performance management. ARIS in practice". Springer Berlin, Heidelberg, New York, pp 31–44

Murat JA, Yasin M, Zimmerer T (2004) TQM practices in service organizations: an exploratory study into the implementation, outcome and effectiveness. Manag Serv Qual 14(5):377–389

Neely A, Mills J, Platts K, Richards H, Gregory M, Bourne M, Kennerley M (2000) Performance measurement system design: developing and testing a process-based approach. Int J Oper Prod Manag 20(10):1119–1145

Palmberg K (2010) Experiences of implementing process management: a multiple case study. Bus Process Manag J 16(1):93–113
Parasuraman A, Zeithaml VA, Berry LL (1994) Reassessment of expectations as a comparison standard in measuring service quality: implications for further research. J Market 58:114–124
Pardo-Álvarez JM (2012) Configuración y usos de un mapa de procesos. AENOR Eds, Madrid
Parmenter D (2010) Key performance indicators. Developing, implementing and using winning KPIs. Wiley, Hoboken, New Jersey
Prajogo DI (2005) The comparative analysis of TQM practices and quality performance between manufacturing and service firms. Int J Serv Ind Manag 16(3):217–228
Repa V (2011) Building the process-managed organization by means of services. J Syst Integr 2:11–16
Rummler GA, Brache AP (2013) Improving performance: how to manage the white space on the organization chart, 3rd edn. Wiley, San Francisco, CA
Shahin A, Mahbod MA (2007) Prioritization of key performance indicators: an integration of analytical hierarchy process and goal setting. Int J Prod Perform Manag 56(3):226–240
Sila I, Ebrahimpour M (2003) Examination and comparison of the critical factors of total quality management (TQM) across countries. Int J Prod Res 41(2):235–268
Singh PK (2012) Management of business processes can help an organization achieve competitive advantage. Int Manag Rev 8(2):19–26
Trkman P (2010) The critical success factors of business process management. Int J Inform Manag 30:125–134
Zellner G (2011) A structured evaluation of business process improvement approaches. Bus Process Manag J 17(2):203–237

Chapter 8
Quality Management Systems ISO 9901 and the Use of High Involvement Work Practices

Amable Juárez-Tárraga, Jose Miguel Albarracin-Guillem, Marta Palmer-Gato, and Juan A. Marin-Garcia

Abstract Quality management systems place great emphasis upon HR management as a key factor in assuring the attainment of an organization's objectives, given that they can sustain the competitive window and bring great efficiency, being a valuable and intangible active factor in an organization. Starting from this vision, and by applying a purely instrumental point of view centered upon results, in this chapter we will analyze to what extent the implementation of a quality management system based on the application of ISO 9001 favors the putting into action of High Involvement Work Practices, and what is the impact of this on the results of the organizations.

High Involvement Work Practices or High Performance Work Practices (HIWP or HPWP) are a group of HR management practices that act synergistically and improve the organizational efficiency by creating work conditions that increase employee satisfaction, incentivize closeness and loyalty to the company and create an environment where work tasks are better performed.

8.1 Introduction

The ISO 9001 forms part of the ISO 9000 family of quality management system standards which were produced at the heart of the ISO/TC 176 committee (see http://www.iso.org/iso/iso_9000), and is currently made up of.

A. Juárez-Tárraga (✉) • J.M. Albarracin-Guillem • M. Palmer-Gato • J.A. Marin-Garcia
Departamento de Organización de Empresas, Universitat Politècnica de València, Camino de Vera, Valencia 46022, Spain
e-mail: amjua@omp.upv.es; jmalbarr@omp.upv.es; marpalga@doe.upv.es; jamarin@omp.upv.es

M. Peris-Ortiz and J. Álvarez-García (eds.), *Action-Based Quality Management: Strategy and Tools for Continuous Improvement*, DOI 10.1007/978-3-319-06453-6_8,

Table 8.1 Needs and expectations of the stakeholders (Source ISO 9004:2009)

Interested party	Needs and expectations
Customers	Quality, price and delivery performance of products
Owners/shareholders	Sustained profitability
	Transparency
People in the organization	Good work environment
	Job security
	Recognition and reward
Suppliers and partners	Mutual benefits and continuity
Society	Environmental protection
	Ethical behaviour

- ISO 9000:2005 "Quality management systems—Fundamentals and vocabulary". Covers the basic concepts and language.
- ISO 9001:2008 "Quality management systems—Requirements". Sets out the requirements of a quality management system
- ISO 9004:2009 "Managing for the sustained success of an organization—A quality management approach". Focuses on how to make a quality management system more efficient and effective
- ISO 19011:2011—"Guidelines for auditing management systems". Sets out guidance on internal and external audits of quality management systems.

The standard ISO 9004 proposes the following example to identify the stakeholders (Freeman 1984) in the sustained success of a company, though this can differ significantly over time and between organizations, industries, sector and environment.

As is shown in the Table 8.1, each interested party has different needs and expectations regarding the sustained success of the company, but with regard to owners and shareholders the principal objective of any company is to maximize the economic efficiency and/or the shareholders' dividends (Becker et al. 1998).

The implementation of Quality Management (QM) tools and the use of ISO 9001 had received a high degree of attention in extant literature. Several research papers attribute superior firm performance to adoption of QM practices, and while there have been doubts about QM's return on the investment, more recent research found that effective implementation of QM practices will contribute to better financial, marketing, and even innovation performance by improving quality performance and/or operational performance (Nair 2006).

In the concrete case of the influence of human resource on quality management systems, the meta-analysis undertaken by Nair in 2006 (Nair 2006) shows that people management has a positive relationship with aggregate performance, financial performance and operational performance. This reaffirms the importance attributed to the human resource management component of QM practices, including ISO 9001.

In the current environment two main Quality Management tendencies co-exist, and offer two distinct models:

- To adopt a normalization focus and design a quality system using the standard ISO 9001 as reference.
- To consider one of the models that underlie the quality awards as a base for quality management. The principal awards, at an international level, are the Deming Award in Japan, the Malcolm Baldridge National Quality Award (PNCMB) in the USA, and the European Quality Award, given by the EFQM.

In this chapter we will focus on the first of these models, the regulatory one; firstly because of its wide diffusion in Europe, and secondly because it is commonly the first phase that companies use when they consider implementing the EFQM model. EFQM.

With regard to the motives that push a company to contemplate the implantation and posterior certification of a quality management system based upon ISO 9001, two fundamental aspects can be identified that can be combined in variable proportions depending upon the organization:

- External motives: pressure from clients, utilization of the certification as an argument for sales with commercial or image goals.
- Internal motives: to utilize the certification as a management tool within the organization.

Those studies that analyze company motivation to implant ISO 9001 give higher relevance to external motives, which is to say pressure from customers or publicity aims (Hughes et al. 2000). However, companies obtain better results when the motivation to implant an ISO 9001 quality management system is internal (Manders et al. 2013; Martínez-Costa et al. 2009)

In the first case, companies tend not to go deeply with the implantation of the requirements marked out by the standard, and stay with the minimum demanded for certification; while those organizations that use the certification as a management tool from the beginning of the process are those that are able to take full advantage of the improvements, just as much in work methods as in result indicators that are obtained following the implantation of the quality system (Martínez-Costa et al. 2009)

Independently of the motive that pushed the company towards ISO 9001, the implantation process as much as the posterior maintenance are not easy tasks, and the result depends in great part on appropriate human resource management, requiring the assurance that the knowledge, preparation and above all appropriate attitude and motivation are taken into account at all times (Alfalla-Luque et al. 2012; Marin-Garcia 2002).

We will start this chapter by undertaking a brief introduction to HIWP, to be able to afterwards analyze ISO 9001:2008, including a brief reference to the changes that are being considered in the new version, ISO 9001:2015 in that which concerns personnel management. We will also analyze ISO 10018, and we will evaluate, at a descriptive level, to what extent high involvement practices fit within the framework of these standards.

The results of this analysis will aid company managers as well as HR and quality management consultants to identify which of the HIWP tools are clearly identified in the ISO 9001 standard, and which are not, with the goal of establishing the starting point laid down by ISO 9001, and thus approach the next stage with a higher level of success in the implementation of these tools.

8.2 High Involvement Work Practices

Faced with the most traditional management practices, HIWP has as its basic objective the improvement of worker capacity and their greater involvement in the firm. It can be considered that those companies that develop these practices to the greatest extent are those that present the most advanced or proactive HR strategy (Ordiz-Fuertes and Fernandez-Sanchez 2003).

The definitions of the HIWPs all have different nuances according to the investigators that analyzed their use and consequences, although in general all coincide in that there is a relationship to the results of the company (Conci 2012; Marin Garcia and Conci 2013)):

- They are a group of practices of human resources management that act synergistically and improve organizational efficiency by creating working conditions that increase worker satisfaction, encourage him to be linked to the Organization and to better perform their tasks (Huselid 1995)
- High involvement work practices are a set of human resources practices that focus on giving employees opportunities to make informed decisions concerning the conduct of their Jobs (Lawler et al. 1992).
- The HIWP represent a set of Human resource management practices that transform the workforce into a source of sustainable competitive advantage, provided they use integrated with the company's strategy (Guerrero and Barraud-Didier 2004; Guthrie et al. 2002)

With respect to which practices to include in HIWP, there is no consensus amongst the investigators (Marin Garcia 2013). In 2006 a meta-analysis was published showing the results of 92 investigations in which the influence of the application of these techniques upon business performance was analyzed (Combs et al. 2006). In this meta-analysis, Combs et al. (2006) analyzes the influence of 13 practices, which are the most utilized in the investigations upon which the study is based: incentive compensation, training, compensation level, participation, selectivity, internal promotion, HR planning, flexible work, performance appraisal, grievance procedures, teams, information sharing, and employment security.

But perhaps the predominant at the moment is the AMO model (Jiang et al. 2012; Subramony 2009; Marin Garcia 2013) (Fig. 8.1).

Investigations relating to the use of, and the results obtained by, HIWP have been plentiful over recent years, and one of the most interesting questions that has

Fig. 8.1 Source: Marin Garcia (2013) reproduced with permission

come from them is to understand how high involvement systems affect a given company's results.

There are multiple investigations that show the close link between High Performance Practices and company performance. Several of these investigations stand out; Arthur (1994), Huselid and collaborators (1995, 1997), Wright and collaborators (2005) in the American context, Guthrie (2001) in companies in New Zealand, Zheng and collaborators (2006) in China, and Guest et al. (2003) in the United Kingdom.

Various investigators have also undertaken analyses, descriptive as well as quantitative, of the results of previous investigations which looked into the relationship between HR management practices and company performance. Work carried out by Boselie et al. (2005) and Subramony (2009) stands out. Boselie et al. (2005) undertook a descriptive analysis of 104 articles where the interaction between HR management and different company performance measures was evaluated, and Subramony (2009) did a meta-analysis in which the relationship between different HR management packages and company performance in 65 articles was evaluated.

Combs (2006) sets out a model in which the contributions of their meta-analysis are reflected, amongst which the below stand out:

- High Performance Practices positively affect company performance.
- High Performance Practice systems have a greater effect than the individual use of these practices.
- The identification of the three most widely analyzed elements that moderate the results obtained: company strategy (differentiation/costs), the context (fabrication/services) and the design of the investigation (selection of the performance measures).

8.3 HR in ISO 9001

The importance that ISO 9001 places upon human resources is reflected in 2 of the 8 principles purported by the standard:

Principle 2: Leadership

Leaders establish unity of purpose and direction of the organization. They should create and maintain the internal environment in which people can become fully involved in achieving the organization's objectives.

a) *Key benefits*

- *people will understand and be motivated towards the organization's goals and objectives,*
- *activities are evaluated, aligned and implemented in a unified way,*
- *miscommunication between levels of an organization will be minimized.*

b) *Applying the principle of leadership typically leads to*

- *considering the needs of all interested parties including customers, owners, employees, suppliers,*
- *financiers, local communities and society as a whole,*
- *establishing a clear vision of the organization's future,*
- *setting challenging goals and targets,*
- *creating and sustaining shared values, fairness and ethical role models at all levels of the*
- *organization,*
- *establishing trust and eliminating fear,*
- *providing people with the required resources, training and freedom to act with responsibility and*
- *accountability,*
- *inspiring, encouraging and recognizing people's contributions.*

Principle 3: Involvement of People

People at all levels are the essence of an organization and their full involvement enables their abilities to be used for the organization's benefit.

a) *Key benefits*

- *motivated, committed and involved people within the organization,*
- *innovation and creativity in furthering the organization's objectives,*
- *people being accountable for their own performance,*
- *people eager to participate in and contribute to continual improvement.*

b) *Applying the principle of involvement of people typically leads to*

- *people understanding the importance of their contribution and role in the organization,*
- *people identifying constraints to their performance,*
- *people accepting ownership of problems and their responsibility for solving them,*
- *people evaluating their performance against their personal goals and objectives,*
- *people actively seeking opportunities to enhance their competence, knowledge and experience,*
- *people freely sharing knowledge and experience,*
- *people openly discussing problems and issues.*

Taking this aspect into account, ISO 9001:2008 translates this principle into a series of requirements that the organizations need to fulfill in relation to the management of their human resources, given that they are the ones who will put the quality system into work once developed.

Presented below, in Fig. 8.2, are the guidelines laid out by ISO 9001:2008 with respect to people management, which is considered in Sects. 5.5.1 and 6.2. These guidelines establish the need to define personnel responsibilities and authority, determine the competencies needed to address the processes, undertake actions to assure that the company has the identified competences available, periodically evaluate the efficiency of the actions undertaken, promote raising awareness amongst all personnel, and to maintain records of peoples' competences.

The management of the organization has the responsibility to define the structure of the same, and to establish which activities each person should be able to undertake according to the work roles that have been designed. Although this requirement is not considered in Sect. 6.2, it is the key aspect upon which the personnel management system that lays out the standard is supported, and appears in Sect. 5.5.1 "Responsibility and authority".

Once the tasks of all the work roles created are defined, the first activity established by the standard in Sect. 6.2.2 is to determine the competence required to fill the role, i.e. what training, what experience, what education and what skills are needed by the person or persons who fill the role.

Standard ISO 9001:2008 also demands that the organization does not rest on its laurels with the actions undertaken, given that providing training or placing

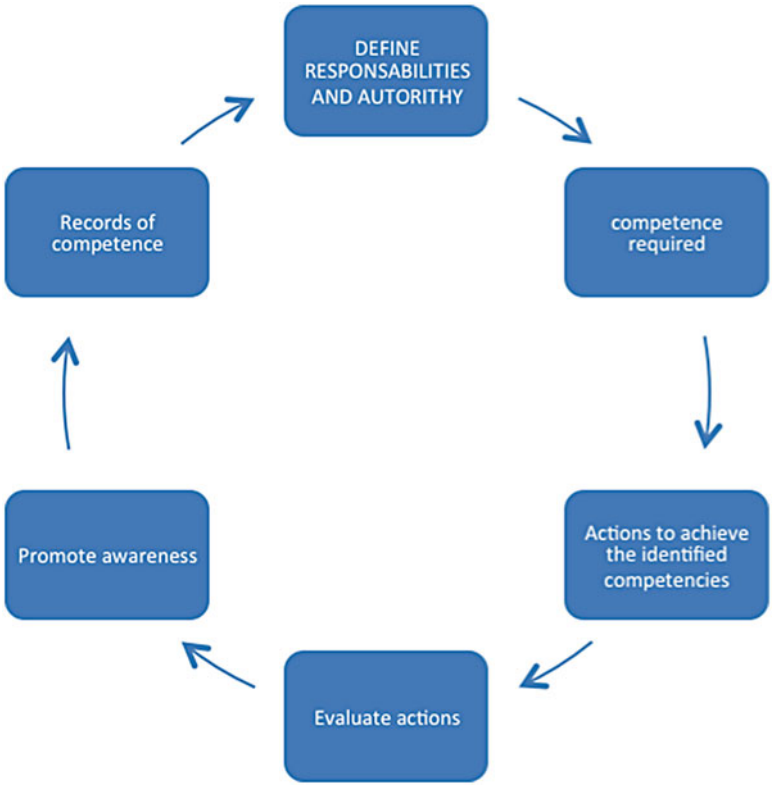

Fig. 8.2 Guidelines about HR in ISO 9001. Source: authors

competent people is not enough. It should be guaranteed that the said actions have covered the necessities, and the efficiency of those actions should be evaluated, with the objective of checking to see if the objectives laid out have been achieved, which in the last instance should result in an improvement in the capacities and results.

The requirements analyzed thus far can be assimilated into the general "know-how", but the standard also concerns itself with "want to do", given that it establishes that actions should be undertaken to ensure that the personnel is aware of the pertinence and importance of their activities and how they contribute to the achievement of the quality objectives.

In that which concerns the evidence of the activities undertaken (we must not forget that the standard centers on the efficiency of the quality management system in meeting the requirements of the customer, and that the companies can use it to "demonstrate their capacity to consistently provide products that satisfy the requirements of the customer as well as applicable legal and regulatory requirements"—section 1.1a), ISO 9001:2008 requires that the organization has within its power information and data that show the competence of its members. This means it is necessary to create records that include information about the competence prior to the incorporation and actualizations in line with how that competence grows by way of the different actions undertaken and achieved.

Fig. 8.3 HR management tools to satisfy requirements of ISO 9001:2008. Source: authors

Once the requirements of ISO 9001:2008 are analyzed, included below, in Fig. 8.3, an illustration of the relationships of the different HR management tools that can be used to satisfy these requirements.

Although it is evident that the requirements laid out by the standard with reference to HR management do not constitute a program of personnel management, they can be seen as the first steps in this direction.

After undertaking this analysis we must consider that this version of ISO 9001 is in the process of revision. On the 3rd of June 2013 the ISO TC 176 committee published the first draft of ISO 9001:2015. This new version does not lay out a formalized or cosmetic revision but in fact a deep and important revision of ISO 9001, with changes of focus and new clauses that suppose an important change of direction.

With respect to the orientation, the below stand out in the draft of the new version:

– Greater orientation toward service companies. The term "product" has been substituted for "goods and services", and some sections specific to production companies have been revised.
– Attention is focused on the total quality diagrams given that it is necessary to understand the needs and expectations of all interested parties (not just the customer's), and this obliges us to consider the socioeconomic environment of the organization in the planning of a quality system.
– The focus on processes is reinforced

– Change management. Planning and control of change gains more relevance given the importance of continuous adaption to changes in environments, which are ever less stable.
– Inclusion of risk management aspects, and the term "preventative action" disappears given that the whole system is considered as a prevention instrument.

With respect to HR management, the principal newness is centered upon:

– Organization leadership is widened and gone into in more depth. The new standard explicitly goes into the requirements of management leadership
– The new standard expressly contemplates the management of knowledge and considers it an important intangible in quality management.
– Competence management. The new version explicitly looks at the need to manage competences.

Without a doubt, these changes increase the need to put new HR management tools into practice, amongst which HIWP will have great importance, although until the definitive new version is published, changes in the content could affect HR management.

8.4 The Standard ISO 10018:2012

As was commented upon in previous section, ISO 9001:2008 does not set out a system of HR management, and following this line the technical committee ISO/TC 176 put together, in the heart of GT 15, the standard ISO 10018:2012, "Quality management—Guidelines on people involvement and competence". This standard provides a framework for getting the best out of people in the implementation of a quality management system based on ISO 9001:2008, and develops a process for encouraging personnel involvement and competence. It also reviews each element of ISO 9001, identifies typical management system problems that can occur through lack of personnel involvement, and specifies actions to overcome those problems.

In the introductory text to the standard one thing that stands out is that "the global performance of a quality management system and its processes depend upon the participation of competent persons" and that "it is very important to identify, develop and evaluate the knowledge, abilities, behavior and work environment necessary for the effective participation of those persons with the necessary competence".

ISO 10018:2012 describes:

– The processes that an organization can use to implement and maintain participation and competence in the quality management systems
– Actions that can be taken to strengthen participation
– Actions that can be taken to fulfil the individual requirements of the quality management system, such as those specified in ISO 9001, although other management system standards can be used.

In the Annex A, this standard describes the factors (13) that impact on people involvement and competence, and explains why each is important, and outlines the benefits gained from their implementation. The analysis of the different dimensions of the human factor remains centered on three aspects and for each one the putting into place of various tools is laid out:

- Leadership factors
  - Leadership (A.9)
  - Sensibilizacion (A.3)
- Personnel participation factors:
  - Communication (A.4)
  - Teamwork and collaboration (A.14)
  - Networking (A.10)
  - Discipline—Motivation (A.2)
  - Responsability and autority (A.13)
  - Recognition and rewards (A.11)
- Competence factors:
  - Recruitment (A.12)
  - Awareness (A.8)
  - Education and learning (A.6)
  - Creativity and innovation (A.5)
  - Competence (A.7)

The standard ISO 10018:2012 analyzes to what extent these factors and tools need to be applied when approaching the development and implantation of ISO 9001. In Table 8.2 the extent to which each of these tools has an application in one or various differing sections of ISO 9001:2008, with differing levels of intensity.

8.5 Relationship Between Standards ISO 9001 and ISO 10018 and the HIWP. Conclusions

As we have seen, ISO 10018:2012 sets out an important qualitative leap in relation to the requirements demanded by ISO 9001:2008 with respect to personnel management. This leap translates into a greater possibility of implanting HIWP.

Before beginning to analyze to what level each one of the analyzed standards foster the putting into use of HIWP, we are going to analyze in detail the principles of quality management that are related to HR management (principles 2 and 3), so as to determine to what level these principles leave room for the use of HIWP in the organizations. To undertake this analysis as reference we will use the AMO model described in Sect. 8.3 and we will indicate with which intensity the different practices can contribute to obtaining the results set out for with the application of these principles.

Table 8.2 Source: authors

	4.1	4.2	5.1	5.2	5.3	5.4	5.5	5.6	6.1	6.2	6.3	6.4	7.1	7.2	7.3	7.4	7.5	7.6	8.1	8.2	8.3	8.4	8.5
Awareness			**			**		**					**	*	*	*	*	*		**	**	**	**
Communication			***	**	***		**	**					**	*	*	*	*	*		**	**	**	**
Competence						***	**						*	*	*	*	*	*		*	*	*	*
Creativity										***			**	**	**	**	**	**					
Education										***													
Leadership			***			***							***										***
Motivation			***										*	*	*	*	*	*		*	*	*	*
Networking				**					***														
Recognition			***				***			***													***
Recruitment			***						***														
Responsibility			***							***													
Sensibilitation			***																				
Teamwork													***	***	***	***	***	***				**	**

Table 8.3 Relationships and intensity between principles and models Source: authors

		Ability/skill				Motivation				Opportunity to perform/Empowerment				
Principle	Results	Job description based on job analysis	Recruitment	Structured and validated tools for selection	Job based skill training	Formal performance managerial/ appraisal	Compensation/ incentives/ rewards	Promotion/ career development	Job security	Job design/ Job enrichment	Works teams/ self directed work teams	Suggestion systems (individual/ group)	Feedback from employees	Information sharing
2. Leadership	Considering the needs of all interested parties including customers, owners, employees, suppliers, financiers, local communities and society as a whole									*			*	*
	Establishing a clear vision of the organization's future					*								
	Setting challenging goals and targets					**								
	Creating and sustaining shared values, fairness and ethical role models at all levels of the organization	*												
	Establishing trust and eliminating fear								***					
	Providing people with the required resources, training and freedom to act with responsibility and accountability		**		***									
	Inspiring, encouraging and recognizing people's contributions						***	***						

(continued)

Table 8.3 (continued)

		Ability/skill				Motivation				Opportunity to perform/Empowerment				
Principle	Results	Job description based on job analysis	Recruitment	Structured and validated tools for selection	Job based skill training	Formal performance managerial/ appraisal	Compensation/ incentives/ rewards	Promotion/ career development	Job security	Job design/ Job enrichment	Works teams/ self directed work teams	Suggestion systems (individual/ group)	Feedback from employees	Information sharing
3. Involvement	People understanding the importance of their contribution and role in the organization	***												
	People identifying constraints to their performance	***												**
	People accepting ownership of problems and their responsibility for solving them												***	**
	People evaluating their performance against their personal goals and objectives							***						
	People actively seeking opportunities to enhance their competence, knowledge and experience				***			***						
	People freely sharing knowledge and experience											***	***	***
	People openly discussing problems and issues										***		***	***

Table 8.4 Relationships and intensity between HIWP and standards. Source: authors

Program	HIWP (AMO model)	ISO 9001:2008	DIS/ISO 9001:2015	ISO 10018:2012
Ability/skill	Job description based on job analysis	*	**	***
	Recruitment	*	**	***
	Structured and validated tools for selection	–	*	***
	Job based skill training	*	**	*
Motivation	Formal performance managerial/appraisal	–	*	**
	Compensation/incentives/rewards	–	*	*
	Promotion/career development	–	*	**
	Job security	*	*	***
Opportunity to perform/ Empower-ment	Job design/Job enrichment	–	*	**
	Works teams/self directed work teams	–	*	**
	Suggestion systems (individual/group)	–	*	**
	Feedback from employees	*	**	***
	Information sharing	*	**	**

Following the analysis and discussion of the available documents, the group of authors proposes the following relationships and intensity between principles and models (Table 8.3), HIWP and standards (Table 8.4).

Following the same outline laid out, in the Table 8.4 the different intensity level with which each standard fosters the use of HIWP is shown.

In this sense, different investigators have evaluated to what extent those companies which have put quality management systems into place have also initiated HIWP programmes or flexible work practices, (Alfalla-Luque et al. 2012; Bayo-Moriones et al. 2011; Bayo-Moriones and Merino Diaz de Cerio 2001; Marin Garcia 2013), and their conclusions confirm that the implantation of quality management systems fosters the use of HIWP, although with higher frequency of non regulatory models (EFQM) than regulatory models (ISO 9001).

From the analysis undertaken it can de deduced that the use of HIWP tools in unlikely in those companies that look to meet the minimum requirements of ISO 9001:2008, given that this standard sets out a very limited requirement level with respect to the use of HR management tools.

However, the draft of the new version of ISO 9001:2015, as well as ISO 10018:2012, set out a scenario much more propitious to the use of HIWP.

This situation needs to be taken into account by the professionals that take on the adoption or improvement of quality management systems and the use of HIWP to improve the results of the organizations.

References

Alfalla-Luque R, Marin-Garcia JA, Medina-López C (2012) Is worker commitment necessary for achieving competitive advantage and customer satisfaction when companies use HRM and TQM practices? Universia Bus Rev 36:64–89

Arthur JB (1994) Effects of human resource systems on manufacturing performance and turnover. Acad Manag J 37(3):670–687

Bayo-Moriones A, Merino Diaz de Cerio J (2001) Quality management and high performance work practices: do they coexist? Int J Prod Econ 73(3):251–259

Bayo-Moriones A, Merino Diaz de Cerio J, Antonio Escamilla-de-León S, Mary Selvam R (2011) The impact of ISO 9000 and EFQM on the use of flexible work practices. Int J Prod Econ 130(1):33–42

Becker BE, Sunny B, Huselid MA, Rutgers U, Ferris GR (1998) High performance work systems and firm performance: a synthesis of research and managerial implications. Res Personnel Hum Resour Manag 16:53–101

Boselie P, Dietz G, Boon C (2005) Commonalities and contradictions in HRM and performance research. Hum Resour Manag J 15(3):67–94

Combs J, Liu YM, Hall A, Ketchen D (2006) How much do high-performance work practices matter? A meta-analysis of their effects on organizational performance. Personnel Psychol 59(3):501–528

Conci G (2012) Perceived results obtained by companies associated to the use of high involvement work practices (HIWP). Working Papers on Operations Management 3(1):01–15

Freeman, R. (1984). Strategic Management: A Stakeholder Approach

Guerrero S, Barraud-Didier V (2004) High-involvement practices and performance of French firms. Int J Hum Resour Manag 15(8):1408–1423

Guest DE, Michie J, Conway N, Sheehan M (2003) Human resource management and corporate performance in the UK. Br J Ind Relat 41(2):291–314

Guthrie JP (2001) High-involvement work practices, turnover, and productivity: evidence from New Zealand. Acad Manag J 44(1):180–190

Guthrie JP, Spell CS, Nyamori RO (2002) Correlates and consequences of high involvement work practices: the role of competitive strategy. Int J Hum Resour Manag 13(1):183–197

Hughes T, Williams T, Ryall P (2000) It is not what you achieve it is the way you achieve it. Total Qual Manag 11(3):329–340

Huselid MA (1995) The impact of human-resource management-practices on turnover, productivity, and corporate financial performance. Acad Manag J 38(3):635–672

Huselid MA, Jackson SE, Schuler RS (1997) Technical and strategic human resource management effectiveness as determinants of firm performance. Acad Manag J 40(1):171–188

Jiang K, Lepak DP, Hu J, Baer JC (2012) How does human resource management influence organizational outcomes? A meta-analytic investigation of mediating mechanisms. Acad Manag J 55(6):1264–1294

Lawler, EE, Mohrman SD, Ledford GE (1992) Employee involvement and total quality management practices and results in fortune 1000 companies. Jossey-Bass business and management series

Manders B, de Vries H, Blind K (2013) The relationship between ISO 9001 and financial performance: a meta-analysis. Acad Manag Proc 2013(1)

Marin Garcia JA (2013) ¿Qué sabemos sobre la relación de los programas de recursos humanos de alto rendimiento y el desempeño organizativo? (What do we know about the relationship between High Involvement Work Practices and Performance? WPOM - Working Papers On Operations Management 4(2):01–15

Marin Garcia JA, Conci G (2013) Validación de un cuestionario para medir el grado de uso de las prácticas de alta implicación de los trabajadores. Intangible Capital 9(3):854–882

Marin-Garcia JA (2002) La gestión participativa en las grandes empresas industriales españolas: grado de uso, resultados obtenidos y comparación internacional. ProQuest Information and Learning, sección UMI (publication number: 3025050)

Martínez-Costa M, Choi TY, Martínez JA, Martínez-Lorente AR (2009) ISO 9000/1994, ISO 9001/2000 and TQM: The performance debate revisited. J Oper Manag. doi:10.1016/j.jom.2009.04.002

Nair A (2006) Meta-analysis of the relationship between quality management practices and firm performanceGÇöimplications for quality management theory development. J Oper Manag 24(6):948–975

Ordiz-Fuertes M, Fernandez-Sanchez E (2003) High-involvement practices in human resource management: concept and factors that motivate their adoption. Int J Hum Resour Manag 14(4):511–529

Subramony M (2009) A meta-analytic investigation of the relationship between HRM bundles and firm performance. Hum Resour Manag 48(5):745–768

Wright PM, Gardner TM, Moynihan LM, Allen MR (2005) The relationship between HR practices and firm performance: examining causal order. Personnel Psychol 58(2):409–446

Zheng C, Morrison M, O'Neill G (2006) An empirical study of high performance HRM practices in Chinese SMEs. Int J Hum Resour Manag 17(10):1772–1803

Chapter 9
Implementing Multiple Management Systems: Is It Sustainable?

Merce Bernardo and Alexandra Simon

Abstract The aim of this paper is to analyze, through a literature review, the implementation of several management systems (MSs) and their sustainable management. Three main scenarios and their outcomes are analyzed. In the first, organizations implement management systems but do not certify them, explaining the decertification phenomenon. In the second, organizations implement management systems and certify them. Organizations in the above scenarios contribute to the MSs diffusion phenomenon. In the third, organizations may or may not implement additional management systems, but they do internalize their requirements. Organizations in this scenario may decide to improve their efficiency by using the requirements of the standards for their internal benefits regardless of their certification or even to manage their MSs by implementing an integrated management system. Both internal and external motivations to implement and manage these MSs will also be analyzed, as will the correlations among them and each scenario. Due to the strong impact of ISO 9001 and ISO 14001 on organizations worldwide, the existing literature has focused on the implementation of these MS standards. Therefore, the analysis presented in this chapter will primarily consider these standards, although some attention will be paid to other MSs. The main contribution of this study is the presentation of three possible scenarios that standardization bodies, organizations and academia should consider for the future study of MSs.

M. Bernardo (✉)
Economy and Business Management, Universitat de Barcelona,
690 Av Diagonal, 8034 Barcelona, Barcelona, Spain
e-mail: merce.bernardo@ub.edu

A. Simon
Business Department, Universitat Autònoma de Barcelona,
Campus de la UAB, Edifici B, 8193 Bellaterra, Barcelona, Spain
e-mail: alexandra.simon@uab.cat

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9.1 Introduction

Over the few last decades, the number of standards published to improve the implementation of managerial and operational practices has increased (see ISO 2013). The most productive institution publishing these standards has been and is currently the International Organization for Standardization (ISO), whose standards are the most implemented and certified worldwide. According to the available data on ISO certification, the quality management system (QMS) standard based on ISO 9001 has been the most highly implemented, with over one million certificates issued worldwide, as well as ISO 14001 for environmental management systems (EMSs), with over 285,000 certificates worldwide (ISO 2013). There exist other standards and MSs that are more focused on specific sectors (ISO 22000 for food and safety MS for example) or that are issued by other certification bodies, such as SA 8000 for working conditions management, AA 1000 for corporate accounting and UNE 166002 for innovation management, among others.

The implementation of these standards as managerial practices is motivated by the improvement of the internal organization of the corporation; more specifically, the internal motivations are related to productivity, internal communication, process performance team work, measurement of performance and communication, and continuous improvement (see, e.g., Sampaio et al. 2010), whereas external motivations are more related to providing an answer to the market's pressure to ensure that the function-specific requirements of the standard are met or, more specifically, to promotional and marketing issues, such as customer and market pressures or market share (see, e.g., Escapa 2004; Kaziliūnas 2010; Sampaio et al. 2010). These motivations may condition the implementation of these practices, e.g., Sampaio et al. (2011a) concluded that this is "*a critical success factor in the impact of the quality management system over the company economic performance*".

Regardless of these motivations, the evolution of the implementation of ISO 9001 and ISO 14001 has been analyzed in-depth in papers on diffusion. This phenomenon may be studied from three different perspectives: factors, scope and model. Diffusion factors are related to a positive institutional environment (Delmas 2002), foreign direct investment (Prakash and Potoski 2007) and geographic and cultural affinity (Albuquerque et al. 2007), among others. The scope of diffusion may be international (Delmas and Montiel 2008), national (Specchiarello and Giagnorio 2009) or sectoral (Alonso-Almeida et al. 2013). The most highly accepted diffusion model is the S-curve model (Franceschini et al. 2004; Llach et al. 2011; Marimon et al. 2011).

The implementation and diffusion of these standards covers two additional concepts: internalization and decertification. The former entails the degree of adoption of these practices, how organizations implement and work with them and the process of becoming a routine, all of which may not be homogeneous (see, e.g., Heras-Saizarbitoria 2011). Decertification means not renewing the certification, although this does not always mean abandoning the managerial practices implemented (Alcalà 2013). This latter phenomenon is increasing its importance, and ISO covers withdrawals in its survey (ISO 2013).

Another aspect that should also be considered in this analysis is how organizations manage the multiple management systems implemented. Two main possibilities arise: separated or integrated. The former means managing the different function-specific MSs, paying no attention to their similarities, whereas the latter means managing all of them as a unique and more efficient MS that benefits from the existing synergies among them (Douglas and Glen 2000; Karapetrovic and Casadesús 2009; Karapetrovic and Willborn 1998; Rocha et al. 2007).

Therefore, considering all the aspects related to the adoption of MSSs, the aim of this paper is to analyze, through a literature review, the implementation of several MSs and its sustainable management. Three main scenarios and their outcomes are analyzed: (1) organizations implement MSs but do not certify them, (2) organizations implement MSs and certify them, and (3) organizations may or may not implement additional management systems but do internalize their requirements.

The structure of the chapter is as follows. After this introduction, the methodology for the literature review is presented. Then, the main conclusions of the scenarios proposed are discussed.

9.2 Methodology

The paper conducts a literature review to identify the several scenarios firms may face related to the implementation of several MSs and their sustainable management. We decided to conduct a systematic literature review to find information from various research articles that shed light on each of these possible scenarios. Therefore, in this literature review, theoretical and empirical studies related to the implementation process of several standards are reviewed.

9.2.1 Literature Search Strategy

Relevant papers were identified through a computer search from two databases: Scopus and ISI Web of Science. The search strategy used was to identify papers with “ISO 9001” or “ISO 14001” and that contained “decertification”, “internalization”, and “diffusion” as main subject headings or text words in the title or the abstract of the paper. Papers published in all years were considered.

9.2.2 Selection of Articles for Review

Our literature search identified 289 references. Their titles, abstracts and text were reviewed in detail by the two authors for relevance to the study. We thus conducted a research literature review, contrasting it with more subjective examinations of the

recorded information. Papers were included if they contained reference to the different scenarios regarding MSs namely diffusion, decertification and internalization. Only 56 empirical papers met the inclusion/exclusion criteria for review. Consequently, these papers were identified and reviewed regarding the different scenarios of MSs implementation.

9.3 Literature Review

The literature review is divided into the three scenarios proposed, namely: decertification, diffusion and internalization.

9.3.1 Decertification

As far as we know, the issue of decertification has been not studied up to now, and we have not found any papers that cover this topic. Only the doctoral work of Alcalà (2013) offers an exploratory approximation of this issue. Other authors have mainly reviewed the tendencies of the certificates, their diffusion, and the benefits and difficulties of certification as related topics (see, e.g., Marimon et al. 2009; Bernardo et al. 2012; Simon et al. 2012) but have done so without specifically investigating why firms might actually want to leave or are abandoning the certificates.

There are several studies that suggest that MSSs such as ISO 9001 or ISO 14001 have stagnated and that the number of certifications is declining (ISO 2013). Some countries are observing how the certification numbers slowdown, whereas others are experiencing a saturation effect (Marimon et al. 2009). Many companies have not decertified, but they raise doubts about the future of certification and mainly continue to be certified for external reasons (image, clients requirements). According to Alcalà (2013), there are four possible scenarios when a firm faces the renewal of its certificates. First, there are firms that explore decertification or will do decertify in the short term. Second, there are firms that already have abandoned their certificates. The third scenario includes the companies that have two MSs but have not certified one or both of them. Finally, the organizations that have the certificates and want to keep them.

Several authors have uncovered the possible causes for decertification, which include the following:

- Not passing the corresponding audit (Marimon et al. 2009).
- Lack of administration support (Casadesus et al. 2001; Heras and Casadesus 2006).
- Level of certification intensity of a country (Corbett and Kirsch 2001) or sector (Franceschini et al. 2004; Marimon et al. 2009).

The empirical study of Alcalà (2013) of case studies of companies in the paper sector uncovers several results regarding the decertification phenomenon. First, many companies keep their certificates due to stakeholder pressure. Second, one of the most important reasons for renewing the certifications is the improvement of the organization's image in front of its clients and other stakeholders. There are mixed results regarding the maintenance of the certificates to improve the firm's competitive advantage. Although this phenomenon appears to be true for the ISO 14001 certificate, it is not a motivation for ISO 9001 in the sample of companies of this study. Similarly, the implementation and renovation costs condition the renewal of ISO 9001 but do not appear to affect ISO 14001.

In conclusion, for the two most diffused MSSs worldwide, there appears to be a stagnation in the certification renewals due to different causes. However, with other existing MSSs and standards, research is needed to determine whether this phenomenon will continue and replicate in the future.

9.3.2 Diffusion

The diffusion of ISO 9001 and ISO 14001 has been widely studied in the literature. As commented previously, diffusion can be studied from three different points of view: factors, scope and model.

Diffusion factors refer to those aspects conditioning or easing the diffusion of these two MSSs. Berliner and Prakash (2013) found that bilateral export and investment in countries with poor regulatory government pressure companies to adopt ISO 14001 (see also Delmas and Montiel 2008; Perkins and Neumayer 2010). In addition, Delmas and Montes-Sancho (2011) found the impact to be significant in the early phases of the adoption. Adopting a wider scope, Qi et al. (2011) analyzed the stakeholders' roles in the diffusion of ISO 14001 in China, finding a significant relationship among foreign customers and community stakeholders but not with organizational stakeholders. Direct foreign investment is another aspect considered as a factor. For example, in Prakash and Potoski (2007), the authors conclude that home countries' investors with higher levels of ISO 14001 implementation are related with higher levels of the standard in the host country. The same authors also found similar evidence considering export markets (Prakash and Potoski 2006).

The diffusion scope concerns the geographical scope, i.e., if the analysis is performed at an international, national or sectoral level. For example, Bodas Freita and Iizuka (2012) compared the diffusion of ISO 9001 and ISO 14001 in different scopes and found that diffusion is significant at the country and industry levels. This framework is usually analyzed together with the diffusion model generally accepted to be the S-curve model. Several studies propose different stages in the evolution of MSSs (see, e.g., Casadesus et al. 2008; Sampaio et al. 2011b): (1) the initial stage, in which the adoption is applied by few companies; (2) the growth stage, in which the great majority of organizations implement the MSS; (3) the saturation stage, in which almost all organizations have the MSSs in place and (4) the decline stage, in

which the organizations decertify, i.e., not renew the certificate. Casadesus et al. (2008) analyzed the different diffusion stages for ISO 9001 and ISO 14001 at the global level, finding that more mature countries in terms of MSSs adoption are in the third and fourth stages. Similar to this but considering the sectors of activity, Marimon et al. (2011) analyzed the diffusion of ISO 14001 at the worldwide level, finding differences in the evolution stage among sectors. In Llach et al. (2011) the analysis and results were the same, but ISO 9001 certificates were considered. Three groups of sectors categorized by the possible evolution of certificates were identified. The model was also analyzed in comparing ISO 9001 diffusion and sectoral MSSs, as in Casadesus et al. (2010) and Alonso-Almeida et al. (2013), to analyze the tourism sector in Spain.

In conclusion, the different stages of diffusion of MSSs are leading to decertification and the implementation sectoral standards more focused on organizations' activities (Llach et al. 2011; Alonso-Almeida et al. 2013).

9.3.3 Internalization

Due to the diffusion of ISO 9001, ISO 14001 and similar standards, the academic research on their implementation is wide; however, little is known on the practical differences existing in their adoption (Nair and Prajogo 2009). The implementation of MSSs, such as ISO 9001 or ISO 14001, has led some authors to consider whether this implementation has been a homogeneous process among companies. The adoption of MSSs and their certification may be a means of obtaining higher business performance (Heras-Saizarbitoria 2011). However, there is mixed evidence from the results that companies obtain from certification (Casadesus and Karapetrovic 2005; Casadesus et al. 2008). These differences may result from degree of the MSs' internalization (Heras-Saizarbitoria 2011). In this line, Briscoe et al. (2005) state that if the complex adoption process of the MSs and its certification are not internalized properly, the benefits on company performance could be hindered.

A good definition of internalization is provided by Qi et al. (2013), who define it as "*the process that consolidates and embeds a firm's beliefs, attitudes, and values into its management and employees*". Ataseven et al. (2014) define it as conformance or compliance to requirements of a standard of practice but also as a process of building capital, which would provide a competitive advantage to organizations. For their part, Llorens-Montes and Ruiz-Moreno (2005) complement this definition, adding that it provides benefits to the company by selecting workers capable of following the rules and by embedding jobs in hierarchical structures that socialize workers, monitor behavior, etc.

There are different terms in the literature that describe the implementation process of the MSs and its linkage to the firms' performance (Nair and Prajogo 2009; Castka and Prajogo 2013). The issue is referred to as "rigorous compliance" (Boiral 2007), "maintenance" of certifications (Balzarova and Castka 2008), "daily usage" of ISO 9001 (Naveh and Marcus 2004), "substantive versus symbolic adoption"

(Christmann and Taylor 2006), "integration" (Boiral and Roy 2007), "depth of implementation" (Jang and Lin 2008) or "level of adoption" (Lee et al. 2009). Finally, authors such as Briscoe et al. 2005; Nair and Prajogo (2009), Heras-Saizarbitoria (2011), Heras and Boiral (2013) or Tarí et al. (2013) refer to "internalization", with which they describe a higher, more rigorous or more active fulfillment of the requirements of the systems. According to the authors' conceptualization of internalization, companies should actively understand and use the MS practices to modify the organization's behavior and decision-making processes (Nair and Prajogo 2009). These practices include employee training, acquainting employees with the company's quality policy and practices, establishing the documentation required by the standards as well as updating them, maintaining daily practices to meet the documented procedures based on the MS' requirements; and, finally, conducting internal audits to regularly improve the processes (Nair and Prajogo 2009).

This last term has been gaining more attention in the literature (e.g., Briscoe et al. 2005; Nair and Prajogo 2009; Prajogo 2011; Heras-Saizarbitoria 2011), especially for the case of the internalization of ISO 9001, the most diffused standard worldwide (ISO 2013). However, due to the similarities between ISO 9001 and ISO 14001 (the other prominent global meta-standard, which shares many similarities in terms of structure, techniques and principles with ISO 9001 (Heras and Boiral 2013), the same principles of internalization may be applied to the latter standard, as several recent studies focusing on the internalization of ISO 14001 have done (Qi et al. 2012; Castka and Prajogo 2013).

In this direction, the recent work of Heras-Saizarbitoria (2011) and Heras and Boiral (2013) shed some light on the differences in adoption levels of the standards. The authors find in their exploratory analysis of the internalization of ISO 9001 that "*the standard tends to be adopted in organizations in such a way as to be adapted to the various needs and internal contingencies of the organizations*". For their part, Boiral (2003, 2007) and Christmann and Taylor (2006) find a discrepancy between written documentation and daily practices, whereas Boiral (2007) finds that the internalization rationale depends on institutional pressures and internal involvement. Other authors find that internal drivers motivate the level of adoption (Boiral and Amara 2009; Jang and Lin 2008; Yin and Schmeidler 2009), whereas some focus on the relationship between internalization and performance (Nair and Prajogo 2009). In general, the authors conclude that there is a heterogeneous internalization of ISO 9001 and ISO 14001 standards (Boiral 2007; Christmann and Taylor 2006; Heras-Saizarbitoria 2011; Yin and Schmeidler 2009).

Some authors question the fact that internalization leads to better results, this being a recent line of research in the field (Nair and Prajogo 2009). A partially contradictory conclusion is reached by all these studies that firms achieve better results if the requirements of certifications are internalized (Nair and Prajogo 2009; Heras and Boiral 2013). However, the factors that facilitate the positive effects of internalization are not evident, and the diversity in the adoption of MSs requires thorough examination (Tarí et al. 2013).

To identify the factors that affect the outcomes of MS adoption, some studies have delved into studying how the variation in the implementation of ISO 9001 and

ISO 14001 may provide different benefits to companies (Huarng et al. 1999; Jones and Arndt 1997; Naveh and Marcus 2004; Lee et al. 2009).

Qi et al. (2013) propose two sources of motivations related to obtaining the greatest benefits perceived by companies that implement and become certified. The authors distinguish between internal and external motivations, which lead to different performance outcomes. Some authors have argued that that companies that implement and certify MS due to internal motives obtain better results than those that implement it only for external reasons, both in the case of ISO 9001 (Boiral and Roy 2007) and in the case of ISO 14001 (Heras et al. 2008). Furthermore, recent studies have established that benefits of internalization driven by internal factors are greater than those for types of implementation associated with external sources of motivation (Christmann and Taylor 2006; Boiral and Roy 2007; Jang and Lin 2008; Nair and Prajogo 2009).

In conclusion, the decision to adopt and internalize MSSs is constrained by both external pressure and internal motivation (Boiral 2001; Johnstone and Labonne 2009). Different combinations of the internal and external motivations lead to firms' heterogeneous implementation strategies (Qi et al. 2013). Firms may also choose to integrate their MSSs into a single one to increase their efficiency and profit from their synergies (Simon et al. 2012). In addition, if firms have internalized the practices required by the standards, they may choose not to certify against the standards, as the benefits from implementing the processes internally will be the same.

9.4 Conclusions

The aim of this paper is to analyze, through a literature review, the implementation of several MSs and their sustainable management. Three main scenarios and their outcomes are analyzed: (1) decertification (2) diffusion and (3) internalization.

The decertification scenario describes organizations implementing MSs but not renewing certification. This scenario tends to result in sectoral MS implementation, both certifiable and not.

The diffusion scenario describes organizations implementing and certifying MSs. The different diffusion stages defined are closely linked to the previous scenario.

In the internalization scenario, organizations may or may not implement additional management systems, but they do internalize their requirements.

All three scenarios are related. Organizations may implement and certify MSSs to improve their efficiency, among other benefits. When companies implement MSs, they may do so superficially, only to obtain the certificate (mainly driven by external motivations or market pressures), or they may try to gain the greatest possible benefit to improve their internal organization (mainly because their implementation is based on internal motivations). In this situation, the latter company is internalizing the requirements of the MSSs, and the degree of internalization or making the practice becoming a routine may differ among companies.

When the organization perceives that having the certificate is no longer providing a competitive advantage (i.e., it is in the saturation stage of diffusion), it may decide not to renew the certificate and invest the money saved in implementing and certifying in another MS that may give it the opportunity to differentiate itself from competitors. In such a case, the organization is decertifying (in the decline phase of diffusion). This situation does not imply that the organization is abandoning the MS; rather, it may have internalized the MS.

Regardless of whether certification is held, managing these MSs within the organization may be accomplished by integrating the MSs into a single and more efficient MS.

The implications of this research are for both practitioners and academia. The former group benefits because this research may help certification and standardization bodies to promote and publish standards that best fit with organizations' needs. In addition, consultants may use these findings to train companies to internalize the MSs to profit from their implementation. For organizations, it is important to consider these possibilities, as doing so may help to improve their management and ensure their sustainable future. Academics may find in the three scenarios a set of contexts ripe for analysis to increase knowledge on this issue. According to the literature review presented here, decertification is the scenario the least analyzed. Identifying a decertification pattern will be the base for future research.

Finally, the main limitations of this study are the selection criteria used to find previous studies and the availability of these studies.

References

Albuquerque P, Bronnenberg B, Corbett C (2007) A spatiotemporal analysis of the global diffusion of ISO 9000 and ISO 14000 certification. Manag Sci 53(3):451–468

Alcalá M (2013) Tendències dels sistemes de gestió estandaritzats: elcas del sector paperer, Universitat de Girona, p 467

Alonso-Almeida MM, Marimon F, Bernardo M (2013) Diffusion of quality standards in the hospitality sector. Int J Oper Prod Manag 33(5):504–527

Ataseven C, Prajogo DI, Nair A (2014) ISO 9000 internalization and organizational commitment—implications for process improvement and operational performance. IEEE Trans Eng Manag 61(1):1–5

Balzarova MA, Castka P (2008) Underlying mechanisms in the maintenance of ISO 14001 environmental management system. J Clean Prod 16(18):1949–1957

Berliner D, Prakash A (2013) Signaling environmental Stewardship in the shadow of weak governance: the global diffusion of ISO 14001. Law Soc Rev 47(2):345–373

Bernardo M, Casadesús M, Karapetrovic S, Heras I (2012) Do integration difficulties influence management system integration levels? J Clean Prod 21(1):23–33

Bodas Freita IM, Iizuka M (2012) Openness to international markets and the diffusion of standards compliance in Latin America. A multi level analysis. Res Policy 41(1):201–215

Boiral O (2001) ISO 14001 certification in multinational firms: the paradoxes of integration. Glob Focus 13(1):79–94

Boiral O (2003) ISO 9000, outside the iron cage. Organ Sci 14(6):720–737

Boiral O (2007) Corporate greening through ISO 14001: a rational myth? Organ Sci 18(1): 127–146

Boiral O, Amara N (2009) Paradoxes of ISO 9000 performance: a configurational approach. Qual Manag J 16(3):36–60

Boiral O, Roy MJ (2007) ISO 9000: integration rationales and organizational impacts. Int J Oper Prod Manag 27(2):226–247
Briscoe JA, Fawcett SE, Todd RH (2005) The implementation and impact of ISO 9000 among small manufacturing enterprises. J Small Bus Manag 43(14):309–30
Casadesus M, Karapetrovic S (2005) The erosion of ISO 9000 benefits: a temporal study. Int J Qual Reliab Manag 22(2):120–36
Casadesus MG, Leal G, Heras I (2001) Benefits of ISO 9000 implementation in Spanish industry. Eur Bus Rev 13(6):327–335
Casadesus M, Marimon F, Heras I (2008) ISO 14001 diffusion after the success of the ISO 9001 model. J Clean Prod 16(16):1741–1754
Casadesus M, Marimon F, Alonso M (2010) The future of standardised quality management in tourism: evidence from the Spanish tourist sector. Serv Ind J 30(14):2457–2474
Castka P, Prajogo D (2013) The effect of pressure from secondary stakeholders on the internalization of ISO 14001. J Clean Prod 47(May):245–252
Christmann P, Taylor G (2006) Firm self-regulation through international certifiable standards: determinants of symbolic versus substantive implementation. J Int Bus Stud 37(6):863–883
Corbett CJ, Kirsch DA (2001) International diffusion of ISO 14000 certification. Prod Oper Manag 10(3):327–342
Delmas M (2002) The diffusion of environmental management standards in Europe and in the United States: an institutional perspective. Policy Sci 35(1):91–119
Delmas M, Montes-Sancho MJ (2011) An institutional perspective on the diffusion of international management system standards: the case of the environmental management standard ISO 14001. Bus Ethics Q 21(1):103–132
Delmas M, Montiel I (2008) The diffusion of voluntary international management standards: responsible care, ISO 9000, and ISO 14001 in the chemical industry. Policy Stud J 36(1): 65–93
Douglas A, Glen D (2000) Integrated management systems in small and medium enterprises. Total Qual Manag 11(4):686–690
Escapa C (2004) Motivations and Barriers of Implementing an EMS in Spanish Organizations. Thesis presented in part-fulfillment of the degree of Master of Science in accordance with the regulations of the University of East Anglia School of Environmental Sciences, University of East Anglia, University Plain, Norwich, August 2004
Franceschini F, Galetto M, Gianni G (2004) A new forecasting model for the diffusion of ISO 9000 standard certifications in European countries. Int J Qual Reliab Manage 21(1):32–50
Guoyou Q, Saixing Z, Xiaodong L, Chiming T (2012) Role of internalization process in defining the relationship between ISO 14001 Certification and corporate environmental performance. Corp Soc Responsib Environ Manag 19(3):129–140
Heras I, Boiral O (2013) ISO 9001 and ISO 14001: towards a research agenda on management system standards. Int J Manag Rev 15(1):47–65
Heras I, Casadesus M (2006) Los estándares internacionales de sistemas de gestión: pasado, presente y futuro. Boletín ICE - Revista del Ministerio de Industria, Turismo y Comercio 2876: 45–61
Heras I, Arana GD, de Junguitu A, Espí M, Molina JF (2008) Los SGM y la competitividad de las empresas de la CAPV. Instituto Vasco de Competitividad, San Sebastián
Heras-Saizarbitoria I (2011) Internalization of ISO 9000: an exploratory study. Ind Manag Data Syst 111(8):1214–1237
Huarng F, Horng C, Chen C (1999) A study of ISO 9000 process, motivation and performance. Total Qual Manag 10(7):1009–1025
ISO (2013) The ISO survey of certifications–2012. International Organisation for Standardization, Geneva, Switzerland
Jang W, Lin C (2008) An integrated framework for ISO 9000 motivation, depth of ISO implementation and firm performance. The case of Taiwan. J Manuf Tech Manag 19(2):194–216
Johnstone N, Labonne J (2009) Why do manufacturing facilities introduce environmental management systems? Improving and/or signaling performance. Ecol Econ 68(3):719–730

Jones R, Arndt G (1997) ISO 9000 among Australian companies: impact of time and reasons for seeking certification on perceptions of benefits received. Int J Qual Reliab Manag 14(7): 650–660

Karapetrovic S, Casadesús M (2009) Implementing environmental with other standardized management systems: scope, sequence, time and integration. J Clean Prod 17(5):533–540

Karapetrovic S, Willborn W (1998) Integration of quality and environmental management systems. TQM Mag 10(3):204–213

Kaziliūna A (2010) Impacts of different factors on the implementation of quality management systems and performance outcomes. Curr Iss Bus Law 2:75–92

Lee PKC, To WM, Yu BTW (2009) The implementation and performance outcomes of ISO 9000 in service organizations. Int J Qual Reliab Manag 26(7):646–662

Llach J, Marimon F, Bernardo M (2011) ISO 9001 diffusion analysis according to activity sectors. Ind Manag Data Syst 111(1–2):298–316

Llorens-Montes FJ, Ruiz-Moreno A (2005) Self-implementation of ISO 9001 versus external support: an examination in laboratories involved in chemical measurement. Accred Qual Assur 10(6):304–307

Marimon F, Heras I, Casadesus M (2009) ISO 9000 and ISO 14000 standards: A projection model for the decline phase. Total Qual Manag Bus Excel 20(1):1–21

Marimon F, Llach J, Bernardo M (2011) Comparative analysis of diffusion of the ISO 14001 standard by sector of activity. J Clean Prod 19(15):1734–1744

Nair A, Prajogo D (2009) Internalisation of ISO 9000 standards: the antecedent role of functionalist and institutionalist drivers and performance implications. Int J Prod Res 47(16):4545–4568

Naveh E, Marcus AA (2004) When does the ISO 9000 quality assurance standard lead to performance improvement? Assimilation and going beyond. IEEE Trans Eng Manag 51(3):352–363

Perkins R, Neumayer E (2010) Geographic variations in the early diffusion of corporate voluntary standards: comparing ISO 14001 and the global compact. Environ Plan 42(2):347–365

Prakash A, Potoski M (2006) Racing to the bottom? Trade, environmental governance, and ISO 14001. Am J Polit Sci 50(2):350–364

Prakash A, Potoski M (2007) Investing up: FDI and the cross-country diffusion of ISO 14001 management systems. Int Stud Q 51:723–744

Prajogo D (2011) The roles of firms' motives in affecting the outcomes of ISO 9000 adoption. Int J Oper Prod Manage 31(1):78–100

Qi GY, Zeng SX, Tam CM, Yin HT, Wu JF, Dai ZH (2011) Diffusion of ISO 14001 environmental management systems in China: rethinking on stakeholders' roles. J Clean Prod 19(11): 1250–1256

Qi G, Zeng S, Yin H, Lin H (2013) ISO and OHSAS certifications: how stakeholders affect corporate decisions on sustainability. Manage Dec 51(10):1983–2005

Rocha M, Searcy C, Karapetrovic S (2007) Integrating sustainable development into existing management systems. Total Qual Manag Bus Excel 18(1):83–92

Sampaio P, Saraiva P, Guimaraes-Rodrigues A (2010) A classification model for prediction of certification motivations from the contents of ISO 9001 audit reports. Total Qual Manag 21(12):1279–1298

Sampaio P, Saraiva P, Guimaraes-Rodrigues A (2011a) The economic impact of quality management systems in Portuguese certified companies. Empirical evidence. Int J Qual Reliab Manag 28(9):929–950

Sampaio P, Saraiva P, Rodrigues AG (2011b) ISO 9001 certification forecasting models. Int J Qual Reliab Manag 28(1):5–26

Simon A, Karapetrovic S, Casadesús M (2012) Difficulties and benefits of integrated management systems. Ind Manag Data Syst 112(5):828–846

Specchiarello M, Giagnorio M (2009) An appraisal of quality standards diffusion in the national economic system. J Commod Sci Technol Qual 48(2):155–176

Tarí JJ, Heras I, Pereira J (2013) Internalization of quality management in service organizations. Manag Serv Qual 23(6):456–473

Yin H, Schmeidler PJ (2009) Why do standardized ISO 14001 environmental management systems lead to heterogeneous environmental outcomes? Bus Strateg Environ 18(7):469–486

Chapter 10
The Impact of TQM Critical Success Factors on Business Performance. The Mediating Role of Implementation Factors in Linking Enabler and Instrumental Factors

Francisco J. Carmona-Márquez, Antonio G. Leal-Millán, Adolfo E. Vázquez-Sánchez, and Antonio L. Leal-Rodríguez

Abstract Total Quality Management (TQM) is a management philosophy focused on customer satisfaction and continuous improvement, and positively related to organizational performance. TQM implementation programs sometimes fail, causing a loss of resources, distrust in top management and a lack of the outcomes expected. This chapter examines the relationship between the implementation of Critical Success Factors and Business performance. For a better understanding, we have divided these factors into three constructs, hypothesizing causal relationships between them and how they affect business performance. We use data collected from a sample of 113 Spanish organizations. Three hypotheses were tested simultaneously using Partial Least Squares, a variance-based Structural Equation Modeling technique. The results support the existence of a mediating role played by implementation factors in ties between enablers and instrumental factors. Our research findings provide practical insights for managers in order to prioritize those critical factors on which they focus their actions to enhance business performance.

10.1 Introduction

The study of Critical TQM Success Factors (CSFs) has been approached from various perspectives and methodologies. Rigorous attempts to identify them come from authors such as Saraph et al. (1989), Flynn et al. (1994), Powell (1995), Black and

F.J. Carmona-Márquez (✉) • A.E. Vázquez-Sánchez
Departamento de Administración de Empresas y Marketing, Universidad de Sevilla,
Avda. Ramón y Cajal, Seville 41018, Spain
e-mail: fcm@fcmgestion.com; aleal@us.es; adolfov@us.es

A.L. Leal-Rodríguez • A.G. Leal-Millán
Departamento de Organización de Empresas, Universidad Loyola Andalucía,
1, Energía Solar, Sevilla 41014, Spain
e-mail: alleal@uloyola.es

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Table 10.1 TQM factor classification

Constructs	Critical success factors	Studies
Enabler factors	1. Top Management commitment and leadership	Ahire et al. (1996), Flynn et al. (1994), Rao et al. (1999), Saraph et al. (1989), Waldman (1994), Khanna et al. (2011), Roldán et al. (2012)
	2. TQM philosophy adoption	Black and Porter (1996), Powell (1995), Roldán et al. (2012)
Implementation factors	3. Customer involvement	Black and Porter (1996), Flynn et al. (1994), Waldman (1994), Khanna et al. (2011)
	4. Supplier involvement	Ahire et al. (1996), Flynn et al. (1994), Powell (1995), Rao et al. (1999), Saraph et al. (1989), Waldman (1994)
	5. Open and flexible structure	Black and Porter (1996), Powell (1995), Khanna et al. (2011)
	6. Employee education and training	Ahire et al. (1996), Powell (1995), Rao et al. (1999), Waldman (1994), Agus (2005), Sadikoglu and Zehir (2010)
	7. Empowerment	Ahire et al. (1996), Powell (1995), Waldman (1994), Chung (1999)
Instrumental factors	8. Benchmarking	Ahire et al. (1996), Powell (1995), Rao et al. (1999), Waldman (1994), Boone and Wilkins (1995)
	9. Process improvements	Flynn et al. (1994), Powell (1995), Rao et al. (1999), Fuentes et al. (2006)
	10. Zero-defects mentality	Black and Porter (1996), Powell (1995), Agus (2005)

Porter (1996), Ahire et al. (1996), Grandzol and Gershon (1998), Dow et al. (1999) and Rahman (2001). CSFs can be defined as the critical areas of managerial planning and action that must be fostered in order to achieve effective quality management within a business unit, ensuring its successful implementation (Saraph et al. 1989; Zairi and Leonard 1994). CSFs are what organizations must accomplish in order to achieve their mission, according to the examination and categorization of their impacts (Oakland 1995).

Plenty of authors have used different sets of factors. Black and Porter (1996) applied the Malcolm Baldrige Award criteria. Tamimi and Gershon (1995) developed an instrument to measure quality management practices adapted from Deming's approach. Ahire et al. (1996) proposed a set of quality management strategies derived from the literature. Many others, according to Talib and Rahman (2010), have selected different sets of factors (Fotopoulos and Psomas 2009; Lenka and Suar 2008; Rahman and Siddiqui 2006; Yusuf et al. 2007). This study proposes a model within which three distinct constructs have been identified. These three constructs gather the different CSFs according to their features and specifications. Therefore, we have distinguished the following clusters: enabler factors, implementation factors and instrumental factors and have developed a brief theoretical statement (Table 10.1) concerning the different factors to be considered in the present study.

TQM practices have brought many benefits to the organizations that have successfully adopted them (Douglas and Judge 2001; Rahman and Sohal 2002).

According to Ahire et al. (1996) and Powell (1995), TQM not only increases competitiveness, it also improves organizational and business performance. York and Miree (2004, p. 292) go further and argue: "doing the right thing, and doing it more efficiently, should have a positive effect on many measures of financial performance of the firm". Many other research studies have sustained the link between an effective implementation of TQM and financial performance improvement (Christiansen and Lee 1994; Easton and Jarrell 1998; Flynn et al. 1996; Hendricks and Singhal 1997; Ittner and Larcker 1996).

However, many other authors have discussed the failure of the TQM model, pointing out causes due to implementation rather than shortcomings in TQM contents (Gurnani 1999; Harari 1993; Krumwiede and Lavelle 2000; Thiagaragan et al. 2001; Mohamed Zairi 1996). There is no consensus on the reasons that cause failures in TQM implementation. This situation drives organizations to waste resources, not achieving the results desired and, occasionally, leading them to abandoning the implementation and progress of the TQM philosophy (Idris and Zairi 2006; Rahman 2001).

The purpose of this study is to empirically investigate the relationships existing between critical TQM success factors with the aim of prioritizing their successful implementation. Identifying cause and effect relationships between them may allow managers not to neglect the order of implementation to achieve the firm's expected performance. To accomplish this, we cluster the factors by means of the three above-mentioned constructs. Their relationships are assessed through the use of Partial Least Squares (PLS), a variance-based structural equation modeling technique applied to a sample of 113 Spanish organizations with experience in implementing a TQM program.

This paper is organized as follows. Section 10.2 includes the research model and hypotheses of the study. Here we set out the relationship between the enablers and instrumental factors. Then we propose a mediating relationship performed by the implementation factors in the link between the enablers and instrumental factors. This section concludes with the assessment of the relationship between instrumental factors and business performance. Section 10.3 introduces the methodology applied, data collection and samples as well as the measures and data analysis. Section 10.4 summarizes the results of both the measurement model and the structural model, while Sect. 10.5 presents the discussion, practical implications and limitations.

10.2 Research Model and Hypotheses

10.2.1 From Enabler Factors to Instrumental Factors

There is a great deal of literature concerning the main features or strategic elements that lead to the successful implementation of the TQM program in firms. A review of the literature suggests, in fact, that a great many factors can be considered critical. Nevertheless, few attempts have been made to establish some sort of order or hierarchy among these factors. In a recent study, Salaheldin (2009) distinguished a

set of what he labelled "Critical success factors of TQM practices". These critical success factors can be seen as those aspects that must go well to guarantee the successful implementation of the TQM program in a firm. In another relatively recent work, Llorens Montes et al. (2003, p. 195) argue that the main TQM elements "will always be guidelines to appraise the effectiveness of a TQM programme following implementation. Company results will differ depending on the successful implementation of said elements. Nevertheless, these elements have different degrees of importance in terms of their final contribution to the results".

The present study identifies enabler factors with a construct that is shaped by top management commitment and leadership and by the extent to which TQM philosophy is effectively adopted by the firm. Many studies identify the role of top management as a key factor for TQM success. In this sense, Ahire et al. (1996) asserts the importance of top management commitment. Anderson et al. (1995) labelled this as "visionary leadership"; and Flynn et al. (1995) defend top management support. Top management commitment and leadership require an unconditional and active defense of quality principles, complete involvement with the TQM program, and an efficient communication of this attitude.

When this paper refers to top management leadership, it means "visionary leadership", more closely linked to a transformational rather than a transactional leadership style. This style of leadership implies top management that is able to define, apply and communicate the long-term vision of the firm, and motivate all employees to accept this vision and commit themselves to it. In a total quality management focus, it is essential for defining and communicating and motivating this philosophy to be the role of senior managers.

On the other hand, TQM is not an activity in which firms can involve themselves easily. Conversely, it requires a critical change in organizational mentality and procedures—in short, a new way of managing and working. An effective adoption of the TQM philosophy and principles also seems to be of significant relevance. According to Roldán et al. (2012, p. 124), "some researchers have begun to explore TQM as a cultural phenomenon rather than as a set of tools and techniques". TQM philosophy adoption deals with the extent to which quality doctrine and principles are embedded within the values, mission and vision of the company. Performing as candidates for business excellence or quality awards such as the EFQM award is a good symptom of a properly adopted TQM philosophy.

It seems essential that, in order to foster quality improvement practices such as benchmarking, process improvement and zero-defects mentality, the firm's orientation toward and support of total quality management become crucial. A firm will be more oriented to this set of instrumental factors if there is a high degree of commitment and leadership from senior managers, and the TQM philosophy is well impregnated in all the firm's culture, strategies and procedures. Hence, we propose the following first hypothesis (Fig. 10.1).

H1: Top management commitment and TQM philosophy adoption (enabler factors) are positively related to benchmarking, process improvement and zero-defects mentality (instrumental factors).

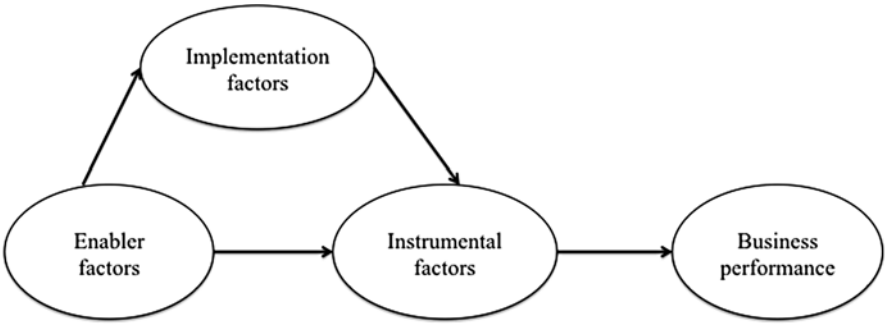


Fig. 10.1 Research model and hypotheses

10.2.2 The Mediating Role of Implementation Factors in the Link Between Enabler Factors and Instrumental Factors

According to Sila and Ebrahimpour (2005), TQM key factors are considered best practices that firms and employees ought to follow in order to effectively foster quality. As discussed above, facilitating factors such as top management commitment and the adoption of TQM philosophy have a positive direct relationship with what we called instrumental factors (benchmarking, process improvement and zero-defects mentality).

Salaheldin's (2009) study aimed to investigate the relationship presented between TQM critical success factors and organizational performance. To this end, this study did not only operationalize these factors in terms of their importance, but also in terms of the relative importance associated with or given to each one. In this sense, this author distinguishes between "strategic factors", "tactical factors" and "operational factors". The first subset of CSFs includes factors such as top management commitment, organizational culture, leadership or quality goals and policy. The second group contains the following factors: employee involvement and empowerment, supplier involvement, employee training and instruction, teambuilding and problem-solving. Finally, the third subset has factors such as product and service design, process control or resource conservation and utilization.

As can be appreciated, there is a remarkable similarity between the groups of TQM success factors proposed in this paper and those suggested by Salaheldin (2009). Firstly, what this author labels as strategic factors includes most of the issues that we identify as enabler factors. Secondly, his tactical factors are made up of the factors which we include in our framework as instrumental factors. Finally, the set of elements that we included in a group called instrumental factors is very similar to the author's operational factors subset.

H2: The relationship between enabler factors and instrumental factors is positively mediated by implementation factors (Fig. 10.1).

10.2.3 The Relationship Between Instrumental Factors and Business Performance

Above, we have discussed the impact of facilitators or enabler factors as well as the mediator role of the set of factors linked to the TQM program implementation. Finally, we will assess the nature of the relationship between the TQM program and business results.

Several studies have addressed the issue concerning the link between TQM factors and business results. Sila and Ebrahimpour (2005) suggest that the outcome of these studies deals with the possibility of detecting which TQM factors have a positive impact on business results, to therefore recommend to managers the factors that should be more thoroughly implemented. Kaynak (2003) found that TQM has a positive influence on both financial and market performance through operational performance. Matsui (2002) posited in turn that TQM plays a significant role while determining the competitive performance of manufacturing firms. According to Das et al. (2000), TQM practices are strongly linked to customer satisfaction, and hence, to business performance.

Within this section we will address a set of issues that we label as instrumental factors. These factors are benchmarking, process improvement and zero-defects mentality. These instrumental factors are the most visible and operative part of the TQM program and constitute the driving force of its constant improvement and enhancement. Most authors who have addressed this topic coincided in positing the existence of a positive relationship between the TQM program implementation and firm performance and results.

Following what Richman and Zachary (1993, p. 3) proposed, "setting a goal of zero defects and continuing to renew one's commitment to moving ever closer toward that goal will lead to improvements that continue to approach absolute perfection over time". These authors also discuss the importance of getting all employees to commit themselves to always doing things right the first time, which is usually known as process improvement.

Brah and Lim (2006) highlighted the positive relationship existing between operational factors and firm performance. Operational factors can be understood as instrumental factors, given that they comply with being the observable or most evident part of TQM program implementation. Specifically, their mission deals with carrying out the TQM philosophy. Thus, we hypothesize that:

H3: There is a positive relationship between instrumental factors and business performance (Fig. 10.1).

10.3 Method

10.3.1 Data Collection and Sample

This study took place in two phases. During the first phase we visited 27 firms involved in the implementation of TQM programs. Around 20 of these 27 companies have been organizations belonging to the "Spanish Excellence Management

Table 10.2 Respondent demographics

	Number	Percentage
Type of business		
Manufacturing company	70	62.0 %
Service company	21	18.6 %
Mixed	22	19.4 %
Number of years implementing TQM		
Five years or more	57	50.50 %
Less than five years	56	49.50 %
Size of the company		
Big enterprise	62	54.9 %
Small/Medium enterprise (SME)	51	45.1 %
Multinational		
Yes	49	43.4 %
No	64	56.6 %

Club", which periodically organizes open days for members. Some of these firms have obtained the European Quality Award. Throughout this first phase, we have been observing, noting and lastly assessing the similarities and dissimilarities we found in the different practices and TQM focus in these firms. We also carried out a total of 39 personal interviews with the senior managers responsible for coordinating TQM programs in Spanish firms. The main objective of these interviews was to test and debug the questionnaire and measurement instruments used. Previously we had carried out an exhaustive revision of the most relevant literature on TQM in diverse scientific journals.

Once this first phase finished and the research design was established, the second phase of the study considered the following study populations: the Spanish firms which offered clear and sufficient indications of having implemented TQM strategies. Our sample was made up of 554 organizations which had implemented a TQM program. This sample consisted of 502 firms with ISO 9000 from the Spanish Agency of Standardization and Certification (AENOR), as well as 79 firms belonging to the Spanish Excellence Management Club. The survey was aimed at the CEOs or senior managers of the companies chosen. Finally, a total of 113 valid responses were obtained, which meant a response rate of 20.4 %. Table 10.2 displays a review of their demographic features.

10.3.2 Measures

The items used to measure the different constructs of the model have been derived and adapted from previously verified sources. The questionnaire was designed on the basis of the literature review described in the article. We essentially used existing scales taken from a previous study carried out by Leal-Millán (1995). The questionnaire items are listed in full in the Appendix.

The three constructs related to TQM factors that make up our research model have been designed as multidimensional constructs. We have followed a superordinate procedure (Polites et al. 2012) in which relationships flow from the

construct to its dimensions. A super-ordinate construct characterizes a broad concept which is manifested by its dimensions (Edwards 2001). Each dimension represents a distinct manifestation or realization of the underlying high-order construct. This particular design of the measurement model includes reflective first-order dimensions and reflective second-order constructs. In this case, we are interested in common variance, that is, the variance shared by the three dimensions. Each of the TQM factors modeled is identified as a reflective first-order construct. Then four second-order constructs have been modeled which are composed of the first-order ones. Three indicators or manifest variables have been used to measure each of the TQM factors. In this section the respondent was asked to indicate the extent to which the following aspects of quality are being implemented in his company. To do so, we used a five-point Likert scale ranging from "1 = we have not implemented this yet, although we have the intention of doing so in the future" to "5 = implementation is at a very advanced stage". The final measurement instrument for this block of TQM key factors is made up of 30 items (3 items for each factor).

As for the business performance construct, this has been modeled as a reflective first-order construct, composed of five items or manifest variables essentially related to financial performance indicators. A subjective measurement of performance has been widely accepted in organizational research for many years. Therefore, in this study we have preferred the use of these measures instead of financial data from the firm's annual accounts, considering the heterogeneity underlying the sample we used. This section of the questionnaire was intended to require the respondent to express the global performance of the firm for the previous 4 years. For this purpose, we also used a five-point Likert scale ranging from "1 = I totally disagree" to "5 = I totally agree".

10.3.3 Data Analysis

In order to assess the relationships between constructs as well as the predictive power of the research model, we have applied Structural Equations Modeling (SEM). Our research model has been specifically tested using Partial Least Squares (PLS), variance-based structural equation modeling (Roldán and Sánchez-Franco 2012), an alternative to classic covariance-based techniques such as AMOS, Lisrel or EQS. The PLS approach has been used because this technique is mainly oriented to causal-predictive analysis, in which the problems explored are complex (high numbers of variables and relationships) and theoretical knowledge is limited (Wold 1979). According to Barclay et al. (1985), this technique is generally recommended for predictive research models which stress theoretical development, such as this study.

PLS represents a mathematical and statistical data-analysis technique that fits the conditions and requirements inherent to social sciences. Wold (1980) called this "soft modeling" because the mathematical and statistical procedures underlying this

technique are robust and rigorous. However, the mathematical model is flexible in the sense that it does not make suppositions related to measuring levels, data distribution or sample size. In addition, the size of the final sample used also suggested the use of PLS with regard to covariance-based structural equation modeling (maximum-likelihood) (Reinartz et al. 2009).

The purpose of PLS modeling is the prediction of manifest and latent variables (Wold 1985). This means that this technique endeavors to explain the variances in both observed and unobserved variables (Fornell and Bookstein 1982). This goal translates into the attempt to maximize the explained variance (R^2) of dependent variables. This leads to the fact that parameter estimations are based upon the independent variables' capacity to minimize residual variances (Chin 1998).

For this reason, the software that has been selected to carry out the PLS analysis was SmartPLS, developed by Ringle et al. (2005).

10.4 Results

PLS models are assessed and interpreted through two phases: (1) the evaluation of the reliability and validity of the measurement model (outer model), and (2) the evaluation of the structural model (inner model). Following this sequential procedure guarantees the validity and reliability of the constructs' measures before attempting to draw conclusions concerning the links between constructs (Roldán and Sánchez-Franco 2012).

10.4.1 Measurement Model

The evaluation of the measurement model is comprised of assessing the individual item reliability, the construct reliability, the convergent validity and, finally, the discriminant validity. As our study satisfactorily meets the requirements of these four tests, we can sustain the strength and reliance showed by the measurement model proposed.

For the case of variables with reflective indicators, like our model's, individual item reliability is considered satisfactory when the items' factor loadings are greater than 0.707 on their respective constructs (Carmines and Zeller 1979).

The construct reliability assessment leads us to verify the internal consistency of all the items while measuring the concept. What we aim to definitely verify here is how rigorous the manifest variables measuring the same latent variable are. To this end we use a measure called composite reliability of the construct (ρ_c). In order to assess this measure, we follow the indications posited by Nunnally (1978), who suggests a level of 0.7 for a modest reliability in early research stages, and 0.8 for a more strict research.

The evaluation of convergent validity is carried out through a measure developed by Fornell and Larcker (1981), called Average Variance Extracted (AVE). This measure provides the amount of variance a construct obtains from its indicators in relation to the amount of variance due to the measurement error. According to these authors, the AVE has to be greater than 0.5, which means that more than a half of the construct's variance is due to its indicators.

Finally, the construct's discriminant validity must be assessed. Discriminant Validity shows the extent to which a given construct is different from the others. This is accomplished through the comparison of the square root of AVE versus correlations. In order to obtain acceptable discriminant validity, the diagonal elements should be considerably greater than the off-diagonal elements in the corresponding rows and columns.

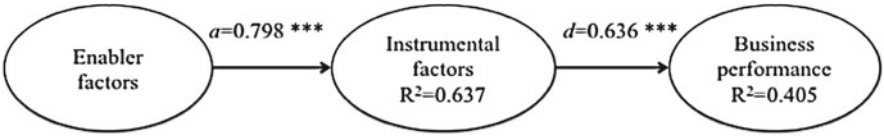
10.4.2 Structural Model

The structural model was tested on the basis of the path coefficients intensity or standardized regression weights (β) and the endogenous variables' explained variance (R^2). Both coefficients were obtained from carrying out the SmartPLS software. In addition, we use a non-parametric Bootstrap resampling technique in order to assess the accuracy and stability of the estimates provided by SmartPLS.

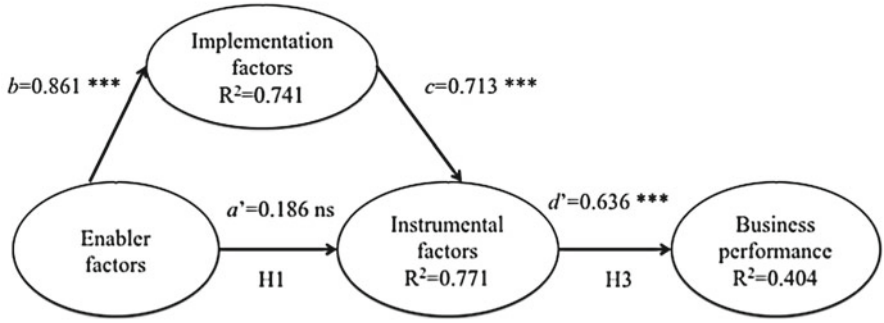
Consistent with Hair et al. (2011), we used a bootstrapping technique (5,000 resamples) to generate standard errors and *t*-statistics, which permit the assessment of the statistical significance of the links contemplated in the models. The results corroborate that the structural model has acceptable predictive relevance for the two endogenous variables: instrumental factors and business performance.

We have followed the methodological approach proposed by Preacher and Hayes (2008) and Taylor et al. (2008) in order to verify our mediation hypothesis (H2). We also assessed the total and direct effects of the independent variable on the endogenous variable (i.e., instrumental factors). In accordance with Williams and MacKinnon (2008) proposals, we used the bootstrapping technique to test the mediation effect. Chin (2010) suggested a two-step procedure for assessing indirect effects in PLS. The first step deals with using the specific model in questions including both the direct and the indirect paths, performing N bootstrap resampling and finally multiplying the direct paths that make up the indirect path we are evaluating. The second step is the estimation of significance through the use of percentile bootstrap (Williams and MacKinnon 2008). This provides a 95 % confidence interval (CI) for mediators. If the interval for a mediation hypothesis does not include zero, this means that the indirect effect is meaningfully distinct from zero with 95 % confidence (Castro and Roldán 2013). As Fig. 10.2a illustrates, the enabler factors construct has a significant total effect on the instrumental factors (path a). When the mediator variable is introduced into the model (Fig. 10.2b), the relationship between the enabler factors and the instrumental factors (path a') becomes non-significant. This means that implementation factors fully mediate the influence of enabler factors on instrumental factors.

a Model with total effect



b Model with indirect or mediated effect



H2 = Enabler factors → Implementation factors → Instrumental factors

*p<0,05; **p<0,01; ***p<0,001; ns Not significant (based on t (4999), one-tailed test).

Fig. 10.2 Structural model

10.5 Discussion

The main purpose of this study was to shed some light on the relationship existing between the implementation of the TQM program and business performance. To do so, and on the basis of a wide theoretical review, a set of ten key factors has been selected and divided into three distinct groups. In this way, we distinguish between enabler factors, implementation factors and instrumental factors.

Contrary to the many studies that emphasize the impact of top management commitment, leadership and a firm's TQM cultural adoption (enabler factors) on the enacting of TQM program principles, we suggest that this link is operationalized by means of a set of implementation factors. In this sense, we propose the existence of an indirect effect. Thus, implementation factors mediate the relationship between enabler and instrumental factors. Our results are consistent with such previous studies as that of Salaheldin (2009).

Several conclusions and practical implications can be upheld. First, we have contributed to the establishment of some kind of order or hierarchy among the key TQM factors. Secondly, although the senior managers' support and engagement with the TQM philosophy certainly supposes an enabler for the successful execution of the TQM program in a firm, we suggest that this is a necessary but not

sufficient condition. There is a series of factors that should be taken into account if the manager really wishes this program to succeed. The involvement of customers and suppliers, fostering an open and flexible structure within the company, the effective training and education of employees in TQM principles and empowerment are practices that ought to be encouraged by managers. Thirdly, we confirm the strong impact that instrumental factors such as benchmarking, process improvement and zero-defects mentality have upon a firm's performance. Favouring the practices mentioned can lead the company to obtain an enhanced performance.

There are several limitations within this work that should be mentioned. The first is related to organizational bias. It seems likely that those firms which are not pleased with their TQM system performance would be less liable and motivated to contribute to the development of this study. Therefore, we have included in the sample a higher proportion of "good" systems than is the case in the population. Secondly, although we provide evidence of causality, causality itself has not been proven. According to Fornell (1982), causal relationship between variables cannot be proven; they are always assumed by the researcher. Thirdly, this research relies mainly on perceptions and we only used a single method to elicit these perceptions. Finally, we carried out this research in a specific geographical setting (Spanish companies). Thus, we must be cautious about generalizing the results in other contexts.

References

Agus A (2005) The structural linkages between TQM, product quality performance, and business performance: preliminary empirical study in electronics companies. Singapore Manag Rev 27(1):87–105

Ahire SL, Golhar DY, Waller MA (1996) Development and validation of TQM implementation constructs. Decis Sci 27(1):23–56

Anderson JC, Rungtusanatham M, Schroeder RG, Devaraj S (1995) A path analytic model of a theory of quality management underlying the Deming management method: preliminary empirical findings. Decis Sci 26(5):637

Barclay D, Higgins C, Thompson R (1985) The partial least squares (PLS) approach to causal modelling: personal computer adoption and use as an illustration. Technol Stud 2:285–309

Black SA, Porter LJ (1996) Identification of the critical factors of TQM. Decis Sci 27(1):1–22

Boone LE, Wilkins D (1995) The role of benchmarking in total quality management. Int J Manag 12(1):123

Brah SA, Lim HY (2006) The effects of technology and TQM on the performance of logistics companies. Int J Phys Distrib Logist Manag 36(3):192–209

Carmines EG, Zeller RA (1979) Reliability and validity assessment. Sage, Beverly Hills, CA

Castro I, Roldán JL (2013) A mediation model between dimensions of social capital. Int Bus Rev 22(6):1034–1050

Chin WW (1998) Structural equation modeling in IS research. Presentado en ISWorld Net Virtual Meeting Center at Temple University

Chin WW (2010) How to write up and report PLS analyses. In: Esposito Vinzi V, Chin WW, Henseler J, Wang H (eds) Handbook of partial least squares concepts, methods and applications. Springer, Dordrecht, pp 645–689, Recuperado a partir de http://www.msvu.ca:2048/login?url=http://www.msvu.eblib.com/patron/FullRecord.aspx?p=993596

Christiansen JS, Lee WY (1994) Total quality management and corporate performance: an empirical investigation (Ford Motor Co. and Kent State University. USA. Working Paper)
Chung CH (1999) It is the process: a philosophical foundation for quality management. Total Qual Manag 10(2):187–197. doi:10.1080/0954412997947
Das A, Handfield RB, Calantone RJ, Ghosh S (2000) A contingent view of quality management-the impact of international competition on quality. Decis Sci 31(3):649–690
Douglas TJ, Judge WQ Jr (2001) Total quality management implementation and competitive advantage: the role of structural control and exploration. Acad Manage J 44(1):158–169. doi:10.2307/3069343
Dow D, Samson D, Ford S (1999) Exploding the myth: do all quality management practices contribute to superior quality performance? Prod Oper Manag 8(1):1–27
Easton GS, Jarrell SL (1998) The effects of total quality management on corporate performance: an empirical investigation. J Bus 71(2):253–307
Edwards JR (2001) Multidimensional constructs in organizational behavior research: an integrative analytical framework. Organ Res Meth 4(2):144–192
Flynn BB, Schroeder RG, Sakakibara S (1994) A framework for quality management research and an associated measurement instrument. J Oper Manag 11(4):339–366
Flynn BB, Schroeder RO, Sakakibara S (1995) The impact of quality management practices on performance and competitive advantage. Decis Sci 26(5):659–691
Flynn BB, Schroeder RG, Sakakibara S (1996) Determinants of quality performance in high and low quality plants. Qual Contr Appl Stat 41(1):73–76
Fornell C (1982) A second generation of multivariate analysis: an overview. In: Fornell C (ed) A second generation of multivariate analysis, vol 1. Praeger, New York, NY, pp 1–121
Fornell C, Bookstein FL (1982) Two structural equation models: LISREL and PLS applied to consumer exit-voice theory. J Market Res 19(4):440–440
Fornell C, Larcker DF (1981) Structural equation models with unobservable variables and measurement error: Algebra and statistics. J Market Res 382–388
Fotopoulos CB, Psomas EL (2009) The impact of «soft» and «hard» TQM elements on quality management results. Int J Qual Reliab Manag 26(2):150–163
Fuentes MMF, Montes FJL, Fernández L (2006) Total quality management, strategic orientation and organizational performance: the case of Spanish companies. Total Qual Manag Bus Excel 17(3):303–323. doi:10.1080/14783360500451358
Grandzol JR, Gershon M (1998) A survey instrument for standardizing TQM modeling research. Int J Qual Sci 3(1):80
Gurnani H (1999) Pitfalls in total quality management implementation: the case of a Hong Kong company. Total Qual Manag 10(2):209–228. doi:10.1080/0954412997965
Hair JF, Ringle CM, Sarstedt M (2011) PLS-SEM: indeed a silver bullet. J Market Theor Pract 19(2):139–152
Harari O (1993) Ten reasons why TQM doesn't work. Manage Rev 82(1):33–38
Hendricks KB, Singhal VR (1997) Does implementing an effective TQM program actually improve operating performance? Manag Sci 43(9):1258–1274
Idris MA, Zairi M (2006) Sustaining TQM: a synthesis of literature and proposed research framework. Total Qual Manag Bus Excel 17(9):1245–1260. doi:10.1080/14783360600750535
Ittner CD, Larcker DF (1996) Measuring the impact of quality initiatives on firm financial performance. In: Fedor DF, Ghosh S (eds) Advances in management of organization quality, vol 1. JAI Press, Greenwich, Conn, London, pp 1–37
Kaynak H (2003) The relationship between total quality management practices and their effects on firm performance. J Oper Manag 21(4):405–435
Khanna HK, Sharma DD, Laroiya SC (2011) Identifying and ranking critical success factors for implementation of total quality management in the Indian manufacturing industry using TOPSIS. Asian J Qual 12(1):124–138. doi:10.1108/15982681111140598
Krumwiede DW, Lavelle JP (2000) The effect of top manager personality on a total quality management environment. Eng Manag J 12(2):9–14

Leal-Millán A (1995) TQM y su influencia en la organización. En Trabajo de investigación para acceso a cátedra. Universidad de Sevilla
Lenka U, Suar D (2008) A holistic model of total quality management in services. ICFAI J Manag Res 7(3):56–72
Llorens Montes FJ, Verdu Jover A, Molina Fernandez LM (2003) Factors affecting the relationship between total quality management and organizational performance. Int J Qual Reliab Manag 20(2):189–209
Matsui Y (2002) Contribution of manufacturing departments to technology development: an empirical analysis for machinery, electrical and electronics, and automobile plants in Japan. PROECO Int J Prod Econ 80(2):185–197
Nunnally JC (1978) Psychometric theory. McGraw-Hill, New York
Oakland JS (1995) Total quality management: text with cases. Butterworth-Heinemann, Oxford
Polites GL, Roberts N, Thatcher J (2012) Conceptualizing models using multidimensional constructs: a review and guidelines for their use. Eur J Inform Syst 21(1):22–48
Powell TC (1995) Total quality management as competitive advantage: a review and empirical study. Strat Manag J 16(1):15–37
Preacher KJ, Hayes AF (2008) Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. Behav Res Methods 40(3):879–91
Rahman S (2001) A comparative study of TQM practice and organisational performance of SMEs with and without ISO 9000 certification. Int J Qual Reliab Manag 18(1):35–49
Rahman S, Siddiqui J (2006) Exploring total quality management for information systems in Indian firms: application and benefits. Bus Process Manag J 12(5):622–631
Rahman S, Sohal AS (2002) A review and classification of total quality management research in Australia and an agenda for future research. Int J Qual Reliab Manag 19(1):46–66
Rao SS, Solis LE, Raghunathan TS (1999) A framework for international quality management research: development and validation of a measurement instrument. Total Qual Manag 10(7):1047–1075. doi:10.1080/0954412997226
Reinartz W, Haenlein M, Henseler J (2009) An empirical comparison of the efficacy of covariance-based and variance-based SEM. Int J Res Market 26(4):332–344
Richman E, Zachary WB (1993) Building an operations management foundation that will last: TQM, JIT and CIM. Industrial Engineering -New York Then Atlanta Norcross- American Institute of Industrial Engineers Incorporated 25(8):39
Ringle CM, Wende S, Will A (2005) SmartPLS 2.0 (M3) beta. Hamburg, Germany
Roldán JL, Sánchez-Franco MJ (2012) Variance-based structural equation modeling: guidelines for using partial least squares in information systems research. In: Mora M, Gelman O, Steenkamp A, Raisinghani M (eds) Research methodologies, innovations, and philosophies in software systems engineering and information systems. Information Science Reference, Hershey, PA
Roldán JL, Leal-Rodríguez AL, Leal AG (2012) The influence of organisational culture on the total quality management programme performance. Investigaciones Europeas de Dirección y Economía de la Empresa 18(3):183–189. doi:10.1016/j.iedee.2012.05.005
Sadikoglu E, Zehir C (2010) Investigating the effects of innovation and employee performance on the relationship between total quality management practices and firm performance: an empirical study of Turkish firms. Int J Prod Econ 127(1):13–26. doi:10.1016/j.ijpe.2010.02.013
Salaheldin S (2009) Critical success factors for TQM implementation and their impact on performance of SMEs. Int J Prod Perform Manag 58(3):215–237
Saraph JV, Benson PG, Schroeder RG (1989) An instrument for measuring the critical factors of quality management. Decis Sci 20(4):810–829
Sila I, Ebrahimpour M (2005) Critical linkages among TQM factors and business results. Int J Oper Prod Manag 25(11):1123–1155
Talib F, Rahman Z (2010) Critical success factors of TQM in service organizations: a proposed model. Serv Market Quart 31(3):363–380. doi:10.1080/15332969.2010.486700
Tamimi N, Gershon M (1995) A tool for assessing industry Tqm practice versus the Deming philosophy. Prod Invent Manag J 36(1):27–32

Taylor A, MacKinnon D, Tein JY (2008) Tests of the three-path mediated effect. Organ Res Meth 11(2):241–269

Thiagaragan T, Zairi M, Dale BG (2001) A proposed model of TQM implementation based on an empirical study of Malaysian industry. Int J Qual Reliab Manag 18(3):289–306

Waldman DA (1994) The contributions of total quality management to a theory of work performance. Acad Manage Rev 19(3):510–536. doi:10.5465/AMR.1994.9412271811

Williams J, MacKinnon D (2008) Resampling and distribution of the product methods for testing indirect effects in complex models. Struct Equ Model: A Multidisciplinary Journal 15(1):23–51

Wold H (1979) Model construction and evaluation when theoretical knowledge is scarce: an example of the use of partial least squares. Université de Genève Faculté des sciences économiques et sociales, Genève

Wold H (1980) Soft modeling: intermediate between traditional model building and data analysis. Math Stat 2:333–346

Wold H (1985) Systems analysis by partial least squares. In: P Nijkamp, H Leitner, N Wrigley (Eds.), Measuring the unmeasurable. Dordrecht ; Boston : M. Nijhoff ; Hingham, MA, pp 221–251 (Distributors for the US and Canada)

York KM, Miree CE (2004) Causation or covariation: an empirical re-examination of the link between TQM and financial performance. J Oper Manag 22(3):291–311. doi:10.1016/j.jom.2004.02.001

Yusuf Y, Gunasekaran A, Dan G (2007) Implementation of TQM in China and organisation performance: an empirical investigation. Total Qual Manag Bus Excel 18(5):509–530. doi:10.1080/14783360701239982

Zairi M (1996) Benchmarking for best practice: continuous learning through sustainable innovation. Butterworth Heinemann, Oxford, Boston

Zairi M, Leonard P (1994) Practical benchmarking: the complete guide. Chapman & Hall, London

Chapter 11
Student Perception of Quality in Higher Education Institutions

Paula Fernandes, Rui Lopes, and Fátima Silva

Abstract Higher education institutions have adopted education, research and cooperation as their main missions. Students, teachers and non-teaching staff articulate for lecturing, researching and developing projects and internships, according to the institution goals and strategy. Quality evaluation is of the utmost importance in the whole process, as it allows providing a competent and rigorous service as well as maintaining high level of attractiveness for additional funding, through cooperation and research projects. This chapter describes the results of an empirical study, performed in the Technology and Management School of the Polytechnic Institute of Bragança, to assess and compare the perceptions of students about the satisfaction and quality of the institutions' services and its importance. The universe comprised 2,031 students and we concluded that globally they have a high values of satisfaction. We also differentiate between study cycles (graduation and master) and field of study (Technological and Business).

11.1 Introduction

Higher education has, in its guidelines, the role of producing knowledge based on the development of science, technology and citizenship. In turn, Higher Education Institutions (HEI) directly influence the economic, cultural and social development

P. Fernandes • F. Silva
Economics and Management, Polytechnic Institute of Bragança (IPB),
Campus de St. Apolónia, Bragança, TMAD 5300-253, Portugal

R. Lopes (✉)
Informatics and Communications, Polytechnic Institute of Bragança (IPB),
Campus de St. Apolónia, Bragança, TMAD 5300-253, Portugal
e-mail: rlopes@ipb.pt

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in regions where they operate, requiring a strong commitment on the quality of services provided. The positive attitudes of a service lead to increased customer retention. The withdrawal or loss of a client (student) results in revenue reduction and the weakening of their image among potential candidates.

The evaluation of the quality of service is based significantly on the characteristics of past experiences and beliefs, comprising various attributes. According to Kotler and Keller (2005), to meet and satisfy customers better than competition is the key to a profitable development.

Quality has become a crucial and strategic subject of discussion among HEI, and has been extensively studied in recent years. Just like any other organizations, to be successful, HEI have to perform their role effectively. In this context one of the main ways to attract students (costumers) is to guarantee their satisfaction with the performance of the institution, when compared to their expectations at the arrival and also during the academic years.

According to this, it is crucial that HEI make an authentic effort to measure their performance on a regular basis. The Importance-Satisfaction Analysis can be used to evaluate the performance of a Higher Education Institution. This methodology is supported by the intersection of two dimensions, such as the level of satisfaction derived from students who use the services and the degree of importance they attach to the services, it is possible to determine whether a HEI has provided the services that fulfilled the needs of its students.

Therefore, the main reason for this study is to increase the literature available in management service quality in higher education. This will be completed through assessing and comparing the perception of undergraduate students at School of Technology and Management of Polytechnic Institute of Bragança (Portugal).

The data for this study was collected in classroom via a questionnaire answered by students who attended the graduate and master programs at School of Technology and Management of Polytechnic Institute of Bragança, located in the town of Bragança, Portugal.

The instrument used was divided into two sections:

Section I—students' personal information;
Section II—students' perceptions of the importance and their satisfaction towards with several attributes. The attributes under consideration were: Quality of General Aspects, Quality of the Library, Quality of Computer Laboratory Facilities, Quality of Academic Services, Quality of Teaching Aspects, Quality of Studies Programs, and Quality of External Relations.

A total of 695 valid questionnaires were received, which represents 34 % of the total student population (2031 students). The sample size showed a sampling error of 3.7 %, assuming a 95 % accuracy level.

Our research is structured as follows, after this introductory section; we carry out a review of the literature relevant about Importance-Satisfaction Model. The methodology adopted, the sample size, the variables used and the statistical methods were described in the Sect. 11.3. This is followed by analysis and discussion of our results before putting forward our final considerations.

11.2 Theoretical Background

The capacity of HEI to attract and retain students strongly depend on the provided satisfaction. According to Aktas et al. (2007) the image of an institution influences their choice and affects the behavior of students. Loyalty is the result of the recognition that attracts and retains customers and linked to the ability to differentiate services, as well as the conviction that the institution will offer them a consistent quality. This analysis involves the simultaneous consideration of evaluations from customers about the importance of the most important attributes and their level of satisfaction with the service provided.

Therefore, the application of Importance-Satisfaction Analysis (ISA) was based on the Importance-Performance Analysis developed by Martilla and James (1977). The performance has been replaced by satisfaction, since it considers that satisfaction has become the main measure of service quality (Matzler et al. 2003; Tonge and Moore 2007; Aktas et al. 2007).

For Baker and Cromptom (2000), cited by Tonge and Moore (2007), they define performance as a measure of production that results in satisfaction. According to these authors, the satisfaction provides information to analyze the performance of a results-based institution. When comparing the importance to the satisfaction of certain attributes, it identifies the areas in which to intervene and focus on service performance/satisfaction.

The ISA consists of a pair of coordinate axis where the 'importance' (y-axis) and the 'satisfaction' (x-axis) of the different elements involved in the service are compared (see Fig. 11.1). Each of the quadrants combines the importance and the satisfaction assigned by the customers/user given element of the service and possesses a different value in terms of management and the respective mean of self-stated raw importance and attribute satisfaction data is the original point of this ISA matrix (Martilla and James 1977; Guadagnolo 1985; Bacon 2003; Matzler et al. 2003; Zhang and Chow 2004; Pike 2004; Go and Zhang 2008; Silva and Fernandes 2010). Each quadrant suggests a different marketing strategy.

The four quadrants in importance-performance analysis are characterized as (Martilla and James 1977; Matzler et al. 2003; Silva and Fernandes 2010):

- Low satisfaction on highly important attributes demands immediate attention, in order to improve overall satisfaction, HEI should 'Concentrate Here' (Quadrant A). If they are ignored, this poses a serious threat;
- Attributes in Quadrant B evaluate high both in satisfaction and importance, representing opportunities for gaining or maintaining competitive advantages. In this area a HEI should 'Keep Up the Good Work';
- Quadrant C contains attributes both low in satisfaction and importance. Typically, it is not necessary to focus additional effort here. These product or service attributes are of 'Low Priority';

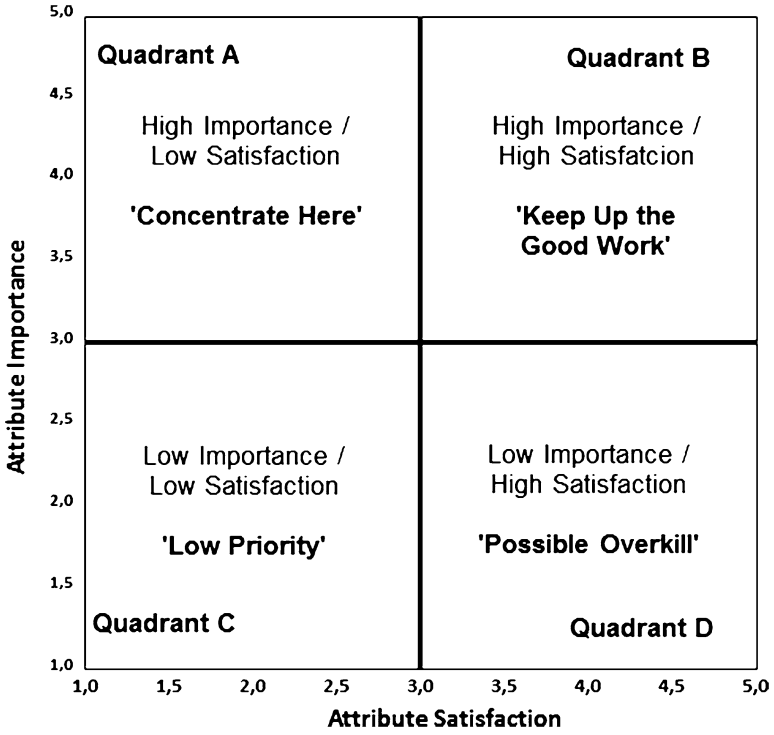

Fig. 11.1 Importance-satisfaction matrix (Adapted from Matzler et al. 2003, p. 115)

– Attributes located in Quadrant D are rated high in satisfaction but low in importance. This implies that resources committed to these attributes would be better employed elsewhere. High performance/satisfaction on unimportant attributes indicates a 'Possible Overkill'.

It should be noted that the definition of the x-axis of the Cartesian graph was maintained over the years by some authors and changed by others, analyzing the performance or satisfaction depending on the phenomenon under study.

To construct the matrix Martilla and James (1977), Tonge and Moore (2007) recommend the use of the average range of the scale for crossing axes. Martilla and James (1977), Lynch et al. (1996) indicates that should still be considered the median value of the data presented to cross the axes, based on the trend of responses. Other authors e.g., Zhang and Chow (2004), Aktas et al. (2007), Abalo et al. (2007), Rial et al. (2008), Lee and Lee (2009), Matzler et al. (2003), recommend the use of average results, to define the intersection of the axes of Cartesian graph, found for each axis.

After the application of ISA, we also formulated some hypothesis to further assess the relation between the services provided and the origin, course and field of the students.

11.3 Methodology Design

11.3.1 Sampling and Survey Instrument

The data for this study were collected in classroom, applying a questionnaire to the students who attend the undergraduate and master degree programmes at the School of Technology and Management (ESTiG) of Polytechnic Institute of Bragança, located in Bragança, Portugal.

The questionnaire contained 42 items reflecting the dimensionality of importance and satisfaction with service levels of Higher Education Institutions.

The final questionnaire was divided into three parts, as follows:

(i) Demographics survey;
(ii) Importance survey: Responses requested on a five-point Likert scale ranging from 'Very unimportant' (1) to 'Very important' (5);
(iii) Satisfaction survey: Responses requested on a five-point Likert scale ranging from 'Strongly Disagree' (1) to 'Strongly Agree' (5).

The survey was conducted during April and May of 2010, in second semester of the 2009/2010 academic year. A total of 695 valid questionnaires were received, which represents 34 % of total population (2.031 students). The sample size resulted in sampling error of 3.7 %, assuming a significance level of 0.05.

11.3.2 Selection of Variables

As for the selection of the determinants of students' satisfaction, the choice has been made on the basis of previous literature (e.g., Joseph and Joseph 1997; Alves 1998; Pike 2004); as result we decided to focus on the following attributes:

(i) Quality of General Aspects: it includes Moderns facilities, Clean facilities, Sports activities, Cultural activities, Associations of students;
(ii) Quality of the Library: Easy access to shelves; Ways of consulted rapidly; Warmth of its staff and Interest in solving the problems of student;
(iii) Quality of Computer Laboratory Facilities: Availability of laboratories and computer facilities; Ability to use after classes and Existence of training in computer tools;
(iv) Quality of Social Services: Financial aid for students; Existence of medical support to students; Availability of accommodation for students; Existence of canteens; Knowledge of rules and procedures; Trust and safety in service; Information service completion; Interest in solving the problems of student; Simple rules and procedures and Warmth of its staff;
(v) Quality of Academic Services: Simple procedures; Knowledge of rules and procedures Simple procedures; Interest in solving the problems of student; Trust and safety in service; Information service completion; Quick response and Warmth of its staff;

(vi) Quality of Teaching Aspects: Friendliness of the teachers; Personalized attention; Easy communication with teachers; Clarity and precision in the exposure of knowledge; Scientific expertise of the teacher; Fair assessment and Advice the basic bibliography;
(vii) Quality of Undergraduate Programmes: Updated content and Several career opportunities;
(viii) Quality of External Relations: Getting the internships; Exchange programs with foreign; Conferences and seminars and Internet connection.

11.3.3 Data Analysis

Descriptive analyses such as frequency, mean and standard deviation were conducted to examine students' demographic profiles. Cronbach's alpha was calculated to test the reliability of the dimensionality of importance and satisfaction with service levels of HEI perceived by students. A factor was considered significant if its Cronbach's alpha was 0.70 or above. In this study it was achieved for an alpha reliability on the importance ratings of the 42 attributes was high (0.972). The alpha reliability on the satisfaction ratings was also high (0.954).

Mean scores rating was calculated for the importance and satisfaction dimensions. Then, the mean scores of the 42 service quality attributes were plotted on the ISA matrix according to their perceived importance and the satisfaction levels as perceived by students.

In addition, we formulated three sets of hypothesis, tested for statistical relevance using mean-comparison *t*-test. For example, the test allows us to see if the students' satisfaction from a given region is higher than other regions. This requires that we calculate the average for the students' satisfaction from that region and then for all the other regions, doing a simple *t*-test to see if they are different. We restricted the results to the ones that shown a statistical relevance higher than 90 %, discarting all the others as non-relevant.

11.4 Findings and Discussion

11.4.1 Profile of Respondents

Table 11.1 lists some of the socio-demographic characteristics of the respondents.

The original sample consisted in 695 students, 46 % female and 54 % male, and the majority has between 18 and 22 years old and coming from undergraduate programs, 57.8 % from technological fields and 42.2 % from business sciences.

As to their origin, this sample is characterized by 87.9 % of students come from the area north of Portugal, and the, district of Bragança, Braga and Porto the main contributors, with respectively 37.5 %, 22.4 % and 20.1 %.

Table 11.1 Socio-demographic characteristics of respondents [n = 695]

Variable	No.	%
Gender		
Female	320	46.0
Male	375	54.0
Age		
18–22 years old	510	73.0
22–27 years old	133	19.0
>28 years old	52	8.0
Study Fields		
Technological	402	57.8
Business	293	42.2
Academic Year		
1st	262	38.0
2nd	226	32.0
3rd	145	21.0
1st master degree	62	9.0
Geographical location		
Northern	611	87.9
Central	52	7.5
Others	32	4.6

The Central Region represents 7.5 % of the sample, and the districts of Aveiro and Viseu are the most representative with respectively 3.7 % and 2.4 %. The area referred to as Other is responsible for 4.6 % of the sample, among which are students with 1.2 % PALOP (African Countries of Portuguese Official Language).

11.4.2 Importance-Satisfaction Analysis

After the sample characterization is intended to make the analysis Importance-Satisfaction applied to ESTiG. It is useful to check not only the importance that students attach to different attributes of the service, as well as the students' satisfaction or dissatisfaction. To this end, this study was based on analysis of eight attributes and variables that are different in each category and are an integral part of the questionnaire. The attributes were explain in Sect. 11.3, point 3.2.

From the below table it is possible to learn the mean rating for both Importance and Satisfaction scale, and is possible to conclude that students are quite satisfied with the quality of all services (mean of 3.519, 0.908 for the standard deviation), but results also convey a higher importance to each of the items under analysis, registering a mean of 4.336 (and 0.783 for the standard deviation) (Table 11.2).

The results are spread over 3 quadrants (Fig. 11.2).

In Quadrant B where are positioned aspects of the undergraduate programmes. These aspects are a paramount importance for students and high satisfaction, the ESTiG has a good performance, and should continue to work and continue to meet the needs of their students.

Table 11.2 Importance vs. satisfaction analysis for ESTiG

Attribute code	Attribute description	Importance			Satisfaction		
		Mean[a]	Standard deviation	*Ranking*	Mean[b]	Standard deviation	*Ranking*
[A]	Quality of General Aspects	3,967	0.817	8	3.600	0.845	3
[B]	Quality of the Library	4,372	0.807	4	3.505	0.933	5
[C]	Quality of Computer Laboratory Facilities	4,315	0.781	5	3.452	0.892	7
[D]	Quality of Social Services	4,294	0.809	6	3.454	0.955	6
[E]	Quality of Academic Services	4,267	0.825	7	3.143	0.939	8
[F]	Quality of Teaching Aspects	4,450	0.749	2	3.518	0.903	4
[G]	Quality of Undergraduate Programs	4,616	0.691	1	3.798	0.873	1
[H]	Quality of External Relations	4,408	0.783	3	3.681	0.928	2
	Global average	**4,336**	**0.783**		**3.519**	**0.908**	

[a]Rating obtained from a five-point Likert scale ranging from "Very unimportant" (1) to "Very important" (5)
[b]Rating obtained from a five-point Likert scale ranging from "Strongly Disagree" (1) to "Strongly Agree" (5)

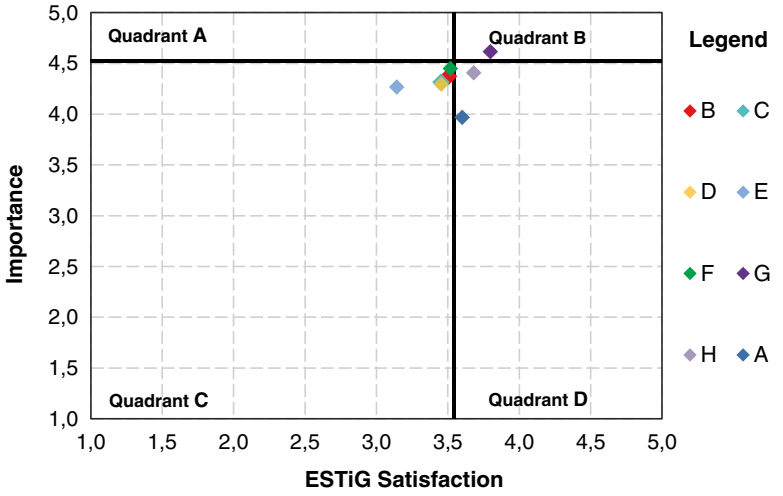

Fig. 11.2 ESTiG ISA for the global average, according to the median value for the axis (4.51; 3.54)

Quadrant C covers the most services, the aspects related with Academic Services, Social Services, Computer Laboratory Facilities, Library and issues related to Teaching Aspects. Quadrant C called the Low Priority demonstrates that student performance is below average, but do not consider important, shows low importance and low satisfaction with these attributes so do not require additional efforts.

In Quadrant D appeared aspects with External Relations and the General Aspects of the school. It thus appears that these aspects have a below average importance and satisfaction for the same students, is above average, indicating that these aspects should receive attention by the ESTiG, and may be used in its promotion. However there should be a balanced consideration not to be wasting excessive strain.

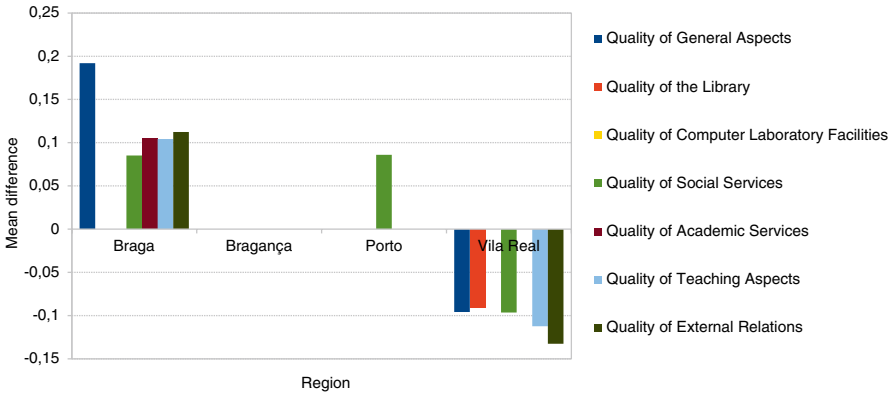

Fig. 11.3 Mean difference for student perception importance by region

11.4.3 Hypothesis

We formulated an hypothesis to the student perception of importance, as follows: the students from <region> give more importance to <service> than the others.

It was tested and its statistical relevance was measured, considering that only relevance above 90 % was meaningful. We also only considered the regions represented with over 90 students (Fig. 11.3).

We also formulated three sets of hypothesis relative to satisfaction, as follows:

- The students from <region> are more satisfied with the <service> than the others.
- The students from technological courses are more satisfied than the others.
- The students from the master courses are more satisfied than the others.

Each hypothesis was tested and the statistical relevance was measured. Only relevance above 90 % was considered. We also only considered the regions represented with over 90 students (Fig. 11.4).

Students from Braga (137) are consistently less satisfied with the library and the Social Services, with statistical relevance over 90 %. The 229 students from Bragança present a contradictory view, revealing high degree of satisfaction with both parameters. The students from Vila Real (97) are essentially dissatisfied. The exceptions are the Quality of Computer Laboratory Facilities, the Social Services and the Quality of Undergraduate Programs.

For the second hypothesis, there is no clear distinction between technological and management area courses. Only regarding the Quality of Teaching Aspects the management area students show less satisfaction than of the other students, with 100 % statistical relevance.

In the last hypothesis, master students (2nd cycle of study) are indeed more satisfied with the Quality of Computer Laboratory Facilities, the Teaching Aspects and

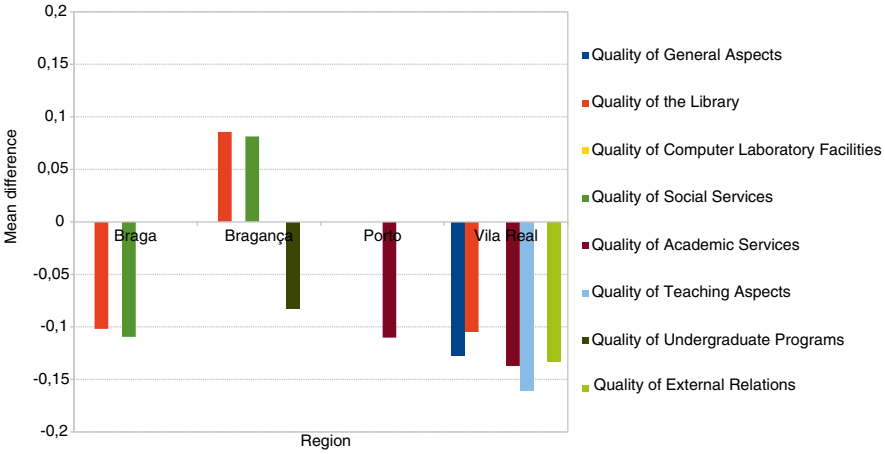

Fig. 11.4 Mean difference for student perception satisfaction by region

the External Relations than graduation students (first cycle of study) (Table 11.3). This can probably result from more specialization and, consequently, more close access to informatic tools relevant to the area of choice.

11.5 Conclusions and Suggestions for Further Study

The increasing importance of higher education for social participation and citizenship as well as for knowledge development and education at a high level, demands a culture of quality that ultimately reflects on the HEI mission development. Based on literature review and empirical studies, this study identifies nine Quality Factors: General Aspects, Library, Computer Laboratory Facilities, Social Services, Academic Services, Teaching Aspects, Undergraduate Programs and External Relations.

Within each, the quality is assessed through the perception of students, in relation to the importance and satisfaction of each attribute. The questionnaires data was analysed through the Importance-Satisfaction Analysis, based on the Importance-Performance Analysis, replacing the performance by satisfaction.

According to the Quadrant Analysis which results from the Importance-Satisfaction Matrix, we conclude that only the aspects related to the course are in Quadrant B, aspects that are of extreme importance and high satisfaction to the students—Quality of Undergraduate Programs. Quadrant C has most of the services, such as the Quality of Academic Services, Quality of Social Services, Quality of Computer Laboratory Facilities, Quality of the Library and Quality of Teaching Aspects. This quadrant is considered as Low Priority, representing low importance and satisfaction, revealing that this factors do not demand additional effort from the

Table 11.3 Mean difference comparison by academic degree

	Quality of general aspects	Quality of the library	Quality of computer laboratory facilities	Quality of social services	Quality of academic services	Quality of teaching aspects	Quality of undergraduate programs	Quality of external relations
1st vs 2nd cycle	0	0	0.16244	0	−0.13876	0.22081	−0.132218	0.17996
Technological vs Business Field	0	0	0	0	0	−0.24948	0	0

institution. In Quadrant D we can find the aspect related to the Quality of External Relations and Quality of General Aspects. These have a low importance and an above average importance, which indicate that, if necessary, some effort in these aspects can be rationalized. The results showed that in general, students are satisfied with the services provided by ESTiG since the average of all aggregate variables are above the middle value. The attributes considered by the students, with greater satisfaction beheld: the Quality of Undergraduate Programs was positioned in first Place; in second Place the Quality of External Relations, at third Place the Quality of General Aspects, and Quality of Teaching Aspects was positioned in fourth Place. The two attributes that showed low level of satisfaction were Quality of Computer Laboratory Facilities and Quality of Academic Services. These aspects should be put under the director consideration, in order be considered for improvement.

To further assess the differences and to characterize particularities and tendencies among the respondents, some importance and satisfaction hypothesis where formulated. These were assessed using a mean-comparison *t*-test, identifying specific approaches among study cycles (master and undergraduate) and field of study (technological and business).

It would also be of interest to extend this analysis to the others schools of Polytechnic Institute of Bragança to see if the students' perceptions regarding satisfaction with services offered by HEI is the same, once the field of study of each school are very distinct of School of Technology and Management. In addition, a more in-depth review of a few of the most important variables cited in this study would also be of interest.

Acknowledgments This work has been supported by the School of Technology and Management of the Polytechnic Institute of Bragança (Portugal). The authors would like to thank the students who answered the questionnaires and the teachers at ESTiG for allowing time in their classes for carrying out the investigation. We would also like to thank ESTiG's Principal for authorizing the use of the questionnaires in the Institution.

References

Abalo J, Varela J, Manzano V (2007) Importance values for importance-performance analysis: a formula for spreading out values derived from preference rankings. J Bus Res 60(2):115–121

Aktas A, Aksu A, Çizel B (2007) Destination choice: an important-satisfaction analysis. Quality & Quality 41(2):265–273

Alves H (1998) O Marketing das Instituições de Ensino Superior: O caso da Universidade da Beira Interior. Dissertação de Mestrado em Gestão apresentada na Universidade da Beira Interior. Universidade da Beira Interior, Covilhã

Bacon D (2003) A comparison of approaches to importance-performance analysis. Int J Market Res 45(1):55–71

Baker DA, Crompton JL (2000) Quality, satisfaction and behavioral intentions. Ann Tour Res 27(3):785–804

Go F, Zhang W (2008) Applying importance-performance analysis to Beijing as an international meeting destination. J Travel Res 35(1):42–49

Guadagnolo F (1985) The importance-performance analysis: an evaluation and marketing tool. J Park Recreat Adm 3:13–22
Joseph M, Joseph B (1997) Employers' perceptions of service quality in higher education. J Market Higher Edu 8(2):1–13
Kotler P, Keller K (2005) Administração de Marketing (12.ª Edição). Prentice Hall, São Paulo
Lee G, Lee C (2009) Cross-cultural comparison of the image of Guan perceived by Korean and Japanese leisure travelers: importance-performance analysis. Tourism Manage 30(6):922–931
Lynch J, Carver R, Virgo J (1996) Quadrant analysis as a strategic planning technique in curriculum development and program marketing. J Market Higher Edu 7(2):17–32
Martilla J, James J (1977) Importance-performance analysis. J Market 41(1):77–79
Matzler K, Sauerwein E, Heischmidt K (2003) Importance-performance analysis revisited: the role of the factor structure of customer satisfaction. Serv Ind J 23(2):112–129
Pike S (2004) The use of repertory grid analysis and importance-performance analysis to identify determinant attributes of universities. J Market Higher Edu 14(2):1–18
Rial A, Rial J, Varela J, Real E (2008) An application of importance-performance analysis (IPA) to the management of sport centres. Manag Leisure 13(3/4):179–188
Silva F, Fernandes P (2010) Using importance-performance analysis in evaluating of higher education: a case study. ICEMT 2010 International conference on education and management techonogy. IEEE, 121–123
Tonge J, Moore S (2007) Importance-satisfaction analysis for marine-park hinterlands: a Western Australian case study. Tourism Manage 28(3):768–776
Zhang H, Chow I (2004) Application of importance-performance model in tour guides' performance: evidence from mainland Chinese outbound visitors in Hong Kong. Tourism Manage 25(1):81–91

Chapter 12
Optimisation Methodology Based on Genetic Algorithms to Increase the Quality and Performance in Autotrading Robots

Antonio Alonso-Gonzalez, Vicent Almenar-Llongo, and Marta Peris-Ortiz

Abstract Genetic algorithms are an application of evolutionary models derived and used in solving various problems of modelling, programming and optimisation. In this paper, we developed an optimisation methodology using the free Indicore SDK 2.0 software to increase the quality and performance of the results of autotrading robots programmed in the LUA 5.1 language with various parameters optimisable in number and range, by dividing the overall process optimisation into various sub phases. This methodology was applied to an autotrading robot built on the basis of the Moving Average Convergence Divergence technique for the currency pair of EUR/USD. This application was for a time scale of 1 h, during a period of annual in-sample optimisation between 2001 and 2007. We then tested this algorithm by applying the optimal configuration yielded by this process to an out-of-sample phase spanning 2008 to August 2011. The results show that the optimal configuration yielded by the optimisation methodology could be used as a tool to increase the quality of autotrading robots, because, in addition to producing positive results in the optimisation phase, the technique improves performance and behaviour when applied in the testing phase.

12.1 Introduction

Genetic algorithms are the paradigmatic example of evolutionary computation (Mitchell 1995). Genetic algorithms (and other evolutionary techniques) consist of transparent evolutionary models not based on a "black box", but rather inspired by

A. Alonso-Gonzalez (✉) • V. Almenar-Llongo
Economics Department, Universidad Catolica de Valencia "San Vicente Martir", San Bartolome, Godella, Valencia 46110, Spain

M. Peris-Ortiz
Departamento de Organización de Empresas, Universitat Politecnica de Valencia, Camino de Vera s/n, Valencia 46022, Spain
e-mail: toni.alonso.gonzalez@gmail.com

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Darwinian evolutionary theory (Dempster et al. 2001). Thus, these models have their axioms rooted in the concept of the "survival of the fittest", defined as the ease of the best members of a population to breed successfully and pass their most satisfactory features on to the next generation (Holland 1975; Koza 1992; Lazarus and Hu 2001; Noguer 2010). From a computational perspective, the evolutionary mechanism is the key area in which the researcher can choose and freely set parameters and evolutionary goals.

In this paper we propose an optimisation methodology applicable to autotrading robots as a tool to increase the quality of results in these robots, allowing computational cost reduction through the subdivision of the optimisation process into different sub phases, performing partial optimisations using genetic algorithms and reaching the optimisation of the last parameter by a final, exhaustive optimisation. To test this methodology, we optimise an autotrading robot based on the divergence signals of the Moving Average Convergence Divergence technique by applying this technique to a scale of 1 h and to the currency pair of EUR/USD. This obtains an optimal configuration which can then, in turn, be applied to a subsequent testing phase to check the final results, quality, and performance levels attained. This chapter has the following structure. In the second section, "Theoretical Background", we present the range of uses and functionality of genetic algorithms, as well as their quality concepts and some interesting results from existing research. In the third section, "Methodology", we exhaustively describe the optimisation methodology and the notation used in our optimisation proposal, both in terms of general notation, and that applied to test the methodology for the currency pair of EUR/USD, during both the optimisation and testing phases. We also present the data obtained from the optimisation process, testing the described autotrading robot through a detailed and comprehensive analysis, and evaluating the performance of the method as a tool to increase the quality of the overall process. Finally, we highlight the conclusions of this analysis in the "Conclusions" section.

12.2 Theoretical Background

12.2.1 Genetic Algorithms

The study of genetic algorithms began in 1975 with the publication of John Henry Holland's book, "Adaptation in Natural and Artificial Systems. An Introductory Analysis with Applications to Biology, Control and Artificial Intelligence." These studies were subsequently extended by Koza (1992). The work of both authors lays the foundation for what is now known as genetic algorithms, a tool for solving a variety of problems in a wide range of scientific fields. In 1995, Mitchell (1995) defined some of the more common applications of genetic algorithms including genetic programming, machine learning, optimisation problems, economic models,

models of immune systems, ecological models, and social models. Some of the key applications of genetic algorithms are to help scientists solve problems where the solution space is too large to use standard procedures, as well as providing invaluable tools where the solution space generates anomalous or irregular behaviour in the system under study.

It is rare to encounter studies where genetic algorithms have been used to define optimisation methodologies to increase the quality of the optimal configurations of trading strategies. In the field of financial markets, genetic algorithms have been implemented mostly to increase the performance of strategies, yielding satisfactory results; usually in conjunction with technical/operational rules. In this vein, Roberts (2002) generated rules using techniques based on genetic algorithms—although the author omits transaction costs from his analysis, and the profits arising from these rules should thus be viewed with caution—, and demonstrated that the application of these rules can distinguish between periods of high profit, and, conversely, slumps and periods of volatility. Lohpetch and Corne (2009) also used genetic algorithms to test the performance of technical rules, obtaining acceptable results in some cases. In summary, these two studies report good results, albeit with limitations such as the need to consider operational commissions or the technical/operational strategy when implementing the genetic algorithm. Some studies state that a limitation on the use of genetic algorithms to generate rules or optimisation techniques lies in the need to consider operational commissions. Allen and Karjalainen (1999) discussed the need to take into account transaction costs in research in this field, as their work reveals that the use of genetic algorithms in generating technical rules for equity markets cannot be considered satisfactory when operating fees, although positive results can be observed in very liquid markets with low transaction costs (such as the Foreign Exchange Market).

12.2.2 Utilities of Genetic Algorithms

The three basic uses of genetic algorithms in financial markets are the following.

1) Data classification, using genetic techniques combined with technical or fundamental analysis, yielding successful results in classifying financial data (Doherty 2003).
2) Genetic programming, applied to financial markets, which has had acceptable results (Farnsworth et al. 2004; Subramanian et al. 2006; Matsui and Sato 2011; Chan and Wonk 2012). Outstanding studies in this area are those of Li and Tsang (1999), who successfully predicted the prices of the Dow Jones index based only on historical data using genetic programming techniques and basic rules for making negotiation decisions, although they argue that they ignored transaction costs and initial capital adequacy. Chen et al. (2000) conducted a study along the same lines, successfully using genetic algorithms to generate operational trading rules based on technical analysis.

3) Optimisation, which, as Chen (2005) clearly expounds, is of definite interest in terms of nomenclature and notation. The author provides an operational strategy based on a combination of several techniques and rules, setting out an optimisation methodology, based on genetic algorithms and the detailed definition of various optimisation windows, and then testing this methodology. Lin et al. (2004) answered the question as to whether the savings in computation time resulting from genetic algorithms compensates for the failure to obtain an optimal solution and having to settle for an approximation. In their study, they compare performance and computation time in the process of the optimisation of a genetic algorithm versus an exhaustive algorithm, concluding that the resulting configurations obtained with the genetic algorithm generate similar benefits to the best solution provided by the exhaustive algorithm, with enormous cost savings in computation time. Subramanian's (2004) research points to similar findings, with this scholar also claiming that, although the convergence of the solutions generated by genetic algorithms is unassured, they are quite robust in the production of near-optimal solutions for a wide variety of problems, particularly those for which the explicit formulation of a precise mathematical notation proves difficult.

In this study, the genetic algorithm is used as an optimisation tool combined with a novel methodology to choose the best optimal solution according to a quality criteria, to optimise and test an autotrading robot in a Foreign Exchange Market environment. For the Foreign Exchange Market, studies have mainly focused on the application of genetic algorithms to trading. Neely et al. (1997) used genetic programming tools to establish rules and negotiation techniques, obtaining strong evidence for benefit with these rules in six currency pairs, for a study period from 1981 to 1995. The results show that the rules used detected techniques and data patterns that remain unidentified by the current standard statistical models. Drake and Marks (1998) claim that, although genetic algorithms were initially used in this market for the generation of operational rules for technical or fundamental analysis (in the latter case with more limited results), the real utility of genetic algorithms is their use as a tool to optimise operational technical rules (based on moving average filters, etc.), as the computation time required for this process is massively reduced compared to standard optimisation processes. In the same vein, Dunis et al. (1999) used a genetic algorithm as a parametric optimiser indicator based on moving averages applied to historical quotes of the Foreign Exchange Market, with optimisation (in-sample) and testing (out-of-sample) phases. They conclude that, although most of the models used yield good results in the optimisation period, some fail to generate profits in the testing phase, although they go on to explain that limitations in their study might have influenced these results. Subsequently, Hryshko and Downs (2003) found the same problem in their research, when they optimised various rules derived from technical analysis (indicators based on moving averages, relative strength, momentum, etc.) using genetic algorithms. Their results were good for the in-sample period, but not for the out-of-sample period. Hirabayashi et al. (2009) results were acceptable—despite their vulnerability to sudden movements in the

market—by means of optimisation of technical rules with a genetic algorithm, which is fed back with new quotes to prompt the recalculation of the optimal values for the technical rules.

12.2.3 Problem Resolution Through Genetic Algorithms

According to the literature (Holland 1975; Koza 1992; Kapishnikov and Borisov 2001; Hryshko and Downs 2003; Ergin 2007; Koskinen et al. 2008; Pappu 2011) the common steps of problem solving through genetic algorithms are as follows.

1) Generation of the initial, randomly generated population, creating a number of potential solutions in the search space. The larger the population size, the better the diversity of solutions, although, accordingly, more powerful computational resources will be required.
2) Calculation of the individual elements' performances, depending on the task performed. The better an element's performance, the more probability it has to take part in the creation process of the next generation.
3) Selection of individual elements in relation to their income. The best individual elements will be involved in the reproductive stage or calculation of the next generation.
4) Calculation of the next generation, restarting the process, commencing with the first phase.

   Therefore, in this study, we will introduce a new step that will ensure the introduction of a quality maximisation rule to improve the performance and results of the autotrading robot:
5) Quality control criteria, to select the best optimal solution from the available alternatives.

The concept of quality is very broad and can be defined differently depending on the specific field of the financial markets under study. In terms of financial markets in general, and Foreign Exchange Market in particular, some authors have claimed that the quality of markets are different if concepts and features such as liquidity, volatility, transaction costs, technology, connectivity, ownership, governance, or even the performance of the trading services operating the markets are taken into account (Fu et al. 2003; Allen et al. 2001). Following this view, and shifting the focus from from the general concept of quality of the market to a specific concept of quality related to automation, Hendershott and Moulton (2010) found that the evolution of markets, increasing automation, and reducing the execution time for market orders increases the cost of immediacy (bid-ask spreads)—because of increased adverse selection—and reduces the noise in prices, making prices more efficient and increasing the market's overall quality. Boehmer (2005), on the other hand, asserts that market quality equates to the cost of order execution in terms of price and time—what he refers to as "execution quality". This view is supported by Boehmer et al. (2007) study, in which these scholars analyse this execution quality

in decisions taken by investors, and this concept's relationship with other market information. Garvey and Wu (2009) studied the behaviour of this execution quality in relation to the trading time during the day. Sato and Hawkings (2001) maintain that the quality of services related to any financial market is essential to assess its quality, whilst Weber and Zysman (2001) state that the type of market participants is crucial for market behaviour and therefore influences quality levels of the market. Finally, Nieto (2001) considers information accessibility and quality one of the most important conditions to ensure market quality.

Obviously these prior definitions of market quality are too broad for the scope of this study, since we focus on an optimisation methodology based on genetic algorithms applied to an autotrading robot to increase the quality of results and performance. So, considering just the quality concept applied to automated trading, Payo-Molina and Perez-Gonzalez (2010) define three different quality criteria that must be applied to an autotrading robot in order to study its quality, robustness, and reliability. These are: out-of-sample testing, in which the methodology is used in an optimisation period to obtain the optimal solutions that will be applied in the test phase; in-sample testing, where the optimal solutions are tested during a period and evaluated according to their performance; and online testing, in which the system is connected directly to the market and tested in real time.

12.3 Methodology

12.3.1 Sample

An autotrading robot based on the divergence operation signals of the Moving Average Convergence Divergence technique (hereinafter MACD) was used to study the optimisation methodology proposed and the quality criteria formulated. The data used in the optimisation and testing process were historical quotes from the EUR/USD FOREX market, on a time scale of 1 h, for the period running from the first trading day in January 2001 to the last trading day in August 2011. The historical data series of quotes were taken from the website FXCodeBase.com.

12.3.2 Quality Criteria and General Notation Applied to the Optimisation Process

The optimisation process proposed in this chapter is based on optimising autotrading robots that have a high number of parameters to be optimised in terms of number and range of solutions, which makes it unfeasible for full optimisation due to the massive computational costs and time that this would entail. Therefore, to solve for the parameters of the optimisation phase, we propose a division of the optimisation

process into several sub phases, using a number of genetic optimisations for resolving most of the parameters until the remaining number of parameters and their range of values permit a final exhaustive optimisation. Before starting the process, most decisive parameters to be optimised are set aside for optimisation in the final exhaustive phase, leaving the remaining optimisable parameters to be solved during the series of genetic optimisations. Below, we describe the quality method to be applied at the end of the optimisation process.

Given a robot with *m* autotrading parameters for optimisation (p_1, p_2 …, p_m) and whose optimisation phase consists of *n* periods, the *Quality Criteria* equation applied to the optimisation function of the proposed methodology would minimise the relative deviation parameter (*RD*), with the following notation:

$$\text{Quality Criteria} = \min(\text{RD}) = \min \sum_{i=1}^{n} \frac{\text{AD}_i}{\sum_{i=1}^{n} \frac{\text{Final Liquidity}_i}{\text{n}}}, \text{ where } \sum_{i=1}^{n} \frac{\text{Final Liquidity}_i}{\text{n}} > \text{IC}$$

where AD_i is the absolute deviation (deviation of the final liquidity obtained by the autotrading robot during period *i*, in comparison with the final liquidity obtained for the whole period of study, in absolute value):

$$\text{AD}_i = \left| \text{Final Liquidity}_i - \sum_{i=1}^{n} \frac{\text{Final Liquidity}_i}{\text{n}} \right|$$

and where *n* is the number of periods of the optimisation phase, *IC* is the initial capital for each period, and *Final Liquidity* is the final liquidity for period *i*:

$$\text{Final Liquidity}_i = f\left(\text{OptExh}(\text{m})_i \left(f\left(\text{OptGen}(\text{m}-1)_i \left(\ldots\left(f\left(\text{OptGen1}_i\right)\right)\right)\right)\right)\right)$$

Final Liquidity remains the overall computation function of all the optimisation phases: the corresponding *m-1* genetic optimisations and the final, exhaustive optimisation. Each of the *m-1* genetic optimisation allows the constraint of the solutions for the *m* parameters. Suppose that the first genetic optimisation optimises the parameter p_1, the notation is as follows:

$$\text{OptGen1} = \max \sum_{i=1}^{n} \text{Final Liquidity}_i f(\text{p}_1) \rightarrow \text{s}_1$$

Once this first solution s_1 for the parameter p_1 is bounded, the algorithm passes to the second genetic optimisation to solve the optimal parameter value p_2, according to the solution for parameter p_1:

$$\text{OptGen2} = \max \sum_{i=1}^{n} \text{Final Liquidity}_i f^{s_1}(\text{p}_2) \rightarrow \text{s}_2$$

This process repeats, noting the solution for each parameters according to the previously optimised parameter, up to the *m-1*th genetic optimisation:

$$\mathrm{OptGen}\left(\mathrm{m}-1\right)=\max\sum_{i=1}^{n}\mathrm{Final\,Liquidity}_{\mathrm{i}}f^{s_1,s_2,\cdots}\left(\mathrm{p}_{\mathrm{m}-1}\right)\rightarrow \mathrm{s}_{m-1}$$

The process then arrives to the exhaustive optimisation, solving for the most critical process parameter optimisation p_m, depending on the previously solved parameters s_1, s_2, …, s_{m-1}:

$$\mathrm{OptExh}\left(\mathrm{m}\right)=\max\sum_{\mathrm{i}=1}^{\mathrm{n}}\mathrm{Final\,Liquidity}_{\mathrm{i}}f^{s_1,s_2,\ldots,s_{m-1}}\left(\mathrm{p}_{\mathrm{m}}\right)\rightarrow \mathrm{s}_{m}$$

12.3.3 Quality Criteria and Notation Applied to the Autotrading Robot

The optimisation problem applied to the autotrading robot was to determine the parameters of the moving average technique MACD *m*, *n*, *r* (where *m* is the short period exponential moving average, *n* is the long period exponential moving average, and *r* is the signal line exponential moving average). The minimum percentage of margin in the account to open a new position (%), the equidistance parameter delta (*D*), and the quality method discussed above were used to minimise the relative deviation (*RD*) from the computation of each year, with a final average liquidity that is higher than the initial capital.

In the optimisation process of the autotrading robot, we chose to split the process into four distinct sub phases for each year: two approaching phases to the optimal solutions using genetic algorithms (to reduce the range of total solutions), a resolution phase to find optimal solutions by an exhaustive algorithm (when the spectrum of solutions makes the process viable), and a final phase once these solutions for each year and specific currency pair had been obtained. At this point, the *Quality Criteria* equation seeks the best solution, measured in terms of the relative deviation of global liquidity, with a final average liquidity that is higher than the initial capital.

In this case, the genetic optimisation depends on two configurable parameters.

- Initial population: the initial number of possible solutions that will participate in the optimisation process. If the initial population is equal to the total population, the optimisation process is exactly the same as the exhaustive process. If, on the other hand, the initial population is smaller, although the process will be faster, it will leave satisfactory or optimal solutions that can later be evaluated.
- Maximum number of generations: the number of attempts made by the genetic algorithm to try to find a better solution for each parameter in the initial population. The higher the number, the more costly the process, although the probability of finding a better solution will be higher.

The default parameters for optimisation provided by the module are:

$$\text{population} = \begin{cases} \text{set size}, & \text{set size} < 25 \\ \dfrac{\text{set size}}{2}, & 25 \le \text{set size} \le 256 \\ 2^{\log_{10}(\text{set size}+1,5)}, & \text{otherwise} \end{cases}$$

$$\text{generations} = \begin{cases} 1, & \text{set size} < 256 \\ 2^{\log_{10}(\text{set size}+2)}, & \text{otherwise} \end{cases}$$

where the *set size* parameter for a sample of *n* parameters is:

$$\text{set size} = \sum_{i=1}^{n} \left(\frac{\max \text{value}_i - \min \text{value}_i}{\text{step}_i} + 1 \right)$$

Optimisation processes were configured to maximise the final balance of the capital in the account at the end of each year, with the measure of optimisation being the final value of liquidity, as we deem that, at the end of each period, all open positions should be closed, joining the floating losses or gains to the final balance. The notation for the quality method applied to the optimisation methodology is:

$$\text{Quality Criteria} = \min(\text{RD}) = \min \sum_{i=1}^{n} \frac{\text{AD}_i}{\sum_{i=1}^{n} \frac{\text{Final Liquidity}_i}{\text{n}}}, \text{ where } \sum_{i=1}^{n} \frac{\text{Final Liquidity}_i}{\text{n}} > \text{IC}$$

where *n* is the number of years of the optimisation period (2001–2007), *IC* is the initial capital for each period (6,000 monetary units), and *Final Liquidity* is the final liquidity for a given year:

$$\text{Final Liquidity}_i = f\left(\text{OptExh}_i\left(f\left(\text{OptGen2}_i\left(f\left(\text{OptGen1}_i\right)\right)\right)\right)\right)$$

where *Final Liquidity* is a function of the three optimisation phases: the first optimisation using genetic algorithms, the second optimisation also using genetic algorithms, and the final exhaustive optimisation. The first phase allowed for optimising the equidistance parameter delta *D*, obtaining, in this first optimisation process, the best solution for that parameter given by the following notation:

$$\text{OptGen1} = \max \sum_{i=1}^{n} \text{Final Liquidity}_i f(\text{D}) \rightarrow \text{D}$$

In the second process optimisation, applying the results of the parameter *D*, and also using optimisation by genetic algorithms, the best solution for the minimum margin percentage in the account to open a new position parameter is:

$$\text{OptGen2} = \max \sum_{i=1}^{n} \text{Final Liquidity}_i f^{D}(\%) \rightarrow \%$$

Table 12.1 Parameters after the optimisation process and quality control

Parameter	First optimisation	Second optimisation	Third optimisation
D	0.08	0.08	0.08
%	–	96.4	96.4
M	–	–	2
N	–	–	44
R	–	–	2

Finally, once parameters *D* and % have been obtained, the exhaustive optimisation is performed, reducing the range of solutions for each year and a particular currency pair to 176 solutions, for which an optimal solution should be selected using the optimisation criterion described above:

$$\text{OptExh} = \max \sum_{\text{i=1}}^{\text{n}} \text{Final Liquidity}_{\text{i}} f_{\%}^{D}\left(\text{m, n, r}\right) \rightarrow \text{m, n, r.}$$

After obtaining the parameters *m*, *n*, *r*, % and *D*, optimised for the period 2001–2007 and applying the quality selection to find the optimal solution (according to the methodology and the conditions described above) for the currency pair of EUR/USD, we proceeded to perform the testing results for the out-of-sample period (2008–2011). This required: loading of the automated operating strategy with the same conditions as those established in the preliminary optimisation phase; setting the same constant values for non-optimisable parameters; and establishing the optimal values resulting from the optimisation process. The notation for this process is:

$$\text{Res} = \sum_{i=1}^{n} \text{Final Liquidity}_{\text{i}} f\left(\text{Opt}\right)$$

where *Opt* is the optimisation function where the optimal parameters are obtained.

12.3.4 Results

From the optimisation process of the currency pair of EUR/USD the following results were obtained for each of the three phases of optimisation (genetic 1, genetic 2, and exhaustive) and for each optimisable parameter, with the quality control notation after the final optimisation phase given in Tables 12.1 and 12.2:

For parameters $D=0.08$ and $\%=96.4$ % obtained in the previous stages of genetic optimisation, the configuration that meets the *Quality Criteria*—lowest relative deviation and positive (higher than 6,000 m.u.) average final liquidity value of the optimisation period (2001–2007)—was the second result shown in the table (as opposed to the first), with a configuration of moving averages of $m=2$, $n=44$, and $r=2$.

Table 12.2 Best results obtained in the last optimisation phase, sorted by the *RD* parameter

M	n	r	2001	2002	2003	2004	2005	2006	2007	M01-07	RD
1	39	4	**5,711.37**	**5,112.40**	**4,869.84**	6,630.93	6,070.20	**5,715.80**	**5,780.20**	**5,698.68**	0.50
2	44	2	6,723.70	6,490.24	7,669.50	7,279.32	6,194.13	7,932.50	7,279.92	7,081.33	0.52
1	35	4	6,677.97	**5,587.20**	**4,704.48**	6,634.10	6,013.82	**5,726.28**	**5,752.60**	**5,870.92**	0.58
1	36	4	6,677.97	**5,667.00**	**4,897.14**	6,643.80	6,149.40	**5,710.14**	**5,499.30**	**5,892.11**	0.61
3	45	2	7,401.51	**5,933.46**	7,163.89	7,581.64	6,817.55	6,156.25	**5,881.80**	6,705.16	0.64
3	43	2	6,793.61	**5,931.26**	7,765.19	7,616.71	**5,977.60**	6,325.48	7,268.85	6,811.24	0.65
4	36	2	6,402.69	**5,951.28**	7,448.93	7,258.38	6,005.97	6,581.15	7,909.59	6,794.00	0.66
3	44	2	7,126.01	**5,933.46**	7,394.69	7,598.51	6,697.95	6,117.08	**5,724.60**	6,656.04	0.66
1	37	4	6,685.37	**5,904.40**	7,173.82	**4,541.11**	6,069.20	**5,730.98**	**5,743.20**	**5,978.30**	0.67
2	42	2	6,593.70	6,191.08	6,702.53	7,361.64	6,395.51	**4,956.85**	7,864.65	6,580.85	0.67

The bold values are the results obtained in our study below 6,000.00 (initial capital), so they can be considered as non-desirable results

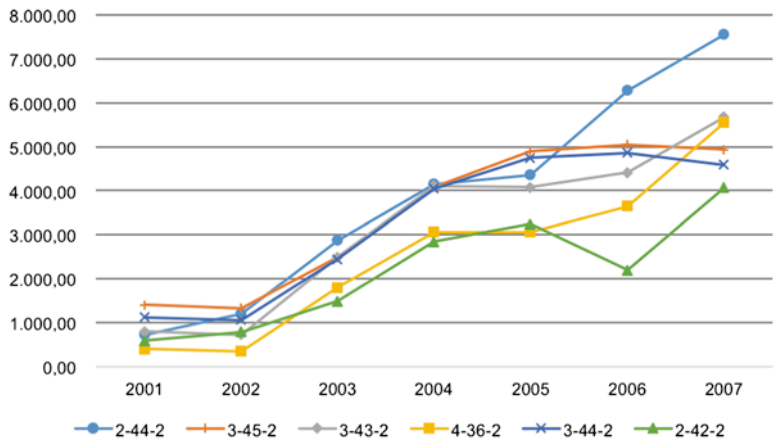

Fig. 12.1 Accumulated liquidity for the six configurations that fulfil the *Quality Criteria* equation during the optimisation phase (2001–2007)

Although for the top ten results we obtained quite small *RD* values, the average final liquidity value for the optimisation period is non-positive in four of the ten configurations—note that, in cases where this value drops below 6,000 m.u., this drop is only slightly. Also, note that, for this currency pair, there are years that the final liquidity results fall below 6,000m.u., although quite smoothly, and with widespread drops in all the configurations settings observed in the years 2002, 2006, and 2007.

Figure 12.1 shows the accumulated liquidity for the best six configurations that fulfil *the Quality Criteria*: lowest relative deviation and positive (higher than 6,000 m.u.) average final liquidity value of the optimisation period (2001–2007), the optimal solution being the one with a configuration of moving averages corresponding to $m=2$, $n=44$, and $r=2$. The quality equation favours the solution

Table 12.3 Testing phase results for the first 10 configurations obtained from the quality criteria

M	n	r	M01–07	DR	2008	2009	2010	2011	M08–11	DR	M01–11	DR
1	39	4	**5,698.68**	0.50	7,153.06	11,126.06	**5,866.14**	**5,292.99**	7,359.56	1.02	6,302.64	1.90
2	44	2	7,081.33	0.52	7,585.04	7,193.13	7,344.93	7,064.98	7,297.02	0.09	7,159.76	0.61
1	35	4	**5,870.92**	0.58	7,986.26	9,338.90	**5,158.97**	**5,683.80**	7,041.98	0.92	6,296.76	1.73
1	36	4	**5,892.11**	0.61	8,114.39	8,318.52	**5,223.68**	**5,677.23**	6,833.46	0.81	6,234.42	1.55
3	45	2	6,705.16	0.64	8,680.56	7,122.20	10,089.60	**5,064.92**	7,739.32	0.85	7,081.22	1.57
3	43	2	6,811.24	0.65	8,283.40	9,621.78	7,965.16	**5,015.00**	7,721.34	0.70	7,142.19	1.59
4	36	2	6,794.00	0.66	8,707.81	9,368.98	9,991.48	**4,515.10**	8,145.84	0.89	7,285.58	1.92
3	44	2	6,656.04	0.66	8,787.76	6,298.77	9,126.08	**5,015.00**	7,306.90	0.90	6,892.72	1.62
1	37	4	**5,978.30**	0.67	7,948.54	9,574.82	6,090.05	**5,596.83**	7,302.56	0.80	6,459.85	1.72
2	42	2	6,580.85	0.67	6,766.23	8,341.43	7,885.28	7,084.42	7,519.34	0.32	6,922.12	1.13

The bold values are the results obtained in our study below 6,000.00 (initial capital), so they can be considered as non-desirable results

with a better linearity among all solutions with final liquidity over 6,000 m.u. This optimal solution is the one that yields the highest final accumulated liquidity (namely, 7,081.33 m.u.) and a general overall linear behaviour, with the exception of the years 2002 and 2005. The other solutions achieve worse accumulated liquidity results (from 6,811.24 to 6,580.85 m.u.), as well as linear behaviour. In general, years 2002, 2005, and 2006 diverge from linearity in most of the configurations.

Once the optimal configuration for the optimisable parameters of the autotrading robot in the currency pair of EUR/USD was obtained through the *Quality Criteria* notation, in addition to analysing the optimal solution yielded by the quality control method, we also analysed the other nine best configurations obtained in the optimisation phase, in order to present a more complete analysis of the results from the testing phase. Table 12.3 summarises the results of the annual final liquidity for the test period, the average final liquidity and the relative deviation of each configuration for the study period, and the average final liquidity and overall relative deviation, encompassing the optimisation and testing phases.

In Table 12.3, the resulting values of average final liquidity in the testing phase are all positive and very high, despite there being some configurations with values of average final liquidity under 6,000 m.u. in the optimisation phase. Also note that most of relative deviation values increase in testing period relative to the optimisation period—doubling in some cases—, due to the disparity in results obtained in liquidity values in the testing period for most configurations. The only year in which liquidity values are under 6,000 m.u. across the board is 2011, where falls are quite considerable in some configurations—up to 25% of the initial capital—albeit offering benefits in the case of the optimal setting for this year. For the optimal configuration ($m=2$, $n=44$, and $r=2$), the relative deviation is 0.09, practically null due to the similarity of the average final liquidity values generated across all the phases during testing, and the total average value of liquidity is 7,297.02 m.u.

Figure 12.2 shows the accumulated liquidity during the testing phase (2001–2007) for the best six configurations that fulfil *the Quality Criteria*: lowest relative

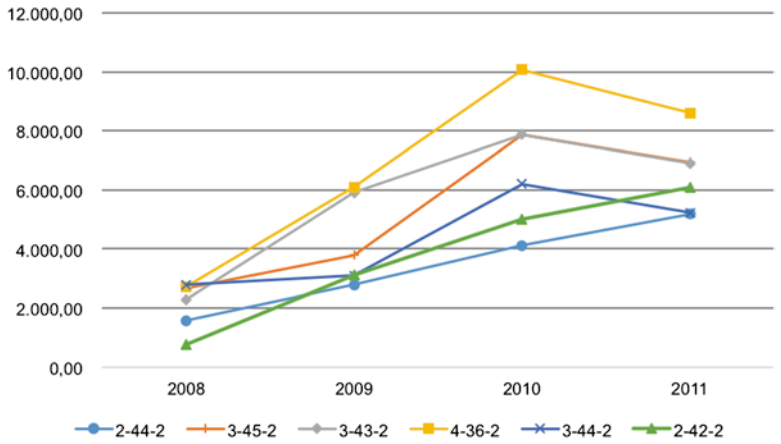

Fig. 12.2 Accumulated liquidity in the testing phase (2008–2011 for the six configurations that fulfil the *Quality Criteria* equation in the optimisation phase (2001–2007)

deviation and positive (higher than 6,000 m.u.) average final liquidity value of the optimisation period (2001–2007). The optimal solution is the one obtained in the optimisation period and selected using quality conditions, with a configuration of moving averages corresponding to $m=2$, $n=44$, and $r=2$. The quality equation applied also favours the solution in the testing stage with the best linearity among all solutions with final liquidity over 6,000 m.u. However, this optimal solution underperforms in this testing phase, with the highest final accumulated liquidity being 8,145.84 compared to 7,297.02 m.u. for the optimal solution. The linear behaviour of this optimal solution is outstanding, albeit being nearly a straight line. The other solutions offer better accumulated liquidity results (from 7,306.90 to 8,145.84 m.u.), as well as linear behaviour. In general, no linear behaviours emerge in years 2009 and 2011 in most of the configurations.

Figure 12.3 shows the accumulated liquidity during the entire period of study (2001–2011) for the best six configurations that fulfil the *Quality Criteria*: lowest relative deviation and average final liquidity value of the optimisation period (2001–2007) positive (higher than 6,000 m.u.). In this case, the optimal solution yields the second highest final accumulated liquidity, 12,757.39 m.u. The linear behaviour of this optimal solution is excellent, with the only exceptions occurring during the optimisation period in years 2002 and 2005, but behaving linearly in both the optimisation and testing phases of the study. There is only one configuration that exceeds the final accumulated liquidity obtained by the optimal solution—in this case 14,141.36 m.u.—and the other solutions present worse accumulated liquidity results—from 9,819.91–12,564.04 m.u.—as well as linear behaviour in several years.

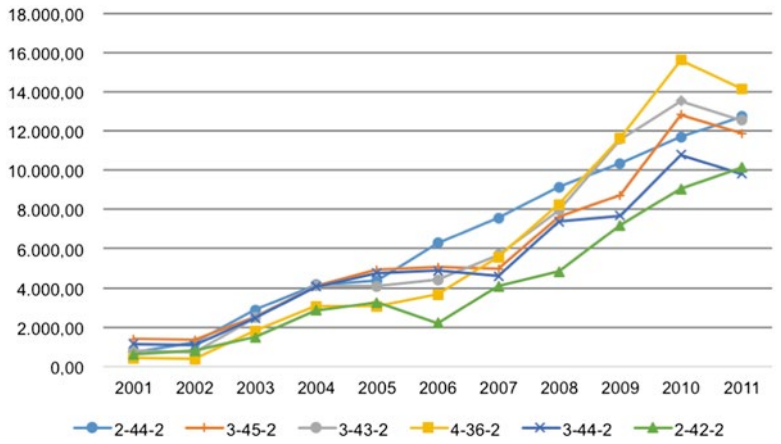

Fig. 12.3 Accumulated liquidity in the entire study (2001–2011) for the six configurations that fulfil the *Quality Criteria* equation during the optimisation and testing phases (2001–2011)

12.4 Conclusions

One of the most noteworthy contributions of this study is the design of an optimisation methodology and a quality control method that can be applied to any autotrading robot with a large number of optimisable parameters in terms of number and range. Using the LUA Strategy Debugger module of the Indicore SDK 2.0 software, the optimisation strategy and quality method in question allows successive approximations with genetic algorithms for the resolution of the parameters with lower value ranges. The process is then completed with an exhaustive iteration when the number of remaining solutions and computational resources permits such an approach, using the *Quality Criteria* equation discussed above to find the optimal solution in the final optimisation stage.

To study the optimisation methodology and quality control proposed, an autotrading robot based on the divergent signals of the MACD technique applied to the currency pair of EUR/USD was optimised, with an optimisation phase (in-sample) for the period 2001–2008 and a testing phase (out-of-sample) for the period between 2009 and the end of August 2011.

After setting the preconditions and establishing the value of non-optimisable parameters for the optimisation of EUR/USD, the process needed two genetic optimisations and a final exhaustive stage. In the first genetic optimisation, the equidistance parameter delta, or D, was obtained. The second genetic optimisation optimised the parameter representing the minimum margin in the account required to open a new position, or %. Finally, in the exhaustive optimisation, using the solution for the values of % and D, MACD technique parameters were optimised for the periods of the exponential moving average of short, long, and signal line. At this

point the *Quality Criteria* equation was used to find the optimal solution among all the solutions obtained, this optimal solution being the one that corresponds to the configuration with lowest relative deviation *RD* and an average final liquidity that is higher than the initial capital.

Regarding the optimal solution yielded by this optimisation and quality control method, we not only obtained positive results in the optimisation phase, but also in the testing phase, with the final average liquidity value of the optimal solution higher in the testing phase than in the optimisation phase and reducing the relative deviation parameter. Moreover, the optimal solution obtained for the cross EUR/USD obeys a very linear behaviour, with average partial liquidity values offering a roughly constant growth that imply a linear nature.

These results can be extrapolated to the computation of the ten best solutions obtained in the optimisation and quality control phase and applied to the testing phase, although only six of these fulfil the two *Quality Criteria* conditions during the optimisation stage. Although it would have been understandable to think that the average final liquidity values should have be higher in the optimisation phase than in the testing phase, and the results of the relative deviation should increase, in fact, the opposite is true, with results improving during the testing phase with respect to the optimisation phase for the first ten solutions.

For the above reasons, and due to the overall analysis of the results, we can conclude that in terms of the optimisation process and quality control notation, the methodology used for the autotrading robot for the currency pair of EUR/USD is satisfactory.

References

Allen F, Karjalainen R (1999) Using genetic algorithms to find technical trading rules. J Financ Econ 51(2):245–271

Allen H, Hawkings J, Sato S (2001) Electronic trading and its implications for the financial systems. BIS Papers No 7: Electronic Finance. A New Perspect Challeng 2001(7):30–52

Boehmer E (2005) Dimensions of execution quality recent evidence for US equity markets. J Financ Econ 2005(78):553–582

Boehmer E, Jennings R, Wei L (2007) Public disclosure and private decisions: equity market execution quality and order routing. Rev Financ Stud 2007(20):315–358

Chan L, Wonk AWK (2012) Automated trading with genetic algorithm neural network. Risk cybernetics. An application on FX Markets. Finamatrix Journal, Leading & Dedicated Research in Risk Control for Sustainable Returns

Chen JS (2005) Trading strategy generation using genetic algorithms. Asian J Inform Technol 4(4):310–322

Chen JS, Deng SX, Lin PC (2000) Generation of trading strategies using genetic algorithms. In: Proceedings of the fifth joint conference on information sciences

Dempster MAH, Payne TW, Romahi Y, Thompson GWP (2001) Computational learning techniques for intraday FX. Trading using popular technical indicators. IEEE Trans Neural Network 12(4):744–754

Doherty CG (2003) Fundamental analysis using genetic programming for classification rule induction. Genetic algorithms and genetic programming at Stanford 2003. Standford Bookstore, 45–51

Drake AE, Marks RE (1998) Genetic algorithms in economics and finance forecasting stock market prices and foreign exchange. A review. Working paper series of the Australian Graduate School of Management. University of New South Wales, Sydney, Australia

Dunis C, Harris A, Leong S, Nacaskul P (1999) Optimising intraday trading models with genetic algorithms. Neural Network World 9(3):193–223

Ergin NH (2007) Architecting system of systems. Artificial life analysis of financial market behavior. Partial fulfillment of the requirements for the degree Doctor of philosophy in systems engineering, Faculty of the Graduate School of the University of Missouri-Rolla, USA

Farnsworth GV, Kelly JA, Othling AS, Pryor RJ (2004) Successful technical trading agents using genetic programming. Sandia Report. Sandia National Laboratories, Albuquerque, New Mexico

Fu F, Krishnamurti C, Sequeira J (2003) Stock exchange governance and market quality. J Bank Financ 27(9):1859–1878

Garvey R, Wu F (2009) Intraday time and order execution quality dimensions. J Financ Market 12(2):203–228

Hendershott T, Moulton PC (2010) Automation, speed, and stock market quality: the NYSE's hybrid. J Financ Market 14(2011):568–604

Hirabayashi A, Aranha C, Iba H (2009) Optimisation of the trading rule in foreign exchange using Genetic algorithm. In: Proceedings of the 11th annual conference on genetic and evolutionary computation GECCO 09

Holland J (1975) Adaptation in natural and artificial systems. An introductory analysis with applications to biology, control and artificial intelligence. University of Michigan Press, Ann Arbor

Hryshko A, Downs T (2003) An implementation of genetic algorithms as a basis for a trading system on the foreign exchange market. The 2003 Congress on Evolutionary Computation 03(3):1695–1701

Kapishnikov A, Borisov A (2001) Technical rules optimisation using intelligent hybrid systems. Institute of Information Technology of Riga Technical University, Latvia

Koskinen J, Airas J, Nummelin T, Pekkala T, Starczewski J (2008) Exploring algorithms for automated FX trading constructing an hybrid model. Seminar on case studies in operations research. Helsinki University of Technology, Finnland

Koza JR (1992) Genetic programming: on the programming of computers by means of natural selection. Bradford Book, The MIT Press, Cambridge/London, MA/England

Lazarus C, Hu H (2001) Using genetic programming to evolve robot behaviours. In: Proceedings of the 3rd British conference on autonomous mobile robotics and autonomous systems, Manchester, UK

Li J, Tsang EPK (1999) Improving technical analysis predictions an application of genetic programming. American Association for Artificial Intelligence

Lin L, Cao L, Wang J, Zhang C (2004) The Applications of Genetic Algorithms in Stock Market Data Mining Optimisation. Wessex Institute of Technology Press, Faculty of Information Technology, University of Technology, Sydney, Australia

Lohpetch D, Corne D (2009) Discovering effective technical trading rules with genetic programming towards robustly outperforming buy-and-hold. World Cong Nat Biol Inspire Comput 1:439–444

Matsui K, Sato H (2011) A comparison of genotype representations to acquire stock trading strategy using genetic algorithms. Lect Note Comput Sci 6260(11):56–70

Mitchell M (1995) Genetic algorithms. An overview. Complexity 1(1):31–39

Neely CJ, Weller P, Dittmar R (1997) Is technical analysis in the foreign exchange market profitable. J Financ Quant Anal 32(4):405–26

Nieto MJ (2001) Reflections on the regulatory approach to E-finance. BIS Papers No 7: Electronic Finance. A New Perspect Challenge 2001(7):90–97

Noguer M (2010) Statistical arbitrage and algorithmic trading overview and applications. PhD. Thesis. Departamento de Economía Aplicada Cuantitativa II, Facultad de Ciencias Económicas y Empresariales, UNED

Payo-Molina L, Perez-Gonzalez P (2010) Sistemas Expertos: Trading. Inteligencia en Redes y Comunicaciones, 28–36

Pappu S (2011) Evolutionary algorithms. Project report. Department of Electronics & Telecommunication Engineering, Sardar Patel Institute of Technology, Munshi Nagar, Mumbai, India

Roberts MC (2002) The value of technical analysis. Departament of Agricultural, Environmental and Development Economics, The Ohio State University, Columbus, OH

Sato S, Hawkings J (2001) Electronic finance: an overview of the issues. BIS Papers No 7: Electronic Finance. A New Perspect Challenge 2001(7):1–12

Subramanian H (2004) Evolutionary algorithms in optimisation of technical rules for automated stock trading. Partial fulfillment of the requirements for the degree of master of science in engineering. Faculty of the Graduate School of The University of Texas, USA

Subramanian H, Ramamoorthy S, Stone P, Kuipers BJ (2006) Designing safe, profitable automated stock trading agents using evolutionary algorithms. In: Proceedings of the 8th annual conference on Genetic and evolutionary computation

Weber S, Zysman J (2001) E-finance and the politics of transitions. BIS Papers No 7: Electronic Finance. A New Perspect Challenge 2001(7):26–29

Chapter 13
Implementation Methodology of Effective Governance to Ensure the Quality of IT Service

Ignacio Gil-Pechuán, Patrick Pullicino, and M. Pilar Conesa García

Abstract Nowadays, businesses have to comply with, or manage, a range of governance frameworks and national and international laws based on factors that include legal requirements, the need for good positioning with respect to their competitors and provider recognition, a customer prerequisite for hiring them or to enhance competitiveness vis-à-vis the end buyer.

The ultimate goal of them all is to get the organisation ready to meet threats to it by preventing, identifying, correcting, reducing, and accepting the risk, and deciding to put in place compensatory measures which, though they may not reduce the risk of occurrence, do nevertheless mean the organisation can deal with some of the related problems in the event of occurrence.

In this field, information technology is, in most cases, in the regulatory and legislative spotlight as it is the core factor in business communications and also tasked with managing organisations' information.

This chapter puts forward a model for implementing good IT governance based on integration into a single management system of the regulatory and legislative frameworks most commonly used in implementation consultancy and compliance audits for the various standards.

I. Gil-Pechuán (✉) • M.P.C. García
Departamento de Organización de Empresas, Universidad Politécnica de Valencia, Camino de Vera, Valencia 46022, Spain
e-mail: igil@doe.upv.es; mconesa1@omp.upv.es

P. Pullicino
Dean Campus Midlesex University Malta, Campus Middlesex University Malta, Block A.Alamein Road, Pembroke PBK 1776, Malta
e-mail: p.pullicino@mdx.ac.uk

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13.1 Introduction

An increasing number of organisations believe that information and the technology associated with it represent their most important assets. Just as in the case of other kinds of assets in a company, quality, control, security and information requirements for them will also be crucial. Management needs to implement a suitable system of internal control.

Today, no one doubts that information has become one of the main assets of companies and in many cases is their main strategic advantage. Hence, enterprises invest huge amounts of money and time in setting up information systems that provide the greatest possible productivity and quality. This is the reason why computer consultancy and auditing issues are becoming increasingly important both internationally and in individual countries.

At country level, legislation with its own legal framework and personal data protection laws have to be addressed before putting forward a model for good IT governance. Internationally, we would underline the importance of the International Organisation for Standardisation (ISO) as it is responsible for promoting the development of international manufacturing, trade and communication standards for all industries. Its main role is to seek standardisation of product and safety standards for businesses and organisations at international level.

We would also stress the importance of the Information Systems Audit and Control Association (ISACA, http://www.isaca.org) since it is a globally recognised leader and provider of knowledge, certifications, a professional community, support and education about information system security and assurance, enterprise governance, IT management and IT-related risks and compliance.

All of this helps companies to comply with the law and position themselves by means of certifications in an increasingly difficult market. It is then when the organisation bears full responsibility for controlling the normal development of all these aspects by building or adapting its management and internal control strategy by incorporating an appropriate methodology tailored to its specific needs.

To achieve these objectives, it is important for companies to analyse and design a "target model" toward which they want to evolve their information technology and structure each component within their overall management framework, as today innovation is the only way to ensure sustained success. Hence, continued growth in their IT investments is more than likely and organisations need an appropriate framework and actual support in order to go down this route.

To achieve this goal, a robust model of governance for information systems and technology (IST, hereafter only IT) has to be built which is designed to ensure accountability for business requirements and thus lead to more efficient and effective operations such as:

- Improving governance of the organisation and IT.
- Improving understanding between IT executives and other executives.
- Improved decision-making due to more timely and better quality information.
- Initiatives for projects aligned with business requirements.
- Compliance with other regulatory requirements, such as privacy.

- Improving operations using an integrated approach to process security, availability and integrity.
- Optimised risk management.
- More efficient prioritisation of business and IT initiatives.

Finally, it should be noted that any proposal for an IT governance model also needs to proactively bear in mind the ongoing publication of the successive versions of frameworks such as COBIT and ITIL, and standards such as ISO 17799 and 2700, since they also contribute significantly to the consolidation and improvement of the IT governance concept.

13.2 IT Governance

The concept of "IT governance" first emerged in the mid-1990s and has since matured and grown to take in increasing numbers of topics and areas to the point that it has become a discipline in itself. The term was first used by Loh and Venkatraman (1992), and then by Henderson and Venkatraman (1993), to describe the set of mechanisms that provide the IT capabilities required for the optimal operation of business processes.

There are multiple definitions of IT governance; thus, for example, Luftman (1996): "IT governance is the selection and use of relationships such as strategic alliances or joint ventures to obtain key IT competencies." Subsequently, Van Grembergen (2002) defined it thus: "IT governance is the organisational capacity exercised by the board, executive management and IT management to control the formulation and implementation of IT strategy and in this way ensure the fusion of business and IT." Somewhat later, Van Grembergen et al. (2004) argued that "IT governance consists of the leadership and organisational structures and processes that ensure that the organisation's IT sustains and extends the organisation's strategy and objectives."

The IT Governance Institute (ITGI 2003) stresses that IT governance is "the responsibility of the Board of Directors and executive management. It is an integral part of enterprise governance and consists of the leadership and organisational structures and processes to ensure that the organisation sustains and extends its strategy and objectives."

Weill and Ross (2004) characterise IT governance as "specifying the decision rights and accountability framework to encourage desirable behaviour in the use of IT." In this respect, it is worth remembering that Allen (2005) defines governance as "setting clear expectations for the conduct (behaviours and actions) of the entity being governed, and directing, controlling, and strongly influencing the entity to achieve these expectations."

Another definition of IT governance comes from Dahlberg and Kivijarvi (2006), who proposed an integrated IT governance framework that seeks to integrate the structural and process perspectives of IT governance, business alignment, IT operations and performance measurement and delivery of value.

Table 13.1 A comparison of governance frameworks in Webb et al. (2006)

Corporate governance	Strategic information systems planning	IT governance
Strategic direction	Aligning investment in IS with business goals	Strategic alignment
	Exploiting IT for competitive advantage	Delivery of business value through IT; exploiting opportunities and maximising benefits
Performance management	Directing efficient and effective management of IS resources	Performance management; IT resources must be used responsibly
Risk management		Risk management; IT related risks to be managed appropriately
Policies and procedures	Developing technology policies and architectures	
Control and accountability		

Webb et al. (2006) aver (after analysing more than 12 definitions) that "IT governance is the strategic alignment of IT with the business such that maximum business value is achieved though the development and maintenance of effective IT control and accountability, performance management, and risk management" (Table 13.1).

Based on the existing literature, Simonsson and Johnson (2006) put forward a detailed definition: "IT governance is about IT decision-making: the preparation for, making of and implementation of decisions regarding goals, processes, people and technology on a tactical and strategic level". They therefore work according to three dimensions: Scope, Domain and Decision-Making Process.

A) Domain: denotes what the decisions should consider based on four dimensional units:

   a. Goals: strategy-related decisions, IT policies and guidelines, and control objectives.
   b. Processes: implementation and management of IT processes.
   c. People: relational architecture within the organisation, and roles and responsibilities.
   d. Technology: the physical things that management decisions consider are part of actual hardware, software and facilities.

B) Decision-making process: three phases are highlighted:

   a. Understanding: before deciding, understand the decision in its entirety.
   b. Deciding: according to corporate IT principles, and defining the How, the Who and responsibilities.
   c. Monitoring: follow-up and monitoring of any decision.

C) Scope:

   a. Tactical decisions: detailed and precise low-level management IT-focussed decisions that are carried out quickly.
   b. Strategic decisions: top management, low detailed and with a long timeline.

The ITGI drew up its own exceptional definition, known as *Taking Governance Forward*, in which it defines IT governance as "a governance view that ensures that information and related technology support and enable the enterprise strategy and the achievement of enterprise objectives and the functional governance of IT, i.e., ensuring that IT capabilities are provided efficiently and effectively".

Finally, we should also mention the important contribution to this conceptualisation of IT governance made by ISO 38500, which provides the following formal definition of IT governance: "The system by which the current and future use of IT is directed and controlled. Corporate governance of IT involves evaluating and directing the use of IT to support the organisation and monitoring this use to achieve plans. It includes the strategy and policies for using IT within an organisation".

13.3 Differences Between IT Governance and Management

It should be borne in mind that while IT management is more focused on the internal supply of IT and is geared towards the present, IT governance is broader in that it also aims to meet external demands (from customers) and in a future time horizon (Peterson 2003). Thus, management focuses on administering and implementing strategies in daily operations while governance is responsible for setting these strategies along with the organisation's policies and culture.

Furthermore, Hamaker and Hutton (2004) argue that while enterprise governance concerns the overall accountability framework which coordinates all management activities vis-à-vis all stakeholders, corporate governance relates mainly to the board, executives and shareholders. IT governance, meanwhile, focuses on the use of technology to meet the organisation's goals set by management. Thus, corporate governance includes aspects of IT governance because without effective IT management, those tasked with corporate responsibilities could not function effectively (Fink et al. 2006).

Over recent years, the word "governance" has become widespread and fashionable. As a result, terms including software project governance, software architecture governance, database governance, SOA[1] governance, software development governance, and security governance are used. However, although there are aspects of "governance" in all these specific areas, governance, in fact, focuses on six principles, namely accountability, strategy, procurement, performance, compliance and the human factor, and three functions, i.e. assessing, managing, and monitoring.

In short, with the appearance of new businesses and new tools for enterprises, IT governance is responsible for aligning the IT plan with the company's business plan, while an "IT factory" is in charge of managing specific areas with the new services and operations that are brought in (see Fig. 13.1).

[1] SOA governance is a concept used for activities related to exercising control over services in a service-oriented architecture (SOA).

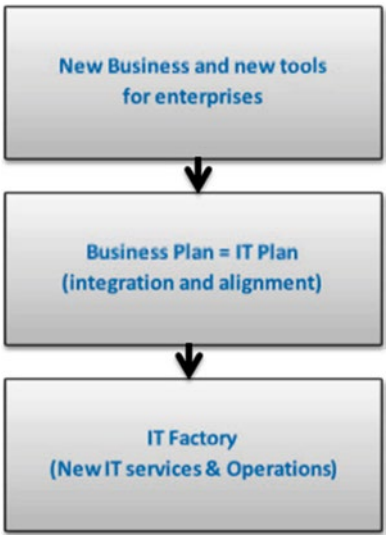

Fig. 13.1 ICT as support for company management (Fernández Sánchez and Piattini Velthuis 2012)

13.4 Factors in the Consolidation of the Importance of IT Governance

As we have seen, and as pointed out by Hamaker and Hutton (2004), IT governance is not new but rather a collection of tools and techniques for managing IT that have been validated by the passage of time and from a broader perspective than that afforded them in the 1980s or 1990s.

However, historically, IT governance activities have not received sufficient senior executive support due to the technical nature of some of the issues or lack of resources (Hamaker and Hutton 2004). This means that in many organisations the implications and scope of IT governance are not well understood.

The historical relationship between organisations and IT has not been satisfactory. It has not found it easy to achieve its objectives, either because the role of IT has lost its value in the organisation or because it has been considered a mere commodity (for example, administrative support functions), as evidenced by the cycles of restructuring, reengineering, downsizing, internalisation, backsourcing and offshoring which the IT function has undergone in many organisations. All of them have been carried out with the primary objective of cutting costs, and therefore reflect the failure to achieve an effective relationship between IT and the organisation.

IT has to be flexible as organisational alignment is one of the most important challenges facing companies, and unfortunately, the difficulties in achieving and sustaining strategic alignment have been largely underestimated (Hirschheim and Sabherwal 2001). Although IT investment and infrastructure are necessary, "they are not enough" as the identification of its value and the flexibility required for management will not be created without mutual understanding and a shared agenda between business managers and IT managers (Prahalad and Krishnan 2002).

13.5 Definition of the Problem and Components of the Model

All enterprises are required to comply with or manage a number of laws or regulations to meet their legal obligations. Alternatively, they choose to do so to positively stand out from their rivals.

From their case studies, De Haes and Van Grembergen (2006) identified different drivers for adopting IT governance; in addition to the need to comply with legislative requirements (for example, Sarbanes-Oxley [2]), other important drivers for IT governance were the push to achieve economies of scale after mergers and acquisitions and budget pressure to focus on activities that add value to the business.

Hardy (2006) stresses that building a robust model for IT governance designed to ensure accountability for business requirements can also lead to more efficient and effective operations such as:

- Improving governance of the organisation
- Improving understanding between IT executives and other executives
- Improved decision-making due to more timely and better quality information
- Initiatives for projects aligned with business requirements
- Compliance with other regulatory requirements such as privacy
- Improving operations using an integrated approach to process security, availability and integrity
- Optimised risk management
- More efficient prioritisation of business and IT initiatives

Of course the publication of the successive versions of frameworks such as COSO,[3] COBIT and ITIL and standards such as ISO 17799 and 27000 have also been instrumental in the consolidation of the IT governance concept in organisations since their progressive adaptation and honing lead to increased awareness of them and thus facilitate their adoption and compliance. Therefore in this chapter we present an implementation model that seeks to integrate the most used frameworks into a single management system.

There are multiple frameworks for IT governance and management. The best known are probably COSO, COBIT, CMMi, UNE-ISO/IEC 27001:2007, ISO/IEC 15504:2004, ISO/IEC 15408:2009, ITIL, PMBOK, etc. Some focus on very specific areas, such as ISO/IEC 15408:2009 and PMBOK, while others are very broad, such as COBIT and COSO. However, we can clearly identify five major domains of

[2] ***Sarbanes-Oxley Act of 2002****, Pub. L. No. 107–204, 116 Stat. 745* (30 July 2002).

[3] The **Committee of Sponsoring Organizations of the Treadway Commission** (**COSO**) is a joint initiative of five private sector organizations, established in the United States, dedicated to providing thought leadership to executive management and governance entities on critical aspects of organizational governance, business ethics, internal control, Enterprise risk management, fraud and financial reporting.

IT governance (according to ITGI 2003 and Webb et al. 2006) that we need to consider in our proposal:

1. IT strategic alignment
2. Delivery of business value through IT
3. Risk management
4. IT resource management
5. Performance measurement

The first two would be output or product, while the last three would be IT governance drivers.

To examine the structures, processes and relational mechanisms for IT governance we turn to De Haes and Grembergen (2004), who refer to the various committees and boards, and roles and responsibilities. "Processes" include decision-making, strategic planning, service level agreements, etc. In terms of "mechanisms", these authors pick out active participation by stakeholders, shared understanding, active conflict resolution, rewards and incentives, cross-functional training, job rotation, etc. As Van Gremberger (2004) points out, since IT governance is an integral part of organisation governance, the Steering Committee appoints a committee to carry out tasks related to IT governance. This committee is called the IT Strategy Committee and it assists the Steering Committee and ensures that it has the information necessary to meet IT governance objectives.

"Governance structures" include Internal Control—the COSO Integrated Framework—a financial reporting control framework that defines the internal control conducted by the steering committee and other managers to provide reasonable confidence about meeting targets for the effectiveness and efficiency of operations, reliability of financial reporting and compliance with laws and regulations.

In addition to the above contributions, we also need to analyse two models developed by the ISACA: COBIT, similar to COSO but focused on IT control, and Val IT,[4] which meets organisations' need to optimise the realisation of value from IT investments and encompasses value governance, portfolio management and investment management (Val IT rounds off COBIT from a financial and business standpoint that helps towards the delivery of value). Val IT focuses on the decision to invest and obtaining benefits while COBIT is focused on implementation, i.e. whether we are doing things correctly and properly (ITGI 2006).

Mention should also be made of the ITIL framework, because while COBIT focuses more on "what is to be done" to achieve good IT governance, ITIL sets out in detail "how it is to be done". Thus, ITIL is a factor in the model supplementing COSO and COBIT that puts forward good practices for IT service management.[5]

[4] Val IT is a governance framework, published by IT Governance Institute, that can be used to create business value from IT investments.

[5] Other frameworks are the Common Criteria for Information Technology Security Evaluation (ISO 15408), Guidelines for the Management of IT Security (GMITS, ISO 13335), Operationally Critical Treat, Asset, and Vulnerability Evaluation (OCTAVE) and the System Security Engineering Capability Maturity Model (SSE-CMM).

Fig. 13.2 Correlation of IT governance models for good enterprise governance

There are other models and many standards and the list will undoubtedly continue to grow, though not all of them can be used together as this would create highly complex integration challenges. However, parts of each standard can be adapted and tailored to each organisation. Each of the standards is intertwined with the others in the context of managing good corporate governance and good business governance, which as a whole is called "enterprise governance" (Fig. 13.2).

Good corporate governance seeks to combine the enterprise's business needs, business strategies and IT objectives, while good business governance focuses on determining how these objectives are met through project initiatives (whether in IT or not) by monitoring and measuring.

Good IT governance encompasses tasks in both areas, ranging from defining business objectives to monitoring performance and achievement of these objectives.

13.6 Implementation of an IT Governance Model

The process of implementing IT governance assists the various levels of the organisation with a detailed roadmap that helps to implement IT governance needs. This roadmap presents a project that can be lengthy and will call for strict project management practices which are too extensive to be covered in this chapter.

Good IT governance enables a system in which all stakeholders, including members of senior management, employees and managers of other departments in the company, have the necessary input into the decision-making process. This prevents misalignment between IT objectives and business objectives.

13.6.1 Where Do We Start?

Identify who the stakeholders are. To start implementing IT governance it is necessary to identify the stakeholders who are interested in its implementation and monitoring, usually the board of directors, executive management, information technology management and any other role identified as appropriate in accordance with individual practices (the laws and regulations governing the business).

Set up a strategy committee. Arrange communication relationships and channels so they facilitate decision-making. Based on best practices in IT governance implementation, this can be achieved by setting up a strategy committee. When doing this, it is important to ask the following questions:

- What organisational structure is there in the organisation?
- Which channels provide effective communication in the organisation?
- What is the prevailing organisational culture?
- Is it a centralised, decentralised or hybrid organisation?
- Are there any subsidiaries?
- Is the organisation a subsidiary?
- Are there any special circumstances? What are they?

The IT strategy committee should be at the highest management level of the organisation and integrated with components that can provide strategic vision, decision-making, experience in information technology issues, and support in all the organisation's areas. Likewise, plans have to be made to set up one or more steering committees and site them at executive managerial levels to lead the implementation of IT governance and continuously report to the strategy committee.

Assign and document responsibilities. Each participant will have their responsibilities throughout the implementation of IT governance and its ongoing maintenance.

Determine an implementation plan which chooses a system or framework to support it in line with the organisation's features. Some of the industry's existing frameworks and good practices for implementing IT governance are:

- The IT Governance Institute (ITGI) adopts the Control Objectives for Information and Related Technology (COBIT) and the practices in the processes described in its IT value framework (Val IT).
- The framework proposed by the CISR [6] at the Massachusetts Institute of Technology.
- The Information Technology Infrastructure Library (ITIL).

The framework chosen to implement IT governance will have to comply with the laws and regulations that are binding on the organisation as part of its normal course of business. A combination of these frameworks can also be tailored to meet individual needs.

[6] CISR—Center for Information Systems Research (MIT): http://cisr.mit.edu/about/our-mission/

Fig. 13.3 The five domains of IT governance (COBIT Diamond)

Hence, based on ITGI and COBIT, we can specifically put forward a plan for implementing IT governance, which should involve consideration of the following points or domains:

- Establishing a governance framework to provide/deliver value to the entire organisation
- Aligning IT strategy with business objectives
- Understanding and managing risks
- Analysing current resources and capabilities (and identifying gaps)
- Measuring performance (results) (Fig. 13.3)

To increase the chances of success in this implementation, an "IT Governance Action Plan" should also be drawn up which (according to the ITGI) provides for:

- *Activities:* comprising the actions to be carried out and topics
- *Outcome measures:* directly related to IT governance topics
- *Best practices*: i.e. examples of how IT governance leaders are performing activities
- *Critical success factors:* the essential conditions, skills and attitudes for successful best practices
- *Performance indicators:* providing information about how IT governance is being achieved, for example, response times.

The most important obstacle in carrying out these proposed IT governance actions is that they are often confused with best practice IT management and control frameworks. To avoid this, ISO 38500 has helped clear up this confusion by describing good IT governance as the management system used by senior management, in other words, that "good IT governance is about administering IT resources to satisfy stakeholders who expect a return on their investment". Those in charge of this administration will look to senior management to implement the IT systems and controls required to achieve this ROI.

Furthermore, the existing IT management and control frameworks provide models for managing risk and controlling objectives, which are essential components of

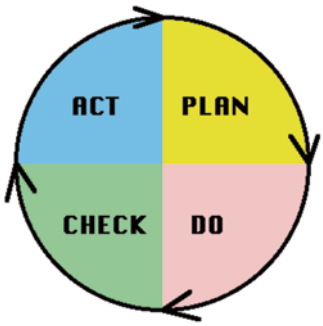

Fig. 13.4 Deming cycle, 1950 (Imai 1886)

good IT governance, although under ISO 38500, it will be much more important for this IT governance to focus on the delivery of value.

Given the limitations present in most organisations, an implementation mechanism to weigh up these limiting factors and implementation requirements has to be found. It should be borne in mind that any process improvement initiative (such as the implementation of good IT governance) can cause more harm than good if used improperly.

Hence, the key to implementing good IT governance within the limitations discussed above begins by focussing on what most benefits the organisation and teams, in other words by prioritising the practices which most benefit the company in terms of solving real problems. We can thus highlight the following key criteria for successful implementation:

- Focus on attacking the problem, not the solution.
- Focus on resource downtime.
- Base process implementation on technological change, i.e. tap IT to implement these processes.
- Perform this process in several cycles or iterations, where each iteration solves a real business problem. This will enable continuous improvement in the organisation.
- Manage change.

The quintessential model that iteratively supports this cycle for continuous improvement in the implementation of best practices and processes is the Deming Cycle [also called the PDCA (Plan-Do-Check-Act) cycle]. Improving always involves changing and the improvement should be defined in terms of business goals and handled in the same way. An improvement process means organised and systematic continuous improvement of the way in which activities are carried out to better meet business objectives (Fig. 13.4).

One of the great characters in the improvement processes in the United States was Dr. Edward W. Deming. Continuous improvement processes began to take off in the 1950s. At the beginning of the 1990s, a number of initiatives emerged to implement best practices in software development which led to a series of industry models and standards being drawn up and published.

In the search for competitive advantage, many companies focused on improving their operational processes while forgetting that an organisation's real advantages come from the union of all its activities and not from advantages obtained in isolated activities.

At the end of the 1990s, standards and models geared towards business management as a whole were updated in line with this new vision: MoProSoft, Bootstrap, the IDEAL model (integrated models for software companies, ISO/IEC TR 15504 valuation models for an organisation's processes, ISO 9000:2000 quality management systems), whose scope is the whole of the undertaking, where it is the connection between activities that is the real advantage and not each of the activities in isolation.

The IDEAL software process improvement (SPI) (Software Engineering Institute 1996) model can be used to guide the development of an integrated long-range plan using an SPI programme. The purpose of the model proposed in this chapter is to provide an adaptation of this general model in its application to the implementation of IT governance, since this model is not restricted solely to software implementation but can also be used for any type of process implementation and is therefore valuable for bringing in good IT governance.

This process implementation and improvement model also focuses on enabling continuous improvement and gradual standardisation, but this time in five phases:

Initiating: this is the phase where the implementation decision is taken, the detailed implementation procedure is chosen and senior management's commitment and support for implementation is ensured. In this first phase, an IT governance start-up project is to be drawn up consisting of (Van Grembergen and De Haes 2008):

- Setting up the IT Governance Committee (ITGC) which will be responsible for starting up IT governance in the organisation.
- Training the ITGC. Executives have to be "trained" as they are probably unaware of the importance of good IT governance and knowledge of this organisational culture is not widespread.

Diagnosing

In this phase, each process and/or standard to be implemented is brainstormed to identify the current state of processes and identify their problems. The following measurements are also added:

- Self-assessment of the initial maturity of IT governance, which aims to determine the initial maturity of IT governance in the organisation.

  The maturity model proposed by the ITGI, which features six possible levels, is recommended:

  – Non-existent (0); the organisation does not know about the principle and is not aware it needs it.
  – Initial/ad hoc (1); the principle is established but processes are disorganised and ad hoc.
  – Repeatable but Intuitive (2); the principle is immature and processes follow a regular pattern.

  - Defined Process (3); the principle is starting to mature, processes are documented and communicated.
  - Managed and Measurable (4); fairly mature principle, processes are monitored and measured.
  - Optimised (5); optimum principle, processes are based on best practice.

- Drawing up an IT governance improvement plan. The committees examine the current status of their IT governance and the state of maturity they wish to achieve for the year ahead, thus determining the target maturity.

Establishing

In this phase, a decision is made about where to start, i.e. actions are prioritised. The good practices that help eradicate the problems that have been prioritised should be reviewed and a set of specific actions to address these problems needs to be established in this iteration of the improvement.

The most important action the governance team should take is to set up a regularly updated IT Project Portfolio. This initiative should also be supplemented with the following actions:

- Establish a template for drafting IT projects including all relevant information (objectives, benefits, steps, performance criteria and associated risks) that the governance team requires to establish the order in which they are to be carried out.
- Properly calculate the cost of an IT project, taking into account IT investment and maintenance costs and also the cost of human resources, their training and, in general, the cost of the organisational changes that the project entails.
- Include actions in IT projects to deal with the risks posed by a lack of commitment by participants. This means training everyone concerned and thus ensuring their engagement, maximum performance by the IT in place, success of the change promoted and consequently, an improvement in the service supplied, and also setting up committees and working groups to facilitate the participation, and therefore, the engagement of stakeholders in the design, monitoring and final evaluation of IT-based change processes.
- Regularly publish the objectives of the IT projects to be implemented and develop a procedure to measure whether they have been achieved once the project has been completed.

Acting

In this phase, the tools required to carry out the predefined actions have to be specified. This is where people with more experience in the field should be brought on board to run the processes in place.

However, a perfect process should not be aimed for the first time round as this will be improved in each iteration. It is important to draw up documents in order to subsequently learn from the actions carried out.

The governance team should devote sufficient resources to maintaining the performance of IT-based services with a high degree of satisfaction for stakeholders connected with the service. This can be helped by the following good practices:

- Establish what IT resources (technical and human) the organisation has, as a first step in planning new resources.
- Have a procedure in place for IT procurement including analysing various offers based on strategic objectives, and not only on technical and economic principles.

The governance team should regularly look at user requirements and set up a procedure to examine the satisfaction of the various stakeholders connected with the IT-based services in operation.

Learning

In this last phase, problems related to the process or other processes should be compiled to be addressed in the following improvement iteration. Documents about actions taken and the results of those actions should be referred to. This is the factor that generates continuous learning in the organisation and is the basis for continuous improvement.

The governance team should draw up and publish a directory of IT-related policies to provide guidance on how to roll out IT across the organisation. It should also design a procedure to measure whether they become known, understood and respected by the entire organisation. The most essential IT policies at present are:

- A policy providing guidance on the different types of procurement and different types of relationships with providers.
- A policy setting out the expected performance of IT-based organisational processes.
- A policy to promote the widespread use of IT-related professional standards and good practices in the organisation.

The governance team needs to ensure compliance with external legislation and internal regulations. The following measures are recommended for this purpose:

- Formally assign responsibility for being familiar with IT-related legislation to a person or group and establish when their competence is to be reviewed to ensure IT regulatory compliance in the organisation.
- Draw up and update a reference directory containing IT-related external regulations and laws affecting the organisation, and design and publish another directory that includes the internal procedures and regulations implementing the IT policies specified by management.
- Measure how widespread employee knowledge of IT legislation and policies is and run training schemes about compliance with external legislation and internal policies and regulations.
- Assign responsibility to a person or group for monitoring regulatory compliance in the organisation and drawing up reports for the governance team which set out the level of compliance with external legislation and internal policies and procedures.

The governance team should drive IT management based on standards (for example, ITIL, ISO 20000). The first measures to be taken in this respect should be:

- Formally assign responsibility for being familiar with IT-related standards to a person or group.
- Draw up and update a reference directory containing the IT-related standards applicable to or already applied in the organisation.

Finally, in its analysis of IT-related risks, the governance team should identify factors associated with resistance to change by affected people or groups, and the lack of commitment of those involved. A first step to resolve this issue would be to start up an awareness process which reduces people's resistance to an IT-based change process (information, training, etc.).

13.7 Conclusions

IT is no longer strategic as it is accessible to all competitors in a given sector. The key to it becoming a strategic asset once more lies in its governance, in management that minimises operational risks and ensures continuous support for the business.

In addition to the above, as a final conclusion, we might mention that there is a problem in IT management in enterprises, and standards help to solve these problems. However, there are many standards around and not all of them should be used. It is also necessary to know which ones to use and how to integrate those used.

These standards are the foundation for good IT governance which will ensure the benefits of investments in IT are achieved based on proper management of risk, resources and strategic alignment. Implementing good IT governance is only possible if it is backed by a framework of performance standards and regulations to ensure that the IT unit supports the organisation's business objectives.

Adopting a progressive implementation plan, with a focus on continuous improvement and gradual standardisation, should be the model for implementation that enables relatively quick visibility of the benefits of good IT governance, and better handling of cultural change in the organisation.

The proposed model provides a clear identification of roles by working committees with defined responsibilities in the allocation of resources, a planning/improvement cycle for resource optimisation, effective change or new business proposal management, and a model that is aligned at all times with the organisation, and improved service quality, as it proposes measurement and better understanding of the role of IT in delivering organisational value.

The proposal is based on two fundamental constraints at source: the need to deliver value to the business, and to reduce IT-related risks. Appropriate IT governance provides the structures that connect IT processes, IT resources, and information with the company's strategies and objectives. It also integrates and institutionalises good (or best) practices for planning and organisation, procurement and implementation, service delivery and support, and monitors IT performance to ensure that the company's information and related technology support its business

objectives. Thus, by means of the proposed model, IT governance leads the company to take full advantage of its information and with it maximise its benefits, capitalise on its opportunities and gain competitive advantage.

References

Allen J (2005) "Governing for Enterprise Security." (CMU/SEI-2005-TN-023). Pittsburgh, PA: Software Engineering Institute, Carnegie Mellon University, June 2005. http://www.sei.cmu.edu/library/abstracts/reports/05tn023.cfm

Dahlberg T, Kivijarvi H (2006) An integrated framework for IT governance and the development and validation of an assessment instrument. In: Proceedings of the 39th Hawaii international conference on system sciences. IEEE Computer Society

De Haes S, Van Grembergen W (2006) An exploratory study into IT governance implementations and its Impacto n Business/IT alignment. Inform Syst Manage 26:123–137, Taylor & Francis Group

De Haes S, Grembergen WV (2004) IT governance structures, processes and relational mechanisms: achieving IT/Business alignment in a major Belgian financial group. Paper presented at the 38th Hawaii International Conference on System Sciences, January 5–8, Big Island, HI, USA

Deming WE (1950) Elementary principles of the statistical control of quality. JUSE, Japan

Fernández Sánchez CM, Piattini Velthuis M (2012) Modelo para el gobierno de las TIC basado en las normas ISO. AENOR, Madrid

Fink D, Huegle T, Dortschy M (2006) A model of information security governance for E-business. Idea Group

Hamaker S, Hutton A (2004) Principles of IT governance. Inform Syst Control J, 2

Hardy G (2006) Using IT governance and COBIT to deliver value with IT and respond to legal, regulatory and compliance challenges. In: Information Security Technical Report. pp 55–61

Henderson JC, Venkatraman N (1993) Strategic alignment: leveraging information technology for transforming organizations. IBM Syst J 32(1):4–16

Hirschheim R, Sabherwal R (2001) Detours in the path toward strategic information systems alignment. California Manage Rev, Fall 44(1):87–108

Imai M (1886) Kaizen: the key to Japan's competitive success. Random House, New York, p 60

ISO 38500 (2008) Corporate Governance of Information Technology. http://www.iso.org/iso/pressrelease.htm?refid=Ref1135

ITGI. IT governance executive summary. IT Governance Institute (http://www.itgi.org)

Loh L, Venkatraman N (1992) Diffusion of information technology outsourcing: influence sources and the Kodak effect. Inform Syst Res 3(4):334–359

Luftman J (1996) Competing in the information age: strategic alignment in practice. Oxford University Press, Oxford

Peterson R (2003) Integration strategies and tactics for information technology governance. Strategies for information technology governance. Idea Group, London, pp 37–80

Prahalad CK, Krishnan MS (2002) The dynamic synchronization of strategy and information technology. MITSloan Manage Rev 43(4):26

Simonsson M, Johnson P (2006) Defining IT governance-A consolidation of literature. In: Proceedings of the 18th Conference on advanced information systems engineering (CAISE) Luxembourg

Software Engineering Institute (1996) Carnegie Mellon University, IDEALSM: a user's guide for software process improvement

Van Grembergen W (2002) Introduction to the minitrack IT governance and its mechanisms. In: Proceedings of the 35 Hawaii international conference on system science. IEEE Compute Society

Van Grembergen W, De Haes S, Gundentops E (2004) Structures, processes and relational mechanisms for IT governance. Strategies for information technology governance. Idea Group, London, pp 1–36

Van Gremberger W (2004) Strategies for information technology governance. Idea Group, London
Van Grembergen W, De Haes S (2008) Implementing information technology governance: models, practices and cases. IGI Global, Hershey, PA
Webb P, Pollard C, Ridley G (2006) Attempting to define IT governance: wisdom or folly. In: Proceedings of the 39th Hawaii international conference on system science. IEEE Computer Society
Weill P, Ross JW (2004) IT governance: how top performers manage IT decision rights for superior results. Harvard Business School Press

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