



# A review of empirical investigations comparing quality initiatives in manufacturing and service organizations

Comparing  
quality  
initiatives

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## Abstract

**Purpose** – The purpose of this paper is to investigate, by reviewing the literature, the relationship between quality management and business performance with a comparison between manufacturing and service organizations.

**Design/methodology/approach** – This meta-analytic study critically examines the literature and evaluates the business performance implications of adopting quality management principles in manufacturing and service organizations. Altogether, 14 published research studies were identified that focused on the relationship between quality management and business performance with a comparison between manufacturing and service organizations.

**Findings** – The results show several inconsistencies in previous research when it comes to the relationship between quality management and business performance when comparing manufacturing and service organizations. Some of these inconsistencies concern the principles of supplier relationships, leadership commitment and customer orientation. The inconsistencies can be explained by a number of factors: the difference in size of the organizations included in the studies, the cultural aspect and the research design. Regarding consistencies, two quality management principles stand out in several studies as being more central for service organizations: employee management and process orientation.

**Practical implications** – The results can provide guidance for service managers aiming to implement quality management. In addition, the paper provides guidance to researchers about methodological issues so that future research can provide more reliable and valid results.

**Originality/value** – The paper provides a critical review of previous research on what principles of quality management should be adopted in a service organization.

**Keywords** Quality management, Business performance, Service industries, Manufacturing industries, Employee involvement, Supply chain management

**Paper type** General review

## Introduction

Quality management is widely discussed in the literature and can be seen as a management philosophy characterized by its principles, practices and techniques which emphasize continuous improvement, increased employee involvement and teamwork, process orientation, competitive benchmarking, committed leadership, constant measurement of results and closer relationships with suppliers. Most empirical studies on quality management have been conducted in the manufacturing



sector, while research on organizations in the service sector has been sparse. The characteristics of services (intangibility, co-production, inseparability and heterogeneity) and the growth of service industries have resulted in an increased focus on the implementation of quality management principles in service organizations interested in delivering high-quality service to customers (Schneider and White, 2004).

There are several research studies that examine the impact of quality management on business performance, e.g. Hendricks and Singhal (1995, 1996, 1997, 2001a, b), Flynn *et al.* (1995) and Eriksson and Hansson (2003). There are also a number of research studies that investigate the impact of quality management principles on business performance with a comparison between manufacturing and service organizations, e.g. Nilsson *et al.* (2001), Sun (2001), Solis *et al.* (1998), Singh *et al.* (2006) and Powell (1995). These studies are intended to help managers implement quality management more effectively by giving recommendations about which quality management principles to adopt depending on whether the organization produces goods or services.

Unfortunately, the present status of the research cannot provide clear guidance. Beaumont *et al.* (1997), for example, concludes that there is no relationship between quality management and business performance in either manufacturing or service organizations. In contrast, Lagrosen and Lagrosen (2003) conclude that quality management and business performance have a stronger relationship for manufacturing organizations than for service organizations, while Woon (2000) on an overall level shows no significant difference between manufacturing and service organizations. To conclude, the three research studies all examine the same research issue but come to different results; how is this possible? Instead of living up to the intention of identifying systematic differences between manufacturing and service organizations concerning the relationship between quality management and business results, these studies are inconsistent and therefore confuse both researchers and managers as to which principles are most important in different organizational contexts.

The aim of our research is to identify why inconsistencies in previous research exist and what researchers can do to conduct strong research studies in the future. To accomplish this aim, we perform a literature review, investigate the research methodology and compare the results of 14 empirical studies published between 1988 and 2006 that focus on the differences between quality management in manufacturing and service organizations. In particular we are interested in the relationship between individual quality management principles and business performance and how it differs among companies in different industries. Our results provide guidance to managers about which conclusions are common across the studies and which recommendations do not hold when the scientific rigor is scrutinized. In addition, we provide guidance to researchers regarding methodological issues so future research can provide more reliable and valid results.

### **Quality management**

Quality management is a business philosophy or a company ideal. Several attempts have been made to define and identify the building blocks of quality management, total quality management, total quality control and similar terms. Hellsten and Klefsjö (2000) define TQM as a management system in continuous change, consisting of values, methodologies and tools, aiming to increase external and internal customer

satisfaction with a reduced amount of resources. Hackman and Wageman (1995) use core values and interventions (structures, systems and/or work practices) as their building blocks of quality management. Both of these models can be used to describe what quality management really is, but they do not fully capture the whole range of activities present in quality management. We argue that quality management is better viewed as a combination of principles, practices and techniques (Dean and Bowen, 1994; see Table I). A principle is implemented through a set of practices, which are simply organizational routines or activities. The practices are, in turn, supported by a wide array of techniques to make the practices effective. To be able to compare industry sectors, the object of comparison should be the principles since the practices performed to display and embody the principles of quality management might differ among industries.

According to Dean and Bowen (1994), most of what has been written about quality management is based on three principles: customer focus, continuous improvement and teamwork. Advocates of the quality movement include more principles in their conceptualization of quality management (see Bergman and Klefsjö, 2007; Dahlgaard *et al.*, 1998). Bergman and Klefsjö (2007) include six principles of quality management:

- (1) focus on customers;
- (2) focus on processes;
- (3) base decisions on facts;
- (4) improve continuously;
- (5) let everybody be committed; and
- (6) top management commitment.

Quality awards or so called excellence models are built on a large number of values, similar to the underlying principles in the quality movement (see SIQ, 2008; NIST, 2008; EFQM, 2005). The Malcolm Baldrige National Quality Award (NIST, 2008), established in 1987 has 11 core values:

- (1) visionary leadership;
- (2) customer-driven excellence;
- (3) organizational and personal learning;
- (4) valuing workforce members and partners;

Concepts	Definitions	Examples
Principles	A set of underlying assumptions of how to view the organization and its relation to customers, competitors and suppliers	Customer focus, continuous improvement, teamwork
Practices	Activities performed to display and embody the principles	Collecting customer information, conduct a customer survey
Techniques	Guidelines and infrastructure of how to perform certain activities	Voice of the customer tables, quality function deployment

**Table I.**  
The building blocks of  
quality management

- (5) agility;
- (6) focus on the future;
- (7) managing for innovation;
- (8) management by fact,
- (9) social responsibility;
- (10) focus on results and creating value; and
- (11) systems perspective.

As can be seen in the review of principles of quality management, the suggested principles differ among various authors; the number of principles also differs (Hellsten and Klefsjö, 2000). Various researchers use between three (Dean and Bowen, 1994) and 13 (SIQ, 2008) of these principles, which contributes to the different perspectives on quality management.

#### *The economic value of quality management*

According to quality management advocates, quality management produces value through a variety of benefits: improved understanding of customers' needs, improved customer satisfaction, improved internal communication, better problem-solving, greater employee commitment and motivation, stronger relationships with suppliers, fewer errors and reduced waste (Juran, 1988). Most existing empirical studies conclude that quality management has a relationship to business performance (see Hendricks and Singhal, 1995, 1996, 1997, 2001a, b; Flynn *et al.*, 1995; Eriksson and Hansson, 2003; Gustafsson *et al.*, 2003). The strongest support for such a relationship is provided by the seminal series of papers by Hendricks and Singhal where they investigate the financial effects of implementing a TQM program. By making comparisons between quality award winners and other companies in the same industries, the authors conclude that the award-winning firms outperform their competitors on operating-income based measures. In addition, the authors show that the improvements of profitability are not a result of winning the award but of the improvement of quality principles within the firm.

Most studies investigating the relationship between quality management principles and business performance have focused on a single industry (see, e.g. Flynn *et al.*, 1995; Dow *et al.*, 1999). Some studies such as Powell (1995), Woon (2000), Badri *et al.* (1995), Quazi *et al.* (1998), Nilsson *et al.* (2001) and Huq and Stolen (1998), however, have studied quality management principles in both manufacturing and service organizations. Powell (1995), for example, investigates the correlation between 12 factors of quality management and business performance. The study concludes that there are differences between a manufacturing and a service organization; supplier relationships, for example, are vital for a manufacturing organization, while process improvements are more important for a service organization. To conclude, a quality principle might have a different role in a manufacturing organization than in a service organization. The question is what these differences are and if we can use the differences between goods and services to explain the various roles of quality principles in manufacturing and service organizations.

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### *Manufacturing and service organizations*

A quality principle that has a different role in a manufacturing firm than a service firm might depend on the various characteristics of goods and services, i.e. intangibility, heterogeneity, inseparability and perishability (Zeithaml *et al.*, 1985). Although these characteristics do not clearly distinguish all goods from all services, we argue that they can be used to better understand the differences between the production of goods and services. Using a similar argument, Anderson *et al.* (1997) and Johnson and Nilsson (2003) show that the quality dimensions of reliability and customization have different roles in manufacturing and service organizations.

Intangibility denotes that services are activities and not physical objects as are goods. The intangible nature of services often means that customers have difficulty evaluating and comparing services. As a result, they may use price as a basis for assessing quality and they may place greater emphasis on personal information sources.

Because services are often produced by people, no two services will be alike. Given that people are involved in providing the actual services in most sectors and that people are unlikely to operate as reliably and constantly as machines, it is often difficult to measure and control quality. As a result, the service and the quality will vary depending on who (both employees and customers) is carrying out the activities. The heterogeneity connected to services is largely the result of human interaction and all the vagaries that accompany it.

Because services are processes, deeds or acts and interactions, customers are involved in the production of a service. The inseparability of production and consumption makes the interaction between employees and the customer an essential ingredient in the service experience. Other customers may be involved in the production and centralized mass production may be difficult, particularly if the service is customized.

Given the intangible nature of services, perishability refers to the fact that services cannot be inventoried, stored, warehoused or reused. The hairdresser cannot store haircuts so that when a rush occurs on a Saturday morning all customers can have their hair cut at once. Thus, the availability of enough opportunities for service delivery at relevant times is important for service managers.

The empirical investigations of quality management in manufacturing and service organizations suggest that the relationship between quality management and business performance is different for manufacturing and service organizations. The research is full of inconsistencies, however, which is an indication that the choice of quality principles included in a study might have influenced the results of the empirical investigations. We argue that due to the service characteristics, an individual quality principle might have a different role in a manufacturing organization than in a service organization. Based on this assumption, we review the literature concerning the relationship between quality management and business performance in manufacturing and service organizations, where we focus specifically on whether the relationship between individual quality management principles and business performance looks different in manufacturing and service organizations.

### **Methodology**

During the last couple of years, some literature reviews have been conducted on the relationship between quality management and business results. Suosa and Voss (2002)

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focus on a small set of studies and investigate them in great detail. Sila and Ebrahimpour (2002) identify and review 347 survey-based empirical studies of quality management. In contrast to these two studies, we aim to make a contribution by examining the studies that have empirically investigated and made comparisons between manufacturing and service organizations. This choice was made due to the fact that much of the literature on quality management is based on research in manufacturing firms. Managers in service organizations need this kind of comparisons between manufacturing and service organizations to decide what part of the research on quality management that is relevant for them. Unfortunately, some of these research efforts have been lacking scientific rigor why there is a need to review these studies and provide guidelines for further research. Our meta-analytic study critically examines the literature and evaluates the business performance implications of adopting quality management principles in manufacturing and service organizations.

The literature review used the databases of Emerald, ASQ and Scirus and the main keywords were “Quality management”, “Business performance” and “Products/goods and services”. Papers of interest were also found by using snowball sampling of identified studies. Altogether we identified 14 research papers that had been published in English and that focused on the relationship between quality management (either the overall relationship or the principle level) and business performance and made a direct comparison between manufacturing and service organizations. The strength of this approach is a more thorough analysis of the selected studies followed by recommendations for researchers and practitioners. The weakness of the chosen approach is that there is a limited set of studies to review. For each of the studies we tried to identify the sample size, the methodologies, the quality management principles analyzed, the results, subjective and/or objective data, the type of study (overall quality management in relation to business performance and/or on principle level) and the conclusions drawn from the different papers in relation to the research questions. An overview of the studies included in the literature review is provided in Table II.

## Results and analysis

### *Type of studies*

A review of the literature reveals that there are 14 empirical investigations on quality management where the authors perform a comparison between manufacturing and service organizations. These studies are of different sizes covering between 33 and 480 organizations. The studies have been carried out in various countries, such as Sweden, Norway, Singapore, US and Australia. The fact that the studies cover a range of national cultures may contribute to the different results in the studies, but it also aids in discovering possible universal laws concerning quality management.

It is of interest to see that the studies have been published in a range of scientific journals such as *Strategic Management Journal*, *The Journal of Service Marketing*, *Journal of Quality Management* and *Quality Management Journal*. In *Managing Service Quality* and the *International Journal of Quality & Reliability Management*, the research on the similarities and differences in the role of quality management in manufacturing and service organizations has been published in a series of papers.

On an overall level, our research reveals that there are three types of studies that have compared manufacturing and service organization regarding quality management:

Paper	Sample	Method/test	Quality management principles	Results	Subjective/objective	Type of study	Conclusions
Nilsson <i>et al.</i> (2001)	360 product, 122 service	Structural equation modeling T-test	Quality management, employee management, process orientation, customer orientation	Customer satisfaction, business performance	Subjective + objective	Principles lead to business performance	<i>Service:</i> Employee management leads to business performance improvements <i>Service:</i> Process orientation leads to customer satisfaction <i>Product:</i> Customer orientation leads to customer satisfaction <i>Product:</i> Quality management leads to (business performance) processes improvements
Lagrosen and Lagrosen (2003)	187 product, 54 private service (26 public)	ANOVA Chi-square Correlation analysis 7-test	Customer satisfaction, process orientation, participation of everybody, leadership commitment, continuous improvement, management by facts	Process improvements; positive and negative effects	Subjective	Quality management leads to business performance	<i>Product:</i> Quality management leads to (business performance) processes improvements
Sun (2001)	180 product, 85 service	Factor analysis Cronbach's alpha Correlation analysis	Leadership, information and analysis, strategic management, human resources, process management, supplier relationship, customer focus	Business performance (internal and external)	Subjective	Quality management and principles lead to business performance	<i>Product:</i> Quality management leads to business performance improvements. All principles influence business performance improvements <i>Service:</i> Leadership, process management and customer orientation effect business performance improvements. Only correlation to external business performance is significant
Beaumont <i>et al.</i> (1997)	313 product, 105 service	Chi-square Non-parametric tests	Quality management	Business performance	Subjective	Quality management leads to business results	No relationship between quality management and business performance

(continued)

**Table II.**  
An overview of empirical studies comparing manufacturing and service organizations

Paper	Sample	Method/test	Quality management principles	Results	Subjective/objective	Type of study	Conclusions
Sharma and Gadenne (2002)	62 product, 58 service	Factor analysis Cronbach's alpha MANOVA	<i>Product:</i> Value chain integration, efficiency improvement, customer liaison, employee involvement, office efficiency, employee training, open organization, and top executive commitment to quality <i>Service:</i> Value chain integration, employee efficiency, supplier quality cooperation, executive involvement, customer-employee cooperation, efficiency-transparency, emphasis on overall quality, and defects reduction	Return on total assets Total performance	Subjective + objective	Principles lead to business performance	<i>Service:</i> Subjective results: Supplier quality cooperation leads to business results improvements, defects reduction leads to business results improvements Objective results: Value chain integration leads to business performance improvements, supplier chain cooperation leads to business performance improvements <i>Product:</i> Subjective results: Value chain integration leads to business performance improvements, open organization leads to business results improvements, top executive quality commitment leads to business performance improvements Objective results: None
Solis <i>et al.</i> (1998)	131 product, 109 service	T-tests	Quality leadership, strategic quality planning, quality information and analysis, human resource development, quality assurance, supplier quality, customer orientating, quality citizenship	Business performance	Subjective	Quality management leads to business performance (significantly on customer orientation, quality citizenship, quality results and quality assurance)	<i>Product:</i> quality management leads to business performance improvements <i>Service:</i> Quality leadership (continued)

Paper	Sample	Method/test	Quality management principles	Results	Subjective/objective	Type of study	Conclusions
Parasuraman and Varadarajan (1988)	35 product, 39 service	7-test	Future emphasis on product/service quality Future emphasis on HR strategies	Financial strategies	Not applicable	Comparison between future level of principle	Differences between product and service concerning quality management practices can only be found for certain employee management issues
Badri <i>et al.</i> (1995)	196 product, 228 service	Factor analysis Correlation Cronbach's alpha	Top management leadership, role of quality department, training, product design, supplier quality management, process management, quality data reporting, employee relations	Quality performance	Not applicable	Principle level	Association between product and service: training, product/service design, supplier quality management and employee relations Negative agreement with regard to the role of quality department and quality data reporting
Quazi <i>et al.</i> (1998)	13 product, 20 service	Factor analysis Cronbach's alpha Correlation	Management leadership and quality policy, role of the quality department, training, product/service design, supplier quality management, process management, quality data and reporting, employee relations	Customer satisfaction Quality performance	Subjective	Principles lead to customer satisfaction and quality performance	<i>Product:</i> Have a higher mean score in each factor than service companies Identifies relationship between all principles and business performance

(continued)

Table II.

Paper	Sample	Method/test	Quality management principles	Results	Subjective/objective	Type of study	Conclusions
Huq and Stolen (1998)	18 product, 18 service	Chi-square	Quality mission statement, customer focus, management commitment, worker empowerment, communications in company, performance appraisal system, statistical evidence of quality, familiarity with TQM, measures of costs of quality, causes of quality variation, customer feedback, commitment for continual improvement, problem solving approach, activities to remove barriers for consensus, comparison of actual with planned performance, education and training, supplier development, quality circles/quality improvement teams, applications of advanced analysis techniques	Not included	Subjective	Principle level	<i>Service:</i> Apply quality management principles selectively (focus on human interactions and processes) <i>Product:</i> Apply quality management totally (favour scientific) 10 out of 19 principles were found to be significantly lower in the service organizations
Woon (2000)	129 product, 111 service	Cronbach's alpha Correlation ANOVA ANCOVA	Quality management, leadership and quality culture, use of information and analysis, strategic planning, human resource development and management, management of process quality, quality and operational results, customer focus	Business performance	Subjective	Principles lead to business performance	No significant difference between the mean scores for service and manufacturing organizations except for management of process quality, which is higher for manufacturing organizations

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Paper	Sample	Method/test	Quality management principles	Results	Subjective/objective	Type of study	Conclusions
Singh <i>et al.</i> (2006)	160 product, 149 service	Cronbach's alpha Non-parametric statistic	Top management leadership, customer focus, supplier relationships, employees, business processes	Business performance	Subjective	Quality management and principles leads to business performance	Differences between service and manufacturing companies concerning customer loyalty, employee morale, response to customer needs, market share, and flexibility to change the volume of production, which is higher for service organizations
Powell (1995)	24 product, 15 service	Cronbach's alpha Correlation	Executive commitment, adopting the philosophy, closer to customers, closer to suppliers, zero defects mentality, training, open organizations, benchmarking, employee empowerment, flexible manufacturing, process improvement, measurement	Business performance	Subjective	Quality management and principles leads to business performance	Differences between service and product organizations; <i>Product</i> : Supplier relationships are more important <i>Service</i> : Process improvements are more important
Benson <i>et al.</i> (1991)	79 product, 152 service	Mancova	Management leadership, role of the quality department, training, product/service design, supplier quality management, process management, quality data and reporting, employee relations	Not included	Not applicable	Quality management influenced by context	Level of quality management is lower in service firms <i>Product</i> : Quality management influenced by both internal and external factors <i>Service</i> : Quality management influenced by internal factors

Table II.

- (1) studies comparing the degree of performance on quality principles;
- (2) studies comparing the relationship between quality management in general and business performance; and
- (3) studies comparing the relationship between individual quality management principles and business performance.

For our purpose and as a guide for managers, the latter is most informative since it provides managers with an option of which principles to include and which principles to not include in a quality improvement program.

*Comparing the results of the studies*

In the following section, we examine how the results of the various research studies relate to the degree of performance on quality principles, the overall relationship between quality management and business performance and the relationship between different quality principles and business performance.

First, concerning the performance of organizations on different quality principles, Quazi *et al.* (1998) in their studies of firms in Singapore conclude that manufacturing organizations show a higher mean score than service organizations in each of the seven investigated quality principles. In their study of 18 manufacturing and 18 service organizations in the USA, Huq and Stolen (1998) show significantly lower scores for service organizations in ten out of 19 investigated quality principles. In contrast, Woon's (2000) study of organizations in Singapore shows no significant difference between manufacturing and service organizations except for one quality principle.

Second, concerning the overall relationship between quality management and business performance, Beaumont *et al.* (1997) in their study of Australian industry shows no relationship between quality management and business performance in either manufacturing or service organizations, while Lagrosen and Lagrosen (2003), Sun (2001), Solis *et al.* (1998), Quazi *et al.* (1998), Huq and Stolen (1998) and Benson *et al.* (1991) conclude that quality management has a stronger relationship to business performance in manufacturing than in service organizations.

Third, the empirical studies show some major differences in results when it comes to the relationship between individual quality principles and business performance. This concerns specifically the principles of supplier relationships, leadership commitment, customer orientation and process management. In Powell's (1995) studies of 39 American firms, the quality principle supplier relationships shows a relatively stronger relationship to business performance in manufacturing organizations (in comparison to service organizations), while the highly similar principle supplier chain cooperation shows a stronger relationship in service organizations in the study by Sharma and Gadenne (2002). In the same study, Sharma and Gadenne (2002) show that the principle top executive quality commitment demonstrates a stronger relationship to business performance in manufacturing firms, while in other studies such as Sun (2001) and Solis *et al.* (1998), the principle leadership shows a stronger relationship to business performance in service organizations. The last major contradiction concerns customer orientation, which in the studies in Sweden (Nilsson *et al.*, 2001) and Taiwan (Solis *et al.*, 1998) has a stronger relationship to business performance in manufacturing organizations, while in studies of Norwegian (Sun, 2001) and Australian manufacturing and service organizations (Singh *et al.*, 2006) customer orientation shows a stronger relationship to business performance in

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service organizations. The principle management of process quality, for example, shows a stronger relationship in manufacturing organizations (in comparison to service organizations) in the study by Woon (2000), while in most other studies such as Nilsson *et al.* (2001), Sun (2001), Huq and Stolen (1998) and Powell (1995), the similar principle process orientation shows a stronger relationship in service organizations. Looking at all the empirical evidence on process management together, we argue that on a general level process management seem to pay off more for service organization. There are, however, no contradicting results in the principle employee management (Nilsson *et al.*, 2001; Parasuraman and Varadarajan, 1988; Singh *et al.*, 2006). Most studies suggest that employee management has a stronger relationship to business results in service organizations than manufacturing organizations. Although these studies show a number of inconsistencies two principles stand out in several studies as having a stronger relationship in service organizations: process orientation and employee management. Our results are particularly relevant for service industries where service production is characterized by a high degree of co-production and where the service provision is carried out over a longer period of time.

### **Discussions and conclusions**

This literature review on the similarities and differences between manufacturing and service organizations concerning the relationship between quality management and business performance, illustrates the areas we can agree on and why research has reached varying results. Our research has identified a number of inconsistencies concerning the fundamental relationship between quality management and business performance. Such differences in research results are frustrating both for researchers designing new studies and practitioners who seek advice on how to implement quality management. There are inconsistencies due to differences in research design, which might explain some of the variation in the results. In the following section, we summarize the implications of our study for researchers and for managers in service organizations. Although we only review 14 research studies on the role of quality principles in manufacturing and service organizations, these studies together cover 1,874 manufacturing and 1,245 service organization from Asia, Europe and the USA. As a consequence, we provide some guidelines concerning quality principles that these 14 research studies reach an agreement on.

#### *Implications for researchers*

Research shows that manufacturing firms, to a larger extent, have adopted different principles of quality management (see Quazi *et al.*, 1998; Huq and Stolen, 1998). But present research shows that this difference is decreasing and that service organizations in general have a stronger development in quality management. In addition, we argue that some of the research instruments have focused on tools and techniques such as design of experiments and statistical process control that are more commonly used in manufacturing organizations (see, e.g. Solis *et al.*, 1998; Beaumont *et al.*, 1997). This literature review shows no systematic difference between manufacturing and service organizations in the individual quality principles they have adopted. As a consequence, the difference between manufacturing and service organizations has been exaggerated in previous research. The use of research instruments that focus on general practices and principles will provide fairer results when adopting quality management.

Concerning the overall question about the financial benefits of quality management, the various research studies show conflicting results. Some studies show no relationship between quality management and business performance, while other studies show a strong relationship. By investigating the more comprehensive studies, such as Nilsson *et al.* (2001), Sun (2001) and Solis *et al.* (1998) there seems to be an agreement that adoption of quality management leads to improvements in business performance. Taking this empirical evidence together with the comprehensive studies by Hendricks and Singhal (1995, 1996, 1997, 2001a, 2001b), there is persuasive evidence as to the benefits of quality management. Quality management pays for service organizations and it is the adoption of quality principles that is beneficial.

In terms of the differences in research design, some of the included studies lack rigor concerning the chosen sample and methods. Some studies use small samples when making their analyses and conclusions, e.g. Powell (1995), Parasuraman and Varadarajan (1988), Quazi *et al.* (1998) and Huq and Stolen (1998). Applying methods such as factor analysis on samples of 30 observations is not consistent with the guidelines of scientific procedures and as a consequence the results cannot be trusted. Some results concerning the relationship between principles and business performance are based on correlations, such as Badri *et al.* (1995) and Huq and Stolen (1998). Their results do not take the multicollinearity between different quality principles into account. As a result, these studies provide an overestimation of the role of quality principles in organizations.

When investigating the relationship between different quality management principles and business performance, it is important to keep in mind that the principles are not distinct; all principles are interrelated – some direct and some indirect, e.g. top management commitment might not have a direct effect on business performance instead its effect is mediated through process management and customer orientation. Attention to a quality initiative in an organization might lead to increased customer orientation, which in turn can lead to improved quality and customer satisfaction. This example emphasizes the importance for a quality management model to include not only quality management principles but also the relationship between them.

This review of previous research provides us with a list of guidelines for forthcoming research. First, future studies need to focus on larger sample sizes. To be able to compare manufacturing and service organizations on statistical grounds, we argue for studies with more than 200 observations. Second, the studies need to use research instruments that focus on general principles and practices that are commonly used in all types of organizations. Third, conceptual models that include an internal structure among the different quality principles and where not all principles directly influence business performance should be used. Fourth, appropriate statistical methods should be used that take multicollinearity into account when estimating the relationship between quality management and business performance.

#### *Implications for managers*

Managers who have quality on their agenda must decide which quality strategies to choose for their companies – strategies which also involve quality management principles. This decision can be difficult to make as there are inconsistencies in the research and different studies give different recommendations to manufacturing and service organizations. The wrong decision can become a very expensive experience. This study will hopefully bring some clarity and give support in this decision and

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function as a guideline for both manufacturing and service companies. Companies must not only choose a quality management principle, but also analyze the relationship between the principles, as they should be seen in both the context and the influence they have on one another.

By examining the 14 studies that make direct comparisons between manufacturing and service organizations, we can provide some guidelines for a service manager who wants to implement quality management. Two quality principles stand out as being central for service organizations: employee management and process orientation. This can be explained by the service logic. As customers are co-producers and services are often produced and consumed at the same time in the service production process, employee management and process orientation have direct effects on customer satisfaction. By focusing on the principles that have a direct influence on the service production process and the everyday life of the customer, an organization can build a quality improvement program that will have a positive influence on business performance. One important criteria in relation to process management of the Malcolm Baldrige National Quality Award is measurement, analysis and knowledge management which serve as a foundation for the performance management system. By making effective process measurements that rely on both financial and nonfinancial information and data, these measures aim to guide the organization towards the achievement of key organizational results and strategic objectives. The criteria can further be widened by including a supply-chain approach, involving all actors in the strategy of process measurements in the co-creation of value for customers.

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