The research register for this journal is available at
http://www.mcbup.com/research_registers/quality.asp

The current issue and full text archive of this journal is available at
http://www.emerald-library.com

An integrated view of project and quality management for project-based organizations

Robert A. Orwig and Linda L. Brennan
Mercer University, Macon, Georgia, USA

Keywords *Quality, Project management, Integration*

Abstract *Quality management (QM) has been the purview of operations management for repetitive processes, where project management (PM) is applied to temporary endeavors to create unique products or services. Any convergence of thought between PM and QM has been focused on using PM to implement a total quality management culture or on assuring the quality of the project outcomes and deliverables. However, for project-based organizations, where the project is the basic form of organization for its operation, PM is of itself an ongoing, repetitive operation to which at least some of the QM practices could apply. By considering both disciplines in terms of the fundamental principles of customer focus, teamwork and continuous improvement, it can be shown that by instituting a formal project management methodology and instituting basic PM techniques, project-based organizations are fulfilling the principles of quality.*

Introduction

Winston Churchill is credited with describing the UK and America as "two great countries divided by a common language". Quality management (QM) and project management (PM) might be described in the same way. Each set of management practices has its own language and set of techniques that distinctly separate the two bodies of knowledge. QM has been an area of operations management that has been most successful where repetitive processes dominate. In contrast, PM is applied to temporary endeavors to create unique products or services (Project Management Institute, 1996). Any convergence of thought between PM and QM has been focused on using PM to implement a total quality management culture (cf. Gupta and Graham, 1997; Milosevic and Daim, 1997; Sink, 1998), or on assuring the quality of the project outcomes and deliverables (cf. Barkley and Saylor, 1994; Ryser, 1996; Shenhar *et al.*, 1997). Academia has directed scant attention toward the effect QM might have on PM processes, i.e. how the projects are conducted. Since QM practices such as process flow analysis, statistical process control and just-in-time (JIT) management were developed for ongoing operations, they do not apply well when a project is considered as a "one of a kind" effort.

This paper has two goals. First our research shows that quality management and project management are synonymous in project dominated service firms. Secondly, that quality management fundamentals, properly employed, can provide valuable insight to the project management firm in

The authors would like to thank the students of TGM 699, Spring, 1999, who rendered much appreciated assistance in the literature review.

International Journal of Quality & Reliability Management, Vol. 17 No. 4/5, 2000, pp. 351-363.
© MCB University Press, 0265-671X

applying project management processes. For project-based organizations, where the project is the basic form of organization for its operation, PM is of itself an ongoing, repetitive operation to which the QM practices, properly adjusted, should relate. Considering both disciplines in terms of the fundamental principles of customer focus, teamwork and continuous improvement, reveals that project-based organizations are fulfilling the principles of quality by instituting a formal project management methodology and basic PM techniques. This paper illustrates how an integrated view of project and quality management improves business performance in such organizations.

Quality's view of project management

Quality management originated in the manufacturing sector of the economy. The management of the production of goods lent itself to various techniques that were identified with the quality movement. Statistical quality control (SPC) provides a renowned example. SPC is highly effective at identifying, and subsequently reducing, variation in a process. Deming attributes the development of this tool to his mentor and colleague, Dr Shewhart. Such tools were useful in the search for manufacturing quality, though not until the Japanese utilized these methods did US manufacturing finally realize their full implication.

As these tools were applied to manufacturing enterprises certain consultants and academicians identified corporations where the quality philosophy had developed into a company-wide effort. These efforts had many different names with the most frequent one being total quality management (TQM). TQM normally included the following concepts:

- continuous improvement;
- employee empowerment;
- benchmarking;
- just-in-time;
- customer focus; and
- various tools (for definitions of each of these concepts see Heizer and Render, 1998, pp. 82-6).

While manufacturing companies developed the theory behind the TQM revolution, service companies began to implement some of these concepts. Wholesale applications to services were met with many difficulties and even failures. Some have theorized that these failures might be due in part to inattention to the assumptions that are embodied in the TQM concepts themselves (Jauch and Orwig, 1998). While few would argue the necessary correctness of continuous improvement, the reduction of waste, or the focusing of the organization on customers, there is room for large differences in the implementation of those concepts. Skinner (1985) points out how focusing on

the right things, in his case productivity, can be extremely counterproductive. Insufficient attention has been focused on how QM initiatives within predominantly service industries can be adjusted to support a truly quality philosophy.

Certain aspects of good management have been incorporated into what is commonly referred to as the quality philosophy or as total quality management (TQM). This quality philosophy suggests that good management will continually improve processes, focus intensely on customer's needs and accomplish the above by extensive use of cross-functional teams and feedback loops throughout the organization.

As a matter of definition the terms quality, continuous improvement and customer focus are unassailable. Organization after organization has found them to be useful and applicable to processes within their fields (Juran, 1988). Yet as they are applied in different business environments they must be revised to fit those environments. Otherwise, the probability of failure increases dramatically. As TQM journeyed from manufacturing environments to service environments an increasing number of failures is noted (Van der Wiele and Brown, 1998; Lemak *et al.*, 1996; Fisher, 1992; Gopalakrishnan and Waldman, 1996). This failure rate should be expected due to the differences within the environments where the philosophy is applied. These failures would be reduced or eliminated by proper knowledge and application of the above quality fundamentals.

A guide to the application of these service quality fundamentals should begin with a model of services, for their dissimilarities have a great effect on the application of quality basics. Schnemmer (1986, pp. 21-6) provides a service process matrix (Figure 1) useful for categorizing service firms.

Operational decisions within each of these quadrants vary extensively from one another. As labor intensity increases, the improvement of processes focuses increasingly on the service provider. As labor intensity diminishes, operations may lend themselves well to "innovations in process, technology and schedule capability" (Heizer and Render, 1999, p. 242.)

As customer interaction and customization increases we would expect serious effects on how business people focus on their customers. More interaction means that the service provider is closer to the customer. Less interaction suggests that the contact with and understanding of the customer is

	Low interaction and customization	High interaction and customization
High labor intensity	**Mass Service**	**Professional Service**
Low labor intensity	**Service Factory**	**Service Shop**

Source: Schnemmer (1986)

Figure 1.
The service process matrix

necessarily less. Given these defining facts, it follows that firms with less interaction must spend more resources gathering customer information than those who have more interaction. Frequently the opportunity for a competitive advantage comes from exceeding the standard of customer focus for the industry. The car salesman who maintains high sales with the help of massive databases and contacts is a prime example.

A dearth of applied examples exists in the professional services' ranks. One aspect of this is the extensive reliance on project management techniques that have not incorporated the best of the quality management fundamentals. Common understanding perceives projects as something one does to establish operations while the standard techniques of TQM require excessive iterations of an operation. By emphasizing the fundamentals of the quality revolution the authors find that the two fields can harmonize nicely.

Project's view of quality management

In an effort to codify project management as a profession, the Project Management Institute (PMI) has published *A Guide to the Project Management Body of Knowledge* (known as the PMBOK). Of the nine knowledge areas outlined in the PMBOK, one is Project Quality Management, which includes the processes required to ensure that the project will satisfy the needs for which it was undertaken (PMI, 1996, p. 83).

Using the framework of the International Standards Organization (ISO), PMI considers Project Quality Management to encompass (PMI, 1996, p. 82):

> . . . all activities of the overall management function that determine the quality policy, objectives and responsibilities and implements them by means such as quality planning, quality control, quality assurance and quality improvement, within the quality system (ISO, 1993).

The framework categorizes the project management quality processes accordingly:

> Quality planning involves identifying which quality standards are relevant to the project and determining how to satisfy them . . . Quality assurance is all the planned and systematic activities implemented within the quality system to provide confidence that the project will satisfy the relevant quality standards . . . Quality control involves monitoring specific project results to determine if they comply with relevant quality standards and identifying ways to eliminate causes of unsatisfactory results (PMI, 1996, pp. 87-9).

While PMI acknowledges that project quality management must address both the management of the project and the product of the project (PMI, 1996, p. 83), the quality tools and techniques identified in the PMBOK are explicitly described in terms of their application to project deliverables and not the management process.

Certainly, quality is an important outcome of a project. It is a widely accepted view that, at a minimum, performance measures of a project are based on time, cost and quality (cf. Barkley and Saylor, 1994; Kerzner, 1992; Chang, 1998). Implicit in this view is the idea that if the project delivered a quality product on time and in budget, then the process of managing the project must

be "good enough". This viewpoint is antithetical to the relentless quest for continuous improvement that is a hallmark of QM. It also underestimates the importance of customer perception in determining service quality; customers do not evaluate service solely on the outcome of a service, but also consider the process of service delivery (Gupta and Chen, 1995, p. 29). Maister (1993, p. 79) argues that there is a critical distinction between technical quality (i.e. how good is the work?) and service quality (i.e. what kind of experience does the customer have?).

What seems to be needed is a more integrated view of these management approaches, to more specifically address the process of PM.

Illustration

It is helpful to consider the case of an operation driven by projects, i.e. a project-based organization. Professional services firms (e.g. consulting companies, law firms) are typically project-based organizations. However, many companies are utilizing the project as a basic form of organization:

> Projects and project management are the wave of the future in global business. Increasingly, technically complex products and processes, vastly shortened time-to-market windows and the need for cross-functional expertise make project management an important and powerful tool in the hands of organizations that understand its use (Pinto and Kharbanda, 1995, p. 18).

The techniques described here may be applied in any project-based organization. The following scenario illustrates the ability of a formal project management methodology to enhance organization wide quality efforts.

Bill Williams, manager of the Power Systems plant in Marion, Illinois, received a telephone call from Ivor Kaney, vice-president of marketing at divisional headquarters. Ivor inquired if Bill wanted to bid on a new product that could more than double the annual sales at the plant from $9.5 million to $20.6 million. The new product, called rocket aerial target system (RATS), was an expendable, low-cost, rocket-propelled, aerial target that would be shot down on US military gunnery ranges by heat seeking missiles. The project would require putting together a technical proposal, submitting a budget proposal, building ten prototype rockets and flying three rockets for the US Army. And all of this had to be accomplished in 4.5 months. After a meeting with the division's marketing staff and US Army representatives, Bill decided to put together a project team at his plant to respond to the proposal and development project. Bill appointed to the project team some of his best personnel from various departments at the plant, enlisting a project manager, a flight engineer, a safety and security officer and a cost analyst. The project members were assigned to the team for the duration of the project, which was expected to take no longer than five months. Reporting directly to the plant manager, the project manager was responsible for the performance of the team including staying within budgets, meeting timetables and successfully carrying out the objectives of the project team. The team's function included not only expeditiously developing but also executing a plan of activities for accomplishing the project.

The above scenario is performed repeatedly in service industries throughout the world. How does this process of project management help support QM initiatives in the company? Furthermore, how can the project management process itself apply the fundamentals of quality? In answering these questions it is appropriate to integrate the two fields retaining the definitions of quality, the concepts espoused by the quality philosophy and the underlying goals of project management.

An integrated view

Consider that the basic flow of activities comprising a project are similar from project to project – even though the purpose, time-line and deliverables will vary by individual project. Projects generally follow the same life cycle, particularly within an application area (e.g. construction, product development and military procurement). Often, organizations provide template project plans as starting points for project teams. In this manner, a project management methodology may be viewed as an operational process. As such the vision of QM principles being utilized in PM situations becomes relevant and advantageous.

To manifest this view, consider the three principles of customer focus, teamwork and continuous improvement as "conceptual glasses" (Orwig and Orwig, 1998).

Customer focus

Dean and Bowen (1994, p. 394) suggest that customer satisfaction is the crucial requirement for long-term organizational success and that achieving consistent satisfaction requires concentration on customers' needs from the entire organization. This sentiment is echoed by Grant *et al.* (1994, p. 31), who state that QM "view(s) long-term profitability as an outcome of serving customers rather than a driving force". In his theoretical framework, Hardie (1998) discloses that whether quality is defined as "conformance to requirements" or "superiority to competitors", good quality will have a positive impact on customer satisfaction, which should lead to increased market share.

Many organizations have the ability to "lock in" on customer specifications, focusing on the customers' project requirements rather than determining customers' needs and expectations (Barkley and Saylor, 1994). If customer satisfaction is defined as a ratio of expectations to deliverables, then it becomes obvious that project teams must address both areas.

The statement of work (SOW) is a description of the project developed by the project team and approved by the customer (and/or the project sponsor). In one or two pages it describes the purpose of the project, its scope and measures of success. Stakeholders are identified. Assumptions and constraints are highlighted. Often, elements of this document are contained in project charters or procurement paperwork, but it is worthwhile to consolidate the information into one easy reference. By creating a SOW as a project team and validating it with the customer, the project manager is encouraging customer focus (and managing customer expectations). The statement of work elements is defined as:

(1) *Scope definition*
- What is the work to be done?
- What is the end point of the project?

(2) *Objectives*
- What is the overriding purpose of the project?
- What are secondary expected benefits?

(3) *Stakeholders*
- Who has an interest in the outcome of the project?
- Who should be kept informed of its progress?

(4) *Assumptions*
- What are the constraints and expectations at the onset of the project?
- What choices must be established before proceeding?

(5) *Issues*
- What intervention is needed to safeguard the project's progress?
- What possible pitfalls are anticipated?

It is important to sustain the focus on the customer throughout the project. Another potentially valuable tool for customer focus is the project's communication plan (CP). The CP identifies who should be kept informed, in what manner and on what frequency. As part of a project's ongoing communications, status reports should describe accomplishments, plans and issues on a regular basis. This maintains open communication channels and manages the customers' expectations as the project progresses. Communication plan elements are shown below:

(1) *Information collection*
- What information is to be collected?
- From whom? By whom?
- At what frequency? In what manner?

(2) *Information distribution*
- What information is to be distributed?
- To whom? By whom?
- At what frequency? In what manner?

(3) *Information management*
- Where and how will project communications be stored?
- Who will be responsible for the maintenance of communications records?

- Who will serve as the focal point(s) for communication on the project team?
- Who will serve as the focal point(s) for communication for the customer?

Open, clear and consistent communications also lay the foundation for strong teamwork.

Teamwork

QM's emphasis on teamwork among unlikely collaborators has profoundly impacted operations management:

> Teamwork [is the] collaboration between managers and non-managers, between functions and between customers and suppliers . . . The first type of teamwork is based on the familiar assumption that non-managerial employees can make important contributions to organizations when they have the power and necessary preparation. Teamwork among functions is based on the notion that organizations as systems cannot be effective if subunits emphasize their own outcomes over those of others. The principle of teamwork with customers and suppliers is based on the perceived benefits (e.g. synergy, loyalty) of partnerships (Dean and Bowen, 1994, p. 395).

These types of collaboration are common in project-based organizations. Cleland (1994, p. 73) suggests that a project consists of a combination of organizational resources pulled together on an *ad hoc* basis and serves to "bring a wide range of experiences and viewpoints into focus [as well as] promote participative and professional management". In fact, project organizational units are often described as "teams", drawing team members from various areas within and outside of the organization.

Creating a team and having teamwork (i.e. team building) are not necessarily synonymous, however. Anderson *et al.* (1994, pp. 480-1) suggest that the:

> . . . creation of a cooperative and learning organization facilitate[s] the implementation of process management practices, which when implemented, support customer satisfaction and organizational survival through continuous improvement of practices, products and services.

The extent to which a project manager fosters teamwork, then, impacts the achievement of customer satisfaction and continuous improvement.

The literature on team building is overwhelming. In the context of a project, specific PM techniques allow a project manager to lay the groundwork for productive collaboration, by developing a common view of the project and engendering accountability for the work to be done.

Creating the SOW as a group is an excellent start. The process opens the communication channels, establishes a vision of the project's goals and identifies the potential issues. Similarly, defining the project's work breakdown structure (WBS) as a group may also be considered a team-building exercise. The WBS (see Figure 2) is a systematic approach to defining the work to be accomplished in distinct work packages. Developing a collective view of the work in this manner clarifies roles and responsibilities on the project team.

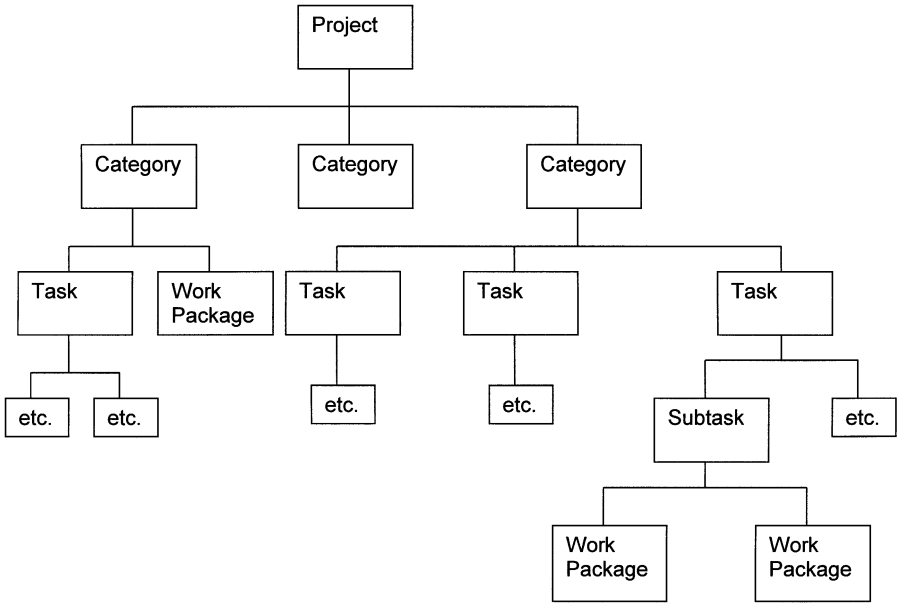


Figure 2.
Work breakdown structure

The WBS is then the basis for creating a networked schedule of activities. The network explicitly identifies the dependencies among the work packages as well as their durations. Again, this encourages teamwork by highlighting interdependencies and responsibilities within the team.

Changes in the status of the project necessitates regular updating of the network. Network schedules are indispensable in conveying the impact of changes and issues on the team's workflow. They support the notion of internal customers, i.e. the next person in the process (or on the schedule), by communicating the scope of changes on the schedules of others. Network schedules afford excellent documentation of a project's progression and provide a useful input for continuous improvement efforts (see Figure 3).

Continuous improvement

On the surface, PM appears to be in conflict with the principle of continuous improvement, since a project is temporary and its results are unique. Because

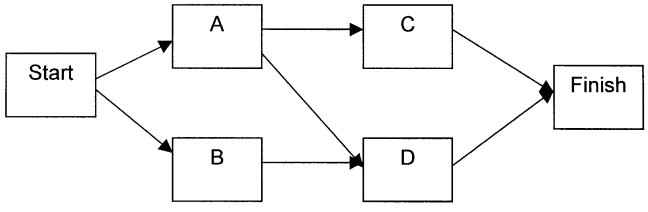


Figure 3.
Network schedule schematic

projects are temporary, measurement and reward systems for project managers tend to be based on short-term measurements of schedule, cost and technical performance (Tippet and Waits, 1994, p. 13). This short-term focus can undermine the long-term emphasis of QM on continuous improvement. In addition, because projects produce unique results, by definition continuous improvement of a singular effort is impossible. Again, it is only when project management is considered an ongoing process in an organization that it becomes obvious that continuous improvement is not only possible, but highly recommended:

> In the design of any system, such as a planning system, the process that people go through is just as valuable as the output ... Another valuable "product" of the planning process is the learning, both individual and collective, enjoyed by the people working together on a project team (Cleland, 1994, p. 422).

However, few professional services firms have any systematic program for ensuring and improving the experience the customer has with the firm (Maister, 1993, p. 82). Assessment identifies where improvement is needed and therefore becomes the foundation of continuous improvement. At the very least, organizations should conduct project debriefings, analysing the projects' performance against planned results. Too often, projects (and project teams) disassemble without orderly closure. Candidly answering a series of questions about what went right (and wrong) and why is a good starting point for assessment.

Project debriefings must be candid to be meaningful. This information should be shared broadly, without recriminations. These debriefing assessments may trigger action items for PM methodology improvements. Project debriefing questions are listed below:

(1) *Project performance against objectives*

- Was the primary objective met? If not, why not?
- Were the secondary benefits accomplished? If not, why not?
- Did the objectives change during the project? How? Why?

(2) *Project performance against schedule and budget*

- Did the project produce the desired deliverables? If not, why not?
- Did the project finish on time? If not, why not?
- Did the project finish within budget? If not, why not?

(3) *Process performance*

- What aspects of the project went well? Why?
- What aspects of the project could have gone better? How?
- In hindsight, what could have been done differently to improve the work?

- What was learned from this project that could be applied to future efforts?
- What skills or experience were gained by project team members?

Ideally, this information – as well as other project documents – would be retained in a project archive, a form of organizational memory. This will extend the usefulness of the assessment and provide a longer-lasting basis for continuous improvement. For example, network schedules may be used as templates for future project planning. Making this kind of information accessible to project managers at a later date greatly extends its usefulness and value by reducing the cost of learning for new project teams (Nevison, 1994).

For project-based organizations, a project management office (PMO) is an organizational entity which serves as a focal point to develop and leverage project management competencies. Establishing a PMO is one way a company can formalize its project management methodology (Bates, 1998) and therefore stabilize its process as a starting point for continuous improvement. The PMO could facilitate project debriefings, develop project templates and maintain project archives. It could also serve as the contact point for customer surveys, using customer feedback as a basis for continuous improvement (and reinforcing the organization's focus on the customer). As such it may establish a service-quality information system (Berry and Parasuraman, 1997). The PMO may also function as the clearinghouse for peer review of project deliverables (Chase and Stewart, 1994). Clearly, a PMO can furnish a project-based organization the structural support and leadership needed to institutionalize systematic approaches to continuous improvement.

Conclusion

This imaginary line between projects and operations is reinforced by the different techniques used to instill quality in the work undertaken. Projects tend to use qualitative approaches such as benchmarking and flowcharting, where operations use more quantitative, data intensive approaches such as statistical process control. Fundamentally, though, both disciplines are supported by the same principles of customer focus, teamwork and continuous improvement.

So, for a project-based organization, such as a professional services firm, formal project management *is* quality management. And quality management fundamentals applied to the project-based organization is good business.

References

Anderson, J.C., Rungtusanatham, M. and Schroeder, R.G. (1994), "A theory of quality management underlying the Deming management method", *Academy of Management Review*, Vol. 19 No. 3, pp. 472-509.

Barkley, B. and Saylor, J. (1994), *Customer-Driven Project Management*, McGraw-Hill, New York, NY.

Bates, W. (1998), "Improving project management", *IIE Solutions*, Vol. 30 No. 10, pp. 42-3.

Berry, L. and Parasuraman, A. (1997), "Listening to the customer – the concept of a service-quality information system", *Sloan Management Review*, Vol. 38 No. 3, pp. 65-76.

Chang, A.S. and Ibbs, C.W. (1998), "Development of consultant performance measures for design projects", *Project Management Journal*, June, pp. 39-54.

Chase, R.B. and Stewart, D.M. (1994), "Make your service fail-safe", *Sloan Management Review*, Vol. 35 No. 4, pp. 35-44.

Cleland, D. (1994), *Project Management: Strategic Design and Implementation*, 2nd ed., McGraw-Hill, New York, NY.

Dean, J.W. Jr and Bowen, D.E. (1994), "Management theory and total quality: improving research and practice through theory development", *Academy of Management Review*, July, pp. 392-418.

Fisher, T. (1992), "The impact of quality management on productivity", *Asia-Pacific Journal of Quality Management*, Vol. 1 No. 1, pp. 44-52.

Gopalakrishnan, M. and Waldman, D.A. (1996), "Operational, organizational and human resource factors predictive of customer perceptions of service quality", *Journal of Quality Management*, Vol. 1 No. 1, pp. 91-107.

Grant, R., Shani, R. and Krishnan, R. (1994), "TQM's challenge to management theory and practice", *Sloan Management Review*, Vol. 35 No. 2, pp. 25-35.

Gupta, A. and Chen, I. (1995), "Service quality: implications for management development", *International Journal of Quality and Reliability Management*, Vol. 12 No. 7, pp. 28-35.

Gupta, V.K. and Graham, D.J. (1997), "A customer-driven quality improvement and management project at Diamond Offshore Drilling", *Project Management Journal*, September, pp. 22-8.

Heizer and Render, B. (1999), *Operations Management*, 5th ed., Irwin, Burr Ridge, IL.

Hardie, N. (1998), "The effects of quality on business performance", *Quality Management Journal*, Vol. 5 No. 3, pp. 65-83.

International Organization for Standardization (1988), *Quality – Vocabulary (Draft International Standard 8402)*, ISO Press, Geneva.

Jauch, L. and Orwig, R.A. (1997), "A violation of assumptions: why TQM won't work in the ivory tower", *Journal of Quality Management,* Vol. 2 No. 2, pp. 279-92.

Juran, J.M. (1988), *Juran on Planning for Quality*, The Free Press, New York, NY.

Kerzner, H. (1992), *Project Management: A Systems Approach to Planning, Scheduling and Controlling*, Van Nostrand, New York, NY.

Lemak, D.J., Montgomery, J.C. and Reed, R. (1996), "Beyond process: TQM content and firm performance", *Academy of Management Review*, Vol. 21 No. 1, pp. 173-202.

Maister, D. (1993), *Managing the Professional Service Firm*, The Free Press, New York, NY.

Milosevic, D. and Daim, T. (1997), "Management of quality improvement: an empirical study", *Engineering Management Journal*, Vol. 9 No. 1, pp. 17-23.

Nevison, J. (1994), "Up to speed: the cost of learning on a white-collar project", *Project Management Journal*, June, pp. 45-9.

Project Management Institute (1996), *A Guide to the Project Management Body of Knowledge*, PMI, Upper Darby, PA.

Orwig, R. and Orwig, L. (1998), "Addicted to quality", *Journal of Ministry Marketing & Management*, Vol. 4 No. 1, 1998, pp. 13-23.

Pinto, J. and Kharbanda, O. (1995), "Lessons for an accidental profession", *Business Horizons*, March-April, pp. 18-27.

Ryser, R. (1996), "Project evaluation parameters", available at: http://207.91.150.63/pep.htm (accessed 20 January 1999).

Schnemmer, R. (1986), "How can service business survive and prosper?", *Sloan Management Review*, Spring, pp. 21-32.

Shenhar, A.J., Levy, O. and Dvir, D. (1997), "Mapping the dimensions of project success", *Project Management Journal*, June, pp. 5-13.

Sink, S. (1998), "The IE as change master", *IIE Solutions*, Vol. 30 No. 10, pp. 36-41.

Skinner, W. (1986), "The productivity paradox", *Harvard Business Review*, Vol. 64 No. 4, pp. 55-9.

Tippet, D.D. and Waits, D.A. (1994), "Project management and TQM: why aren't project managers coming on board?", *Industrial Management*, Vol. 36 No. 5, pp. 12-15.

Van der Wiele, T. and Brown, A. (1998), "Venturing down the TQM path for SMEs".

Available online at www.sciencedirect.com
SCIENCE DIRECT
Technovation 26 (2006) 716–722
technovation
www.elsevier.com/locate/technovation

Relationship between total quality management (TQM) and continuous improvement of international project management (CIIPM)

Joo Y. Jung *, Yong Jian Wang [1]

Department of Management, Marketing and International Business, College of Business Administration, The University of Texas-Pan American, 1201 West University Drive, Edinburg, TX 78539-2999, USA

Abstract

The purpose of this study is to investigate the relationship between the total quality management (TQM) practice and the continuous improvement of international project management (CIIPM) practice. Based on a literature review and qualitative interviews with TQM and project management experts, four hypotheses are posed on how TQM elements affect CIIPM. A cross-sectional survey collected from over 100 mid to senior level international managers is used to validate these hypotheses. The study suggests that the relationship between 'soft' TQM elements and CIIPM is more significant than the relationship between 'hard' TQM elements and CIIPM.
© 2006 Elsevier Ltd. All rights reserved.

Keywords: Total quality management; Continuous improvement; Project management

1. Introduction

In the midst of rapidly changing globalization, dynamic changes are taking places at the organization strategy level. Organizations are paying more attention towards optimizing their management practices. Not all organizations can choose and implement the same set of management practices that are successful elsewhere. The ability to identify what is changing in the environment and respond proactively through continuous improvement efforts has been viewed as a key element needed for organizational success (Brown and Eisenhardt, 2000; Hamel, 2000). One form of operations management practices is total quality management (TQM), which has received a growing amount of attention in the last two decades. Thus far, mixed results on outcomes of TQM implementations have been reported: the relationship of the TQM practice is positively associated with operational performance measures (Choi and Eboch, 1998); and the implementation of the TQM practices marginally affects actual improvement of organizational performance (Broetzmann et al., 1995).

Another type of management practice that has been receiving a burgeoning amount of usage and research in the last decade is project management. An increasing number of organizations are selecting project management as a means to achieve their strategic objectives (Kerzner, 2003). Project management provides the ability to plan, execute and control activities in a systematic way (Meredith and Mantel, 2003). Generally accepted project management standards, such as the guide to the Project Management Body of Knowledge (PMBOK), encourages making continuous improvement to project management practices (PMI, 2000). There have been ranges of studies performed on the relationship between project management elements and project success; there also have been various studies performed on the relationship between TQM elements and firm's success. However, there is a wide range of organizations that have implemented both kinds of management practices and the relationship between TQM elements and continuous improvement aspects of project management is an important area worthy of further investigation. The goal of this research is to investigate how different TQM elements are related to the continuous improvement aspect of international project management, collectively and individually.

This paper is organized as follows. Following this introduction, Section 2 presents a pertinent literature review on total quality management practices and continuous improvement of international project management. A research model and related hypotheses are offered based on the literature review and expert interviews. Section 3 describes the research methodology including the instrument, survey procedure, and validity and reliability tests of the constructs.

* Corresponding author. Tel.: +1 956 292 7460; fax: +1 956 384 5065.
E-mail addresses: joojung@panam.edu (J.Y. Jung), ywang@panam.edu (Y.J. Wang).
[1] Tel.: +1 956 533 4737; fax: +1 956 384 5065.

0166-4972/$ - see front matter © 2006 Elsevier Ltd. All rights reserved.
doi:10.1016/j.technovation.2006.01.003

Section 4 presents the analysis of results. Section 5 presents the implications of the results and the findings. Section 6 concludes this study with further research implications.

2. Theoretical background

2.1. Continuous improvement of international project management (CIIPM)

A growing number of organizations are adopting project management as part of their management practices. The typical goal of project management is to execute the project within a targeted budget, schedule and performance. Academicians and practitioners have studied how various management elements influence project management success. Tatikonda and Rosenthal (2000) studied how various degrees of flexibility and formal control methods exerted over project execution influence project success. Pinto and Prescott (1988) pointed out how personnel factors can be only marginal variables in project management success. The challenge of targeting only those factors that generate value to the business was studied by Holland and Kumar (1995). Zammuto and O'Connor (1992) described how organizational culture, in terms of flexibility verses control, can influence the overall effectiveness of project management. Belout and Gauvreau's (2004) study described how multiple factors such as organizational structure, life cycle stage of business scope, and top management support, all influence project management success as a total entity. As organizations gain more project management maturity, making continuous improvements to project management has to appear as a new avenue towards achieving improved results. Implementing continuous improvement in project management is essential for the success of international organizations (Meredith and Mantel, 2003).

2.2. Total quality management (TQM) practice

TQM can be defined as a holistic management philosophy which strives for continuous organizational improvement (Kaynak, 2003). One of the early research works of defining what elements constitute the TQM practice in measurement study was conducted by Saraph et al. (1989). Since then numerous versions of related studies were conducted by authors including Flynn et al. (1994); Black and Porter (1996); Choi and Eboch (1998), Samson and Terziovski (1999), and Kaynak (2003). Although different versions of previous studies included largely similar TQM elements as the input and various performance measures as the output, mixed results have been reported. The introduction of the Malcolm Baldrige National Quality Award (MBNQA) framework in 1995 has narrowed the number of disputes on what elements constitute TQM practices. Since then, numerous researchers have based their frameworks on the MBNQA framework: leadership, strategy and planning, customer focus, information and analysis, people management, and process management. Samson and Terziovski took a practical approach of determining which elements of TQM practices are more strongly related to operational success (1999). This study adopts classifications similar to those of Saraph et al. (1989); Black and Porter (1996) as a starting point. Further, some elements of TQM practice were modified based on more recent literature reviews, qualitative pre-survey interviews with TQM practitioners, and a pilot test utilizing data collected from three corporations. The list of revised TQM elements is tabulated in Appendix A. The background of revised TQM elements is explained in the following sections.

2.2.1. Leadership

The well-known quality pioneers (Deming, 1986; Juran, 1986) have pointed out how top management leadership, which can be considered as the most influential TQM element, affects other elements of the organization (Anderson et al., 1995; Flynn et al., 1995; cf. Kaynak, 2003). Top management's commitment to quality reflected in organization strategy is instrumental for changing organizational culture in order to implement TQM practices (Hamlin et al., 1997; Ho et al., 1999; cf. Kaynak, 2003). TQM can be part of the organization's strategy to reflect the organizational mission and keep future strategies in line with the objectively chosen goals (Juran, 1989). Consequently, we propose the following hypothesis:

H1: Leadership is positively and significantly related to CIIPM.

2.2.2. Employee relations

Employee relations, including empowerment in decision making, proper recognition and compensation, and teamwork, are asserted to impact the firm's performances (Ho et al., 1999, 2001). Empowering and involving all employees in making continuous improvement is essential; under such conditions, employees work harder and participate more in the change process (Flynn et al., 1995; Handfield et al., 1998; cf. Kaynak, 2003). As employee empowerment and involvement is encouraged, clear open communication of organizational strategy and quality-based incentive procedures can enhance the process (Bonito, 1990; cf. Kaynak, 2003). Management must ensure that an organization-wide training program is available in order to equip employees with the proper skills (Anderson et al., 1995; Flynn et al., 1995; cf. Kaynak, 2003). In order to participate in quality management practice, employees must be adequately trained in total quality management techniques (Ho et al., 1999; cf. Kaynak, 2003). Thus, we propose the following hypothesis:

H2: Employee relations are positively and significantly related to CIIPM.

2.2.3. Customer/supplier relations

Customer relationship management focuses on meeting and exceeding customers' expectations, resulting in customer satisfaction. Dissemination of customer-related information through the organization (e.g. customer complaint resolution) enables effective relationship management. Employee empowerment and involvement through increased access to

information and resources so that employees can make timely and more responsive decisions to customers can have a positive impact towards customer relations (Ahire et al., 1996). Long-term based cooperative relationships with fewer suppliers (e.g. supplier partnership) are key elements that are sought as part of the TQM (cf. Kaynak, 2003; Trent and Monczka, 1999). Thus, we propose the following hypothesis:

H3: Customer/supplier relations are positively and significantly related to CIIPM.

2.2.4. Product/process management

From the TQM perspective, product management and process management go hand in hand in terms of both elements being a 'hard aspect (e.g. more technical)' of TQM. Therefore, they were combined here as one construct. Enhancement made in product design (e.g. standardization) enhances process design (Ahire and Dreyfus, 2000). Enhancement made in process design (e.g. concurrent engineering) enhances product design (Ahire and Dreyfus, 2000; cf. Kaynak, 2003). The use of quality data and reporting system enables organizational improvement based on scientific statistical methods (Choi, 1995; cf. Kaynak, 2003). The existence of accurate and timely quality data is a prerequisite to product design (Ahire and Dreyfus, 2000; cf. Kaynak, 2003) and process design (Ahire and O'Shaughnessy, 1998; cf. Kaynak, 2003). Thus, we propose the following hypothesis:

H4: Product/process management is positively and significantly related to CIIPM.

2.3. Hypothetical model

The hypotheses presented in the previous section lead us to a theoretical model described in Fig. 1. TQM elements are factored into the four constructs of leadership, employee relations, customer/supplier relations and product/process management. The relationship between each construct to CIIPM was hypothesized.

3. Research methodology

The data for this research were drawn from a cross-sectional survey collected from companies that have implemented both TQM and project management practices to various degrees. All companies surveyed are involved in international project management. Construction of the instrument, survey procedure, validity and reliability tests of the constructs are described in the following sections.

3.1. Instrument construction

Several data collection methods such as survey questionnaire, expert interviews and review meetings were utilized. As such, richer contextual information can be obtained from the participants (Narasimhan and Jayaram, 1998). The target population of the survey study was managerial employees who have been involved with TQM and project management practices to some degrees. A list of companies that are involved with international projects conducted between the US and three Far Eastern countries (Korea, China and Japan) was assembled. Based on the literature review and expert interviews, the preliminary survey questionnaire was developed. The initial survey form included 12 demographic questions, 18 TQM related questions and 4 CIIPM related questions. The survey questionnaire was intentionally kept simple by employing a 5-point Likert-type scale for TQM related questions and CIIPM related questions. The survey questions were then refined to 14 TQM related and 3 CIIPM related questions through a series of reviews by several managers who had extensive background in TQM and international project management. A pilot test, utilizing data collected from three companies, showed high validity and reliability of the TQM constructs and CIIPM construct by these refined variables. Another review of questionnaires took place for identifying any language ambiguities and omission of variables. The final version of questionnaire, which includes 14 TQM variables and 3 CIIPM variables, is included in Appendix A.

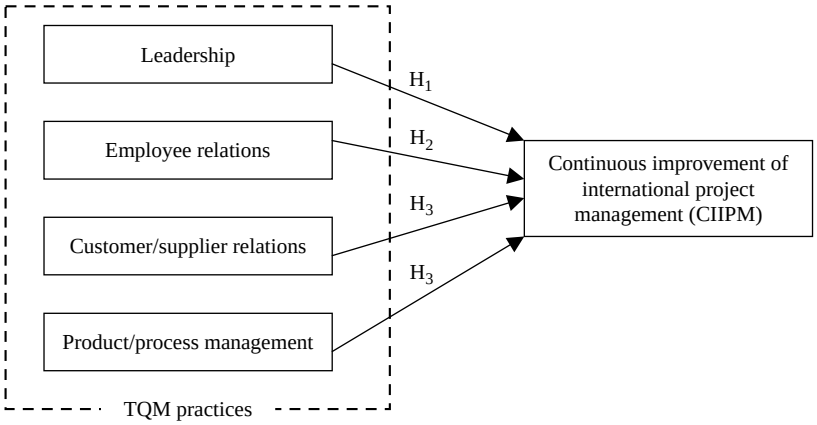


Fig. 1. The conceptual framework of the relationships between TQM elements and CIIPM.

3.2. Sample

With the target population of international managers with TQM and project management experiences, a list of companies involved in international project management was acquired from the American Chamber of Commerce membership directories. The survey questionnaires were sent to 500 randomly selected mid to senior level personnel with a request for academic cooperation and a brief explanation of the research. A total of 57 surveys were returned due to invalid addresses, and 137 usable responses with a response rate of 30.9 percent within a two-month period. This response-rate is consistent with other studies performed on similar subjects.

About 91 percent of respondents were from firms with more than 250 employees. About 95 percent of the respondents have been involved in continuous improvement projects where the typical project duration was between six months and one year. Demographics show that 17 percent of respondents were less than 30 years old, 27 percent in the 31–40 age range, 32 percent in the 41–50 age range, and 24 percent were over 50. The actual respondents' titles varied among organizations, but most of them were in managerial levels (e.g. managing director, project manager, engineering manager, etc.).

A telephone survey of 50 non-respondents was conducted. These non-respondents were asked the questions from the questionnaire. No significant response bias was detected by using the Chi-square test.

3.3. Validity and reliability tests of constructs

In order to evaluate whether the designed model measures the theoretical construct of TQM, factor analysis was used to investigate the composite dimensions on the basis of the 14 TQM related variables. The correlation matrix of the 14 variables reveals that 59 of the 81 correlations (72.8 percent) are significant at the 0.01 level, thus ensuring that the data matrix has sufficient correlations to justify the application of factor analysis (Hair et al., 1998). The Bartlett test of sphericity shows overall significance of the correlation matrix at the 0.000 level. In the meantime, the overall MSA shows a value of 0.885, which far exceeds the threshold of 0.50 suggested by Hair et al. (1998). These two measures indicate that the 14 variables are appropriate for the factor analysis. Principal components extraction with varimax rotation was employed. The Kaiser criterion (eigenvalue >1) was employed in conjunction with evaluation of scree plots. Factor analysis results are tabulated in Table 1.

The scree test indicates that only four factors should be considered. The extraction of the component factors resulted in four factors with eigenvalues of 4.511 (employee relations), 1.932 (leadership), 1.524 (product/process management) and 1.166 (customer/supplier relations). Each of the 14 variables has a loading above 0.70 on one of the four TQM element constructs that it was designed to measure. Since all the loadings exceed the cutoff point of 0.50 for a sample size of 110 at the 0.05 level, the loadings can be considered as both statistically and practically significant (Hair et al., 1998). As a whole, the four factors account for 56.8 percent of the total variance of TQM. Results of the factor analysis indicate a high level of construct validity of the measure.

As shown in Table 1, Cronbach's alpha values of the four TQM element constructs all exceed the 0.70 standard of reliability for survey instruments (Hair et al., 1998). This indicates that the four multi-item constructs are achieving high internal consistency reliability by using these 14 variables. Based on factor analysis, the initial 14 variables are now factored on to 4 TQM element constructs.

In our questionnaire, the CIIPM construct consisted of three variables as shown in Appendix A. The results of the factor analysis for the CIIPM construct are shown in Table 2. Factor loadings of the three variables are all higher than the suggested value of 0.50 on a single construct. Further, the Cronbach's alpha value for the construct exceeds the suggested threshold of 0.70, indicating high internal consistency reliability for these 3 elements to form the CIIPM construct. The bivariate correlations of the TQM and the CIIPM constructs are tabulated in Table 3. The four TQM elements are significantly correlated with the CIIPM.

Table 1
Factor analysis: TQM constructs

Variables	Constructs	Factor loadings	Internal consistency reliability
Top management commitment	Leadership	0.622	$\alpha=0.736$
Vision and strategy		0.765	
Organizational quality culture		0.604	
Objectives for quality performance		0.553	
Customer relationship management	Customer/supplier relations	0.643	$\alpha=0.732$
Supplier partnership		0.631	
Customer/supplier involvement		0.547	
Employee empowerment/involvement	Employee relations	0.829	$\alpha=0.835$
Human resource issues		0.795	
Open and transparent communication		0.780	
Existence of organization-wide training		0.764	
Availability and use of quality data	Product/process management	0.843	$\alpha=0.718$
Employee evaluation based on quality		0.576	
Use of quality improvement measurement system		0.654	

Table 2
Factor analysis: CIIPM construct

Variables	Construct	Factor loadings	Internal consistency reliability
Small improvement by discipline	Continuous improvement of international project management	0.622	$\alpha = 0.763$
Reduction of waste		0.666	
Employee creativity		0.805	

4. Results

Multiple regression analysis is used to investigate the relationship between the dependent variable (CIIPM) and the four independent variables (TQM elements) which resulted from the factor analysis. The multiple regression method is an appropriate technique in analyzing the relationship between a single dependent variable and several independent variables with an objective of explaining the single dependent value defined using independent variables whose values are known (Hair et al., 1998). The underlying assumption of multiple regression analysis, which applies to relationship between each variable and all variables as a whole, was assessed before the analysis. The assumption was met in terms of relationship linearity, homoscedasticity, error term independence and error term distribution normality. This ensures the confidence of the interpretations and predictions from the results of multiple regression analysis.

All the four TQM elements are included in the model as independent variables in order to examine the relationship between the dependent variable and four independent variables. The overall model using simultaneous estimation show high statistical significance ($p = 0.000$). The beta coefficient, which is the standardized regression coefficient, is used as a direct comparison between coefficients as to their relative explanatory power of the dependent variable (Hair et al., 1998). The results of multiple regression analysis, including the standardized beta coefficients and the coefficient of determination, are tabulated in Table 4.

Table 3
Bivariate correlation matrix of independent and dependent variable construct factor scores

	Leadership	Customer/ supplier relations	Employee relations	Product/process management
Independent				
Leadership	1.000			
Customer/ supplier relations	0.354[a]	1.000		
Employee relations	0.583[a]	0.428[a]	1.000	
Product/process management	0.362[a]	0.561[a]	0.396[a]	1.000
Dependent				
Continuous improvement of project management (CIIPM)	0.432[a]	0.318[a]	0.562[a]	0.329[a]

[a] Correlation is significant at the 0.01 level (one-tailed).

Table 4
Multiple regression analysis

Analysis of variance

	Sum of squares	df	Mean square	F	Significance
Regression	43.831	4	10.958	21.661	0.000
Residual	24.282	48	0.506		
Total	68.113	52			

Standardized coefficients Independent variables	Beta	t	Significance	Collinearity statistics Tolerance	VIF
Leadership	0.214	1.887	0.025	0.578	1.731
Employee relations	0.552	4.551	0.000	0.505	1.979
Customer/supplier relations	0.124	0.991	0.327	0.476	2.100
Product/process management	0.041	0.344	0.732	0.515	1.943

Coefficient of determination

Dependent variable	Multiple R	R^2	Adjusted R^2	Standard error
Continuous improvement of project management	0.802	0.644	0.614	0.711

As shown in the correlation matrix (Table 3), the four independent variables (TQM elements) are significantly correlated. There clearly exists some multicollinearity among them, which suggests that an organization that is advanced in one TQM element tends to be also advanced on other TQM elements. The effect of multicollinearity needs to be taken into account for the process of model estimation and interpretation, because multicollinearity can have substantive effects on the estimation of the regression coefficients and their statistical significance tests (Hair et al., 1998). The effect of multicollinearity was assessed by reviewing the tolerance/VIF value of each independent variable. All the values far exceed the suggested cutoff threshold of 0.10 (Hair et al., 1998). Therefore, each of the four selected independent variables included in the regression has proficient amount of variability not explained by the other independent variables, and the multicollinearity effect to the model is in an acceptable extent.

5. Discussion of results

The results show that the independent variable 'employee relations' has the greatest influence towards achieving continuous improvement of international project management (dependent variable) with a beta coefficient of 0.552, which explains 30.5 percent of the variance of the dependent variable ($p = 0.000$). Therefore, H2 is supported. With a beta coefficient of 0.214, the variable 'leadership' has the second largest influence on the dependent variable ($p = 0.025$). Subsequently, H1 is also supported. The results reveal that 'customer/supplier relations' (beta coefficient = 0.124) and 'product/process management' (beta coefficient = 0.041) have less explanatory power of the dependent variable. Also, these regression

coefficients are not significant. Therefore, customer/supplier relations and product/process management are positively related to CIIPM, but the relationships are not significant. Subsequently, H3 and H4 are only partly supported.

The results suggest that the 'employee relations' factor (consisting of employee empowerment/involvement, human resource issues, open and transparent communication, and existence of organization-wide training and development) has the largest impact towards achieving CIIPM. The 'leadership' factor (consisted of top management commitment to quality, existence of vision and strategy, existence of organization-wide quality culture, existence of objectives for quality performance) is the second significant factor out of four factors. These two factors are characterized as the 'soft TQM' by Bullock and Rahman (2005). The other two factors, 'product/process management' and 'customer/supplier relations' in our classification, and characterized as the 'hard TQM' by Bullock and Rahman (2005) seem to make considerably less contribution towards achieving CIIPM. This is consistent with Samson and Terziovski (1999)'s study where they found no significant relationship between 'hard TQM' elements and firm's performance.

The four independent variables together explain 64.4 percent of the variance of the dependent variable, CIIPM. It reveals that the regression variate that consists of the four independent variables (TQM elements) has a high explanatory power in explaining the dependent variable (CIIPM).

6. Conclusions and further research recommendation

This research investigated the relationship between the TQM practice and the continuous improvement aspect of international project management (CIIPM). The major finding of this study is that 'soft' TQM elements have more significant and positive relationships with the CIIPM, when compared to 'hard' TQM elements. The study suggests that employee relation's elements are the most contributing elements towards achieving CIIPM. Investment made in employee training and development, efficient communication mechanisms, employee work environment flexibility and safety, and employee satisfaction, can make a significant contribution to CIIPM. The study also suggests that leadership makes the second largest impact towards CIIPM. Management's leadership in commitment to quality through vision and strategy, organization-wide quality culture, and objectives for quality performance, will facilitate CIIPM. Often classified as the 'hard' TQM elements, 'customer/supplier relations' and 'product/process management' seem to make less of a contribution towards achieving CIIPM. This is not suggesting that 'hard' TQM elements are not useful, but their direct contribution is less than that of 'soft' TQM elements.

The validity and reliability of our TQM and CIIPM constructs are high, but still subject to improvement. Further empirical research may be conducted on redefining the TQM elements by a more refined method. The survey data for this study was collected only for one aspect of international project management performance. Future research work can be conducted on how TQM elements affect the international project management performance in a broader spectrum (e.g. financial, schedule, etc.).

Appendix A. List of measurement indicators included in the survey

A.1. Total quality management

A.1.1. Leadership

Top management commitment to quality
Existence of vision and strategy
Existence of organization-wide quality culture
Existence of objectives for quality performance

A.1.2. Customer/supplier relations

Customer relationships management
Supplier partnership management
Customer/supplier involvement

A.1.3. Employee relations

Employee empowerment/involvement
Human resource issues
Open and transparent communication
Existence of organization-wide training

A.1.4. Product/process management

Availability and use of quality data
Part of employee evaluation based on quality
Use of quality improvement measurement system

A.2. Continuous improvement of international project management

Small improvement by discipline
Reduction of waste
Employee creativity

References

Ahire, S.L., O'Shaughnessy, K.C., 1998. The role of top management commitment in quality management: an empirical analysis of the auto parts industry. International Journal of Quality Science 3 (1), 5–37.

Ahire, S.L., Dreyfus, P., 2000. The impact of design management and process management on quality: an empirical examination. Journal of Operations Management 18, 549–575.

Ahire, S.L., Golhar, D.Y., Waller, M.A., 1996. Development and validation of TQM implementation constructs. Decision Sciences 27, 23–56.

Anderson, J.C., Rungtusanatham, M., Schroeder, R.G., Devaraj, S., 1995. A path analytic model of a theory of quality management underlying the deeming management method: preliminary empirical findings. Decision Sciences 26, 637–658.

Belout, A., Gauvreau, C., 2004. Factors influencing project success: the impact of human resource management. International Journal of Project Management 22 (1), 1–11.

Black, S.A., Porter, L.J., 1996. Identification of critical factors of TQM. Decision Sciences 27 (1), 1–21.

Bonito, J.G., 1990. Motivating employees for continuous improvement efforts. Part 3. Additional critical success factors. Production and Inventory Management Review and APICS News 10 (8), 32–33.

Broetzmann, S.M., Kemp, J., Rossano, M., Marwaha, J., 1995. Customer satisfaction-lip service or management tool? Managing Service Quality 5, 13–18.

Brown, S., Eisenhardt, K., 2000. Competing on the edge: strategy as a structured chaos. Harvard Business School Press, Boston, USA.

Bullock, P., Rahman, S., 2005. Soft TQM, hard TQM, and organizational performance relationships: an empirical investigation. Omega 33, 73–83.

Choi, T.Y., 1995. Conceptualizing Continuous Improvement: Implications for Organizational Change. Omega 23 (6), 607–624.

Choi, T., Eboch, K., 1998. The TQM paradox: relations among TQM practices, plant performance, and customer satisfaction. Journal of Operations Management 17 (1), 59–75.

Deming, W.E., 1986. Out of crisis. Massachusetts Institute of Technology, Center for Advanced Engineering Study, Cambridge, MA.

Flynn, B.B., Schroeder, R.G., Sakakibara, S., 1994. A framework for quality management research and an associated measurement instrument. Journal of Operations Management 11, 339–366.

Flynn, B.B., Sakakibara, S., Schroeder, R.G., 1995. Relationship between JIT and TQM: practices and performance. Academy of Management Journal 38, 1325–1360.

Hair, J.F., Anderson, R.E., Tatham, R.L., Black, W.C., 1998. Multivariate data analysis. Prentice-Hall, Inc., Upper Saddle River, NJ.

Hamel, G., 2000. Leading the revolution. Harvard Business School Press, Boston, USA.

Hamlin, B., Reidy, M., Stewart, J., 1997. Changing the management culture in one part of the british civil service through visionary leadership and strategically led research based OD interventions. Journal of Applied Management Studies 6 (2), 233–251.

Handfield, R., Ghosh, S., Fawcett, S., 1998. Quality-driven change and its effects on financial performance. Quality Management Journal 5 (3), 13–30.

Ho, D.C.K., Duffy, V.G., Shih, H.M., 1999. An empirical analysis of effective TQM implementation in the Hong Kong electronics manufacturing industry. Human factors and Ergonomics in Manufacturing 9 (1), 1–25.

Ho, D.C.K., Duffy, V.G., Shih, H.M., 2001. Total quality management: an empirical test for mediation effect. International Journal of Production Research 39, 529–548.

Holland, D., Kumar, S., 1995. Getting past the obstacles to successful reengineering. Business Horizons 38 (3), 79–85.

Juran, J.M., 1986. The quality trilogy. Quality Progress 19 (8), 19–24.

Juran, J.M., 1989. Juran on leadership for quality. Free Press, New York.

Kaynak, H., 2003. The relationship between total quality management practices and their effects on firm performance. Journal of Operations Management 21, 405–435.

Kerzner, H., 2003. Strategic planning for a project office. Project Management Journal 34 (2), 13–25.

Meredith, J.R., Mantel, S.J., 2003. Project management a managerial approach. Wiley, New York.

Narasimhan, R., Jayaram, J., 1998. Reengineering service operations: a longitudinal case study. Journal of Operations Management 17 (1), 7–22.

Pinto, J., Prescott, J., 1988. Variations in critical success factors over the stages in the project life cycle. Journal of Management 14 (1), 5–18.

Project Management Institute, 2000. A guide to the project management body of knowledge. Project Management Institute.

Samson, D., Terziovski', M., 1999. The relationship between total quality management practices and operational performance. Journal of Operations Management 17, 393–409.

Saraph, J.V., Benson, P.G., Schroeder, R.G., 1989. An instrument for measuring the critical factors of quality management. Decision Sciences 20 (4), 810–829.

Tatikonda, M., Rosenthal, S., 2000. Successful execution of product development projects: balancing firmness and flexibility in the innovation process. Journal of Operations Management 18 (4), 401–425.

Trent, R.J., Monczka, R.M., 1999. Achieving world-class supplier quality. Total Quality Management 10, 927–938.

Zammuto, R.F., O'Connor, E.J., 1992. Gaining advanced manufacturing technologies' benefits: the roles of organization design and culture. Academy of Management Review 17 (4), 701–728.

Dr Joo Y. Jung is currently assistant professor at the Management, Marketing and International Business Department at the University of Texas-Pan American. He received BS, MS, and PhD in mechanical engineering from the University of Connecticut and MBA from the Duke University. Dr Jung's experience includes 13 years of international project management and quality management with ABB, Westinghouse and LG Electronics.

Mr Yong Jian Wang is a doctoral student at the Management, Marketing and International Business Department at the University of Texas-Pan American.

The current issue and full text archive of this journal is available at
www.emeraldinsight.com/0954-478X.htm

The relationship between total quality management and the focus of project management practices

David James Bryde
School of Management, Faculty of Business and Law, Liverpool John Moores University, Liverpool, UK, and
Lynne Robinson
Berrybridge Housing, Riverside Group, Liverpool, UK

Abstract

Purpose – The purpose of the paper is to explore the influence of a total quality management (TQM) programme on the level of focus in project management practices.

Design/methodology/approach – Prior literature was used to develop a construct indicating the degree of focus on customers, time/cost/quality (iron/golden triangle) and other stakeholders. A questionnaire was mailed to a random selection of UK organizations to obtain data on the degree of focus and on whether a TQM programme existed.

Findings – The results from an analysis of completed questionnaires show that those in organizations with a TQM programme in place are more customer-focused in their project management practices than those in organizations with no TQM programme. No such relationship was found between the level of iron/golden triangle and other stakeholder focus and a TQM programme.

Research limitations/implications – Given the exploratory nature of the research reported in this paper there is the opportunity for further work on larger populations to confirm the generalizability of the findings. Also, this research has highlighted an association between the level of focus of project management practice and the existence of a TQM programme, and this requires further investigation in terms of confirming suggested cause and effect relationships.

Practical implications – The existence of a link between a TQM programme and customer-focused project management practice provides a potential route for those looking to improve project performance through placing a greater emphasis on satisfying the customer. The absence of a link between TQM and a focus on other stakeholders suggest that the elements of TQM that facilitate an increase in customer-focus are not able to overcome the barriers to high levels of stakeholder-focus on project management practice.

Originality/value – The exploratory research in this paper focuses on the link between TQM and an area of operational practices, namely, project management-related, that has received limited attention in prior studies.

Keywords Total quality management, Project management, Project evaluation

Paper type Research paper

Introduction

One focus of project management research has been on establishing the attributes of effective project performance, i.e. the success criteria (Cooke-Davies, 2002) and the factors that facilitate effective project performance, i.e. the critical success factors (CSFs) (Daniel, 1961; Rockart, 1979). Traditionally, project performance had been defined in terms of the "iron/golden" triangle (Atkinson, 1999; Gardiner and Stewart, 2000), which refers to meeting cost, time and quality (technical)-related criteria. The

The TQM Magazine
Vol. 19 No. 1, 2007
pp. 50-61
© Emerald Group Publishing Limited
0954-478X
DOI 10.1108/09544780710720835

iron/golden triangle is still regarded as applicable for measuring project performance, as shown by a recent survey of project managers (White and Fortune, 2002). Project management researchers have explored the factors that influence the emphasis given to the cost, time and quality-related criteria that make up the iron/golden triangle (see Might and Fischer, 1985; Kerzner, 1989; Pinto and Slevin, 1987; Pinto and Prescott, 1990). However, the predominant approach of these studies has tended to be hypothetical, asking the question how project performance criteria ought to be emphasized rather than establishing the factors influencing actual project management (PM) practice (Shenhar *et al.*, 2001). There is a need to investigate influences on the iron/golden triangle that focus on asking the question "what is influencing performance-related decisions in projects?" and the study reported in this paper goes some way to meeting this need by focusing on actual practice in relation to the performance criteria emphasized in project environments

In operations management research there have been studies exploring the links between operational practices and dimensions of organizational performance. Fullerton *et al.* (2003) reported the impact of just-in-time practices on performance and McKone *et al.* (2001) considered the effect on performance of introducing a total productive maintenance approach. There has been limited research specifically focused on project environments, though a study by Tukel and Rom (2001) investigated the link between having ISO 9000 certification and the level of customer-focus in PM practice (finding no link). One area that has received attention in studies is the influence of total quality management (TQM) practices on performance (Hendricks and Singhal, 2001; Kaynak, 2003). The assumption is that there will be a positive effect on performance through the changes brought about from implementing a TQM-type programme, in such areas as leadership, human resource management, process management, supply chain management and information management (Shieh and Wu, 2002). One study has considered the impact of TQM on project performance, though the study by Shieh and Wu (2002) was limited to appraising the effect on the processes in the architectural planning stage of construction projects rather than on achievement of the end objectives across a variety of projects. There is a need for further systematic research into the relationship between TQM and project performance to see if the introduction of a TQM approach leads to changes in actual project management practices relating to managing performance. To meet this need in the context of the traditional iron/golden triangle measure of project performance the following hypothesis was developed:

H1. Respondents working in companies with a recognized TQM programme are more likely to be time, cost or quality (technical)-focused in their practices for managing a project than respondents in companies with no recognized TQM programme.

Although the iron/golden triangle is still a valid measure of project performance it focuses on a narrow range of criteria that are managed during a project's life. In addition, the iron/golden triangle views project performance from a tactical perspective, detached from the high-level, longer-term strategic imperatives that exist in organizations. The deficiencies of a narrow perspective were recognized in the performance measurement domain (Bourne *et al.*, 2000). In operations the limitation of traditional performance measurement frameworks that focused on a narrow range of

mainly financial-based measures, such as return on investment included a failure to focus on continuous improvement and the sub-optimization of performance (Ghalayini and Noble, 1996). As result of theoretical developments, principally as a result of Kaplan and Norton's work on The Balanced Scorecard (BSC) (Kaplan and Norton, 1992, 1996), many organizations developed frameworks that consider a range of attributes.

The theoretical developments in the area of performance management have informed changes in understanding of the attributes of effective project performance. The need to move frameworks for measuring project performance beyond the iron/golden triangle to take into account other attributes led to a distinction being made between "project management" success and "project" success (De Wit, 1988). Project management success encompasses meeting the iron/golden triangle time, cost and quality (technical) objectives and also the way in which the project is managed, i.e. the quality of the process. Project success is broader in its perspective and includes the effect of the final product or service on the customer (Baccarini, 1999). Adopting a holistic view, optimization of performance encompasses both project management and project related measures. As well as the iron/golden triangle and internal process, projects will provide some benefit for the customer (Tukel and Rom, 2001) and hence effective project performance will be customer-focused.

The concept of customer-focus is a fundamental principle of TQM (BSI, 2000). A link between TQM, customer-focus, and organizational performance has been made in relation to the management of operations (Terziovski and Samson, 1999). In this study of manufacturers in Australia and New Zealand, Terziovski and Samson (1999) concluded that elements of TQM, such as customer-focus, related positively to organizational performance in the areas of customer satisfaction, employee morale, delivery, productivity, cash flow, and sales growth. The aim of customer-focused project management, as articulated by Egan (1998), is predicated upon a similar link existing between TQM, customer-focus, and project performance. However, a consistent message through the debate about the need for change has been the recognition that project-focused industries, such as construction, were not as customer-focused as some other industries, as shown by a specific aim set out by Egan (1998, p. 40), who stated in his report that within five years of his study, the construction industry should "deliver its products to its customers in the same way as the best customer-led manufacturing and service industries". As a means of understanding the antecedents to customer-focused PM, it would be useful to investigate whether the link between TQM and customer-focused practices, observed in manufacturing environments, exists in project environments. This leads to the second hypothesis:

H2. Respondents working in companies with a recognized TQM programme are more likely to be customer-focused in their practices for managing a project than respondents in companies with no recognized TQM programme.

In terms of maximizing project performance the literature has also recognized the theoretical importance of considering the interests of other stakeholders, besides the customer, (Cleland, 1986; Karlsen, 2002; Mallak *et al.*, 1991; Tuman, 1993). A multi-dimensional performance management framework will include measures that take an external-oriented and social perspective, in particular focusing on the satisfaction of key stakeholders, such as local communities and the environment

(Mallak *et al.*, 1991) and measures that consider the psychosocial perspective of internal stakeholders, such as team members (Boehm and Ross, 1989; Bryde, 2003). The US-based Project Management Institute, in their latest body of knowledge, state that project management is concerned with "adapting the specifications, plans, and approach to the different concerns and expectations of the various stakeholders" (Project Management Institute, 2004, p. 8). However, evidence exists showing that the practical implementation of the stakeholder-focus concept is difficult to achieve in project environments. Boehm and Ross (1989) gives examples of situations in which a failure to meet the needs of various stakeholders to the project, including the team, leads to poor performance. Maylor (2001), in a review of the current state of the project management discipline, states that the processes for managing stakeholders are poorly understood. A theoretical contribution of a TQM-type approach, in terms of overcoming the obstacles to developing a high degree of stakeholder-focus has been put forward (BSI, 2003) yet there has been little systematic research into whether there is a link between the implementation of TQM and stakeholder-focused PM practices. This link is explored through the final hypothesis:

H3. Respondents working in companies with a recognized TQM programme are more likely to be focused on stakeholders other than the customer in their practices for managing a project than respondents in companies with no recognized TQM programme.

Research method

Prior work has shown the usefulness of collecting quantitative data via surveys for exploratory research of perceptions, attitudes and behaviour (Sotgiu and Ancarani, 2004; Craig and Johnson, 2006; Konidari and Abernot, 2006); and given the focus of the study reported in this paper is on exploring behaviours in relation to project management practices, a questionnaire was regarded as a valid measuring instrument.

To obtain contemporaneous data, the first part of the questionnaire asked people to select a particular project, which could be either ongoing or completed, and to then base their responses solely on this project. The questionnaire then asked for data about whether a TQM-type programnme existed.

In the questionnaire's final section, more detail was sought about project management practices. Tukel and Rom (2001) developed and validated a construct indicating preferences towards the degree of customer, time, cost, quality (technical) specification, and rework focus. This framework was adapted to measure the degree of focus on customers, time, cost, quality (technical) and other stakeholders. A review of the literature highlighted the importance of psycho-social factors related to team members and staff, such as opportunities to learn and develop (Boehm and Ross, 1989) and of satisfying all stakeholders (Mallak *et al.*, 1991) therefore four statements were devised to measure the emphasis placed on stakeholders linked to these issues. The level of focus associated with each item was measured using a seven-point Likert scale. The full list of questions asked is provided in Table I. The validity of the project success construct was examined using Cronbach's alpha test. Table II shows the results of the test.

(See Table I for extract of questionnaire.) The validity of the construct was examined using Cronbach's alpha test. The internal consistency for the amended part of the construct, namely the addition of stakeholder focus, is strong (alpha value 0.72), suggesting that the construct is a valid measure.

	Strong emphasis	Weak emphasis
Customer-focus		
Fully satisfying the customer's needs takes precedence over other objectives		
Measuring overall customer satisfaction		
Making prompt responses to customer requests		
Taking corrective action to meet customer requirements		
Other stakeholder-focus		
Providing development opportunities for project team members		
Providing organization learning		
Fully satisfying stakeholders' needs (other than the customer) taking precedence over other objectives		
Measuring overall stakeholder (other than the customer) satisfaction		
Time-focus		
Evaluating suppliers/subcontractors based on how well they meet schedules		
Making additional resources available to meet project milestones and deadlines		
Taking corrective action to control progress against the project schedule		
Minimizing the project duration precedence over other objectives		
Cost-focus		
Taking corrective action to control project costs		
Relaxing deadlines to fully meet costs		
Evaluating suppliers/subcontractors based on how well they meet the agreed budget		
Minimizing the project cost taking precedence over other objectives		
Technical-focus		
Evaluating suppliers/subcontractors based on how well they meet technical specifications		
Taking corrective action to control conformance to technical requirements		
Relaxing other constraints to meet technical specifications		
Meeting the technical specification precedence over other objectives		

Source: Adapted from Tukel and Rom (2001)

Table I.
Emphasis on success criteria in project management practice

Construct	Cronbach's alpha score
Customer focus	0.76
Time focus	0.65
Cost focus	0.75
Quality (technical) focus	0.75
Other stakeholder focus	0.72

Table II.
Cronbach's alpha score for project success construct

The values for customer, time, cost, and technical focus are comparable to those previously reported by Tukel and Rom in their 2001 study. The internal consistency for the amended part of the construct, namely the addition of stakeholder focus, is strong (alpha value above 0.7), suggesting that the construct is a valid measure.

Although the survey was exploratory, the authors wished to ensure that data were collected from a diverse range of project environments and project management perspectives (which would enhance the generalizability of the findings). This diversity would include: industry sectors with a high degree of focus on projects, such as construction and those with less of project focus, such as service providers; those organizations that typically take the client role on projects and those who are contracted to undertake projects on behalf of the client. Therefore a strategy of purposive and heterogeneous sampling was used.

To ensure that organisations reflecting the client perspective were included in the sample, a sub-sample of not-for-profit social housing providers (housing associations) were included. The suitability of the sub-sample was based upon the authors' personal experiences working on projects in this industry sector. To reflect the perspective of the contractors a sub-sample of construction companies were selected. As the housing associations would typically have a low focus on projects and the construction companies a high focus, a final sub-sample was made up of sundry manufacturing and service organizations that would reflect a mix of client/contractor relationships and different degrees of project focus.

Given that response rates to operations management-related postal surveys can typically be in the region of 10-20 per cent (Larson and Poist, 2004), the questionnaire was mailed to 1,200 organizations. It was anticipated that this sample size would yield approximately 150 returned questionnaires, which would be an adequate number in terms of undertaking some useful exploratory data analysis. To achieve the balance of client/contractor perspectives and degrees of project-focus (discussed previously) the 1,200 sample was made up of: 350 members of the National Housing Federation (NHF) randomly selected from the NHF's *Directory of Members*; 200 organizations in the Fame database (which contains details, including industry sector and number of employees, of 5 million UK organizations) randomly selected from those categorized as construction companies; 650 organizations randomly selected from the Fame database, with the following business codes: manufacture of food products and beverages, manufacture of chemicals and chemical products, electricity, gas, steam and hot water supply, computer and related activities, research and development, public administration and defence, compulsory social security, health and social work.

Before posting, the questionnaire was piloted with three key informants, representing a housing association, a construction company and a service provider. The main purpose of the piloting was to ensure that there were no problems with the wording of questions and any project-management terminology used. A few minor amendments were made to the wording of questions based on feedback from the pilot. The questionnaire was then mailed with an accompanying letter explaining the purpose of the survey. In total, 176 (15 per cent) responses were received from the 1,200 questionnaires posted (which was in line with expectations). In total, 53 (15 per cent) returned completed questionnaires were received from the housing association sub-sample, 38 (19 per cent) from the sub-sample of construction companies and 85 (13 per cent) from the sundry manufacturing and service-provider sub-sample. The number of returned questionnaires was regarded as

acceptable for exploratory data analysis, with adequate representation of the three sub-samples. Therefore no further mailing was undertaken.

Results

Of the respondents, 38 (22 per cent) had the job title of project manager; 138 (78 per cent) did not. However, another 81 (46 per cent) respondents stated they were involved in the management of projects, despite not having a formal job title of project manager. In all, 119 (68 per cent) respondents worked in the managing of projects. The other 57 (32 per cent) respondents held related project management positions, such as sponsor and project team member. For 65 (37 per cent) organizations, a TQM programme was in place, versus 111 (63 per cent) organizations reporting that either no such programme existed or the existence of such a programme was unknown.

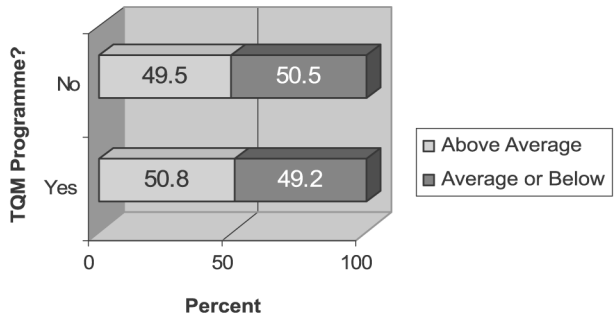
To investigate the hypotheses, a distinction was made between the respondents who had above average iron/golden triangle-focus, customer-focus or other stakeholder-focus, and those who had an average/below average focus. To make this distinction, the mean score for the statements relating to iron/golden triangle-focus, customer-focus or other stakeholder-focus (see Table I) was calculated and those respondents with scores below the mean were classed as above average and those with scores at or below the mean were classed as average or below (after Tukel and Rom, 2001). The Chi Square test was then used to compare the observed and expected levels of focus of those with TQM programmes in place in their organization and those with no such programme.

The results were as follows:

H1. Respondents working in companies with a recognized TQM programme are more likely to be time, cost or quality (technical)-focused in their practices for managing a project than respondents in companies with no recognized TQM programme.

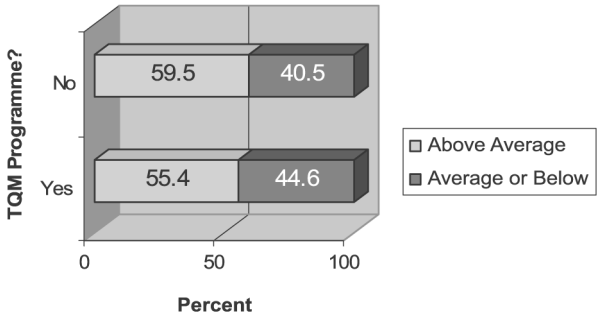
The results of the Chi Square test (see Figures 1-3) *do not support* the hypothesis that those working in companies with TQM programmes are more likely to be time, cost or quality (technical)-focused in the management of a project than those with no TQM programme.

H2. Respondents working in companies with a recognized TQM programme are more likely to be customer-focused in their practices for managing a project than respondents in companies with no recognized TQM programnme.



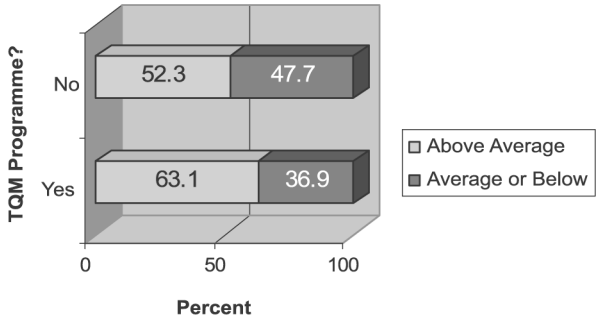
Chi Square = 0.024 1df p = 0.870

Figure 1.
Influence of TQM programme on time-focus



Chi Square = 0.279 1df p = 0.597

Figure 2.
Influence of TQM programme on cost-focus



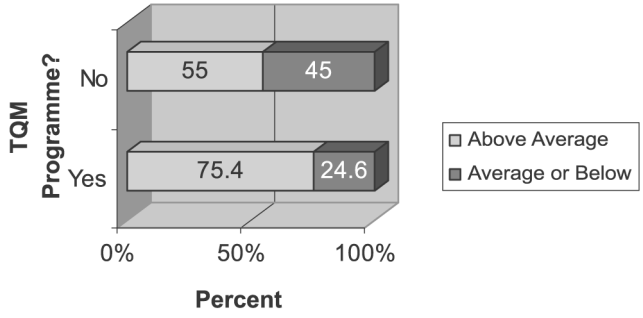
Chi Square = 1.952 1df p = 0.162

Figure 3.
Influence of TQM programme on technical-focus

Of the 65 respondents having a TQM programme in their company, 49 (75.4 per cent) were classed as having an above average customer-focus in the management of their project. The remaining 16 (24.6 per cent) were classed as having a below average customer-focus. The results of the chi square test (see Figure 4) *support* the hypothesis that those working in companies with TQM programs are more likely to be customer-focused in the management of a project than those lacking a TQM programme.

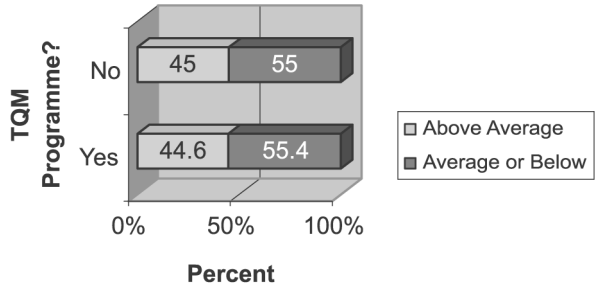
H3. Respondents working in companies with a recognized TQM programme are more likely to be focused on stakeholders other than the customer in their practices for managing a project than respondents in companies with no recognized TQM programme.

The results of the chi square test (see Figure 5) *do not support* the hypothesis that those working in companies with TQM programmes are more likely to be other stakeholder-focused in the management of a project than those with no TQM programme.



Chi Square = 7.3 1df p = 0.007

Figure 4.
Influence of TQM programme on customer-focus



Chi Square = 0.003 1df p = 0.956

Figure 5.
Influence of TQM programme on other stakeholder-focus

Conclusions and implications for further study

The first broad finding was that there was no link between the level of focus on the iron/golden triangle and the existence of a TQM programme. This can perhaps be explained by the fact that, as was discussed in the introduction, PM practices focused on the iron/triangle are the most commonly used and will typically exist in some form in most project environments.

The second finding related to the relationship between a TQM programme and the level of customer-focus in PM practice. The existence of such a relationship suggests that TQM is an antecedent to customer-focused PM, and given the link made in prior studies between customer-focus and performance, the relationship may provide evidence of some of the processes needed if an organization wishes to increase the level of customer-focus in the management of its projects. For example, generic factors identified in successful TQM implementations include a clear understanding among management of the nature and purpose of any improvement programme, a clear understanding of other approaches to improving quality, such as ISO 9000, and the potential benefits to be achieved by such a programme (Taylor and Wright, 2003). By translating these factors to a project context, an organization might be able to use elements of a TQM programme to facilitate the introduction of customer-focused

project management. For example, establishing best-practice from one of the findings of Taylor and Wright's study, if an organization wished to move towards a "partnership-type" approach to PM that typically requires a high level of customer-focus (Winch *et al.*, 1998) senior management would need to clearly understand the nature and purpose of any changes in PM practices that were proposed.

The survey reported in this paper is exploratory in nature and focused on investigating whether there is a link between the focus of project management practices and the existence of a TQM programme. Having established a link in respect of customer-focused practices there is a need for further research in this area. In particular, in-depth study is required to understand the relationships and interactions between the diverse elements that constitute TQM and customer-focused PM practices.

The absence of any evidence of a link between the existence of a TQM programme and the level of other stakeholder-focus is also noteworthy. This result may not necessarily reflect any deficiencies in this area on the part of TQM programmes, but rather further confirmation that in project environments the processes for managing stakeholders are poorly understood and ignored (Maylor, 2001). Clearly there is the potential for further study in terms of understanding what the barriers are to the management of project stakeholders and what processes are needed to break down the barriers and introduce an effective stakeholder management process. Indeed further study is required to investigate in more detail the relationships between elements of a TQM programme and factors that may moderate, and perhaps negate, any positive influence of having implemented TQM. For example, although the theoretical benefits of focusing on satisfying other stakeholders have been highlighted in the literature, there is some evidence that in some project environments a particular problem is unwillingness on the part of all parties to commit to the principle in practice, due in part to commercial pressures (Chan *et al.*, 2003; Ng *et al.*, 2002). A useful line of enquiry will be to examine how this and other extraneous variables interact with TQM programmes to impact on the level of focus on other stakeholders in PM practice (and to establish whether there are any fundamental limitations in the TQM implementations that help explain why TQM organizations are not more stakeholder-focused in their PM).

References

Atkinson, R. (1999), "Project management: cost, time and quality, two best guesses and a phenomenon, it's time to accept other success criteria", *International Journal of Project Management*, Vol. 17 No. 6, pp. 337-43.

BSI (2000), *BS EN ISO 9000:2000 Quality Management Systems – Fundamentals and Vocabulary*, British Standard Institute, London.

BSI (2003), *BS EN ISO 10006 Quality Management and Guidelines to Quality in Project Management*, British Standards Institute, London.

Baccarini, D. (1999), "The logical framework method for defining project success", *Project Management Journal*, Vol. 30 No. 4, pp. 25-32.

Boehm, B.W. and Ross, R. (1989), "Theory-W software project management: principles and examples", *IEEE Transactions on Software Engineering*, Vol. 15 No. 7, pp. 902-16.

Bourne, M., Mills, J., Wilcox, M., Neely, A. and Platts, K. (2000), "Designing, implementing and updating performance measurement systems", *International Journal of Operations & Production Management*, Vol. 20 No. 7, pp. 754-71.

Bryde, D.J. (2003), "Modelling project management performance", *International Journal of Quality & Reliability Management*, Vol. 20 No. 2, pp. 229-54.

Chan, A.P.C., Chan, D.W. and Ho, K.S.K. (2003), "Partnering in construction: critical study of problems for implementation", *Journal of Management in Engineering*, Vol. 19 No. 3, pp. 126-35.

Cleland, D.I. (1986), "Project stakeholder management", *Project Management Journal*, Vol. 17 No. 4, pp. 36-44.

Cooke-Davies, T. (2002), "The 'real' success factors on projects", *International Journal of Project Management*, Vol. 20 No. 3, pp. 185-90.

Craig, J.B.L. and Johnson, D. (2006), "Establishing individual differences related to opportunity alertness and innovation dependent on academic-career training", *Journal of Management Development*, Vol. 25 No. 1, pp. 28-39.

Daniel, R.D. (1961), "Management information crisis", *Harvard Business Review*, Vol. 39 No. 5, pp. 111-21.

De Wit, A. (1988), "Measurement of project management success", *International Journal of Project Management*, Vol. 6 No. 3, pp. 164-70.

Egan, J. (1998), *Rethinking Construction*, Department for Environment, Transport and the Regions/HMSO, London.

Fullerton, R.R., McWatters, C.S. and Fawson, C. (2003), "An examination of the relationships between JIT and financial performance", *Journal of Operations Management*, Vol. 21 No. 4, pp. 383-404.

Gardiner, P.D. and Stewart, K. (2000), "Revisiting the golden triangle of cost, time and quality: the role of NPV in project control, success and failure", *International Journal of Project Management*, Vol. 18 No. 4, pp. 251-6.

Ghalayini, A.G. and Noble, J.S. (1996), "The changing basis of performance measurement", *International Journal of Operations & Production Management*, Vol. 16 No. 8, pp. 63-80.

Hendricks, K.B. and Singhal, V.R. (2001), "Firm characteristics, total quality management and financial performance", *Journal of Operations Management*, Vol. 19 No. 3, pp. 269-85.

Kaplan, R.S. and Norton, D.P. (1992), "The Balanced Scorecard – measures that drive Performance", *Harvard Business Review*, Vol. 40 No. 1, pp. 7-9.

Kaplan, R.S. and Norton, D.P. (1996), *The Balanced Scorecard*, Harvard Business School Press, Boston, MA.

Karlsen, J.T. (2002), "Project stakeholder management", *Engineering Management Journal*, Vol. 14 No. 4, pp. 19-25.

Kaynak, H. (2003), "The relationship between total quality management practices and their effects on firm performance", *Journal of Operations Management*, Vol. 21 No. 4, pp. 405-35.

Kerzner, H. (1989), "Systems project management: a case study at the IRS", *Systems Project Management*, Vol. 40 No. 1, pp. 7-9.

Konidari, V. and Abernot, Y. (2006), "From TQM to learning organisation: another way for quality management in educational institutions", *International Journal of Quality & Reliability Management*, Vol. 23 No. 1, pp. 8-26.

Larson, P.D. and Poist, R.F. (2004), "Improving response rates to mail surveys: a research note", *Transportation Journal*, Vol. 43 No. 4, pp. 67-74.

McKone, K.E., Schroeder, R.G. and Cua, K.O. (2001), "The impact of total productive maintenance practices on manufacturing performance", *Journal of Operations Management*, Vol. 19 No. 1, pp. 39-58.

Mallak, L.A., Patzak, G.R. and Kursted, H.A. Jr (1991), "Satisfying stakeholders for successful project management", *Computer Industrial Engineering*, Vol. 21 No. 14, pp. 429-33.

Maylor, H. (2001), "Beyond the Gantt chart: project management moving on", *European Management Journal*, Vol. 19 No. 1, pp. 92-100.

Might, R.J. and Fischer, W.A. (1985), "The role of structural factors in determining project management success", *IEEE Transactions on Engineering Management*, Vol. 32 No. 2, pp. 71-7.

Ng, S.T., Rose, T.M., Mak, M. and Chen, S.E. (2002), "Problematic issues with project partnering: the contractor perspective", *International Journal of Project Management*, Vol. 20 No. 6, pp. 437-49.

Pinto, J.K. and Prescott, J.E. (1990), "Planning and tactical factors in the project implementation process", *Journal of Management Studies*, Vol. 27 No. 3, pp. 305-27.

Pinto, J.K. and Slevin, D.P. (1987), "Critical factors in successful project management", *IEEE Transactions on Engineering Management*, Vol. 34 No. 1, pp. 22-7.

Project Management Institute (2004), *A Guide to the Project Management Body of Knowledge*, 3rd ed., Project Management Institute, Newton Square, PA.

Rockart, J.F. (1979), "Chief executives define their own data needs", *Harvard Business Review*, Vol. 57 No. 2, pp. 81-93.

Shenhar, A.J., Dvir, D., Levy, O. and Maltz, A.C. (2001), "Project success: a multidimensional strategic concept", *Long Range Planning*, Vol. 34 No. 6, pp. 699-725.

Shieh, H.-M. and Wu, K.-Y. (2002), "The relationship between total quality management and project performance in building planning phase: an empirical study of real estate industries in Taiwan", *Total Quality Management*, Vol. 13 No. 1, pp. 133-51.

Sotgiu, F. and Ancarani, F. (2004), "Exploiting the opportunities of internet and multi-channel pricing: an exploratory research", *Journal of Product & Brand Management*, Vol. 13 No. 2, pp. 125-36.

Taylor, W.A. and Wright, G.H. (2003), "A longitudinal study of TQM implementation: factors influencing success and failure", *Omega: The International Journal of Management Science*, Vol. 31 No. 2, pp. 97-111.

Terziovski, M. and Samson, D. (1999), "The link between total quality management practice and organizational performance", *International Journal of Quality & Reliability Management*, Vol. 16 No. 3, pp. 226-37.

Tukel, O.I. and Rom, W.O. (2001), "An empirical investigation of project evaluation criteria", *International Journal of Operations & Production Management*, Vol. 21 No. 3, pp. 400-16.

Tuman, J. (1993), "Models for achieving project success through team building and stakeholder management", in Dinsmore, P.G. (Ed.), *The AMA Handbook of Project Management*, AMACOM, New York, NY, pp. 207-23.

White, D. and Fortune, J. (2002), "Current practice in project management: an empirical study", *International Journal of Project Management*, Vol. 20 No. 1, pp. 1-11.

Winch, G., Usmani, A. and Edkins, A. (1998), "Towards total project quality: a gap analysis approach", *Construction Management & Economics*, Vol. 16 No. 2, pp. 193-207.

Corresponding author
David James Bryde can be contacted at: D.J.Bryde@livjm.ac.uk

To purchase reprints of this article please e-mail: **reprints@emeraldinsight.com**
Or visit our web site for further details: **www.emeraldinsight.com/reprints**

The research register for this journal is available at
http://www.mcbup.com/research_registers/quality.asp

The current issue and full text archive of this journal is available at
http://www.emerald-library.com

Contribution of quality management tools and practices to project management performance

Miryam Barad and Tzvi Raz
Tel Aviv University, Israel

Keywords *Quality management, Israel, Project management, Computer software*

Abstract *There is little empirical research that demonstrates a link between quality management practice and better project management performance. Some evidence to this effect is presented and analysed. Reviews two studies that examined the relationship between quality management practice and performance in two areas: manufacturing, and logistics. Next, data are analysed from a survey of project managers in the high-tech and software industries in Israel. Finally, the results of the survey are integrated with those of previous work, and some insights regarding the contribution of quality management practices to project success are offered.*

Introduction

Quality is now universally accepted as a major concern for every organization. Although in the last two decades numerous quality management philosophies, methodologies, practices and tools have been designed, developed and applied, only in recent times has information regarding the extent and nature of their contribution to organizational performance come into view. Thus, the literature on quality strategies has lately been enriched through many empirical research studies, dealing with application issues of quality management (QM). A main objective of some of these works was to define and measure a variety of QM components. Saraph *et al.* (1989) developed key factors of quality management and operating measures to estimate them. Flynn *et al.* (1994) pursued this topic while providing a detailed procedure for conducting reliability and validity analysis of the developed measures. The criteria of the Malcolm Baldrige Award were used by Black and Porter (1996) to identify their version of critical QM components. Benson *et al.* (1991) measured managers' perception of an ideal versus an actual system structural model of QM. Questions regarding an holistic versus a piecemeal implementation of these components were considered by Ahire *et al.* (1996), while Anderson *et al.* (1998) proposed a causal model to investigate the practice of input QM components and their effects on operational and business results. Sitkin *et al.* (1994) addressed limitations in the way TQM has been applied. They argued that the universal application of quality management models is too simplistic, and that a more promising way to understand the synergy and interactions involved in applying quality

International Journal of Quality & Reliability Management, Vol. 17 Nos4/5, 2000, pp. 571-583.
© MCB University Press, 0265-671X

management to specific areas is through a contingency based application approach.

In this paper we are concerned with quality management in organizations that are engaged in projects. We regard project management as a specific and promising application area of quality management tools and practices. In its *Guide to the Project Management Body Of Knowledge*, the Project Management Institute (1996), which is the leading professional organization devoted to the subject, defines a project as "a temporary endeavor undertaken to create a unique product or service". The same document lists quality management as one of the main eight processes that together constitute the project management process. However, there is not much empirical research that demonstrates a link between quality management practice and better project management performance. In this paper we present and analyze some evidence to this effect.

The main objective of this work is to investigate the adaptation of global quality management tools, proved effective in manufacturing and other areas, to the generic quality needs of project management. This is achieved through the analysis of data from a survey of project managers in the high-tech and software industries in Israel (Raz and Michael, 1999).

Modeling approach

We synthesize information on project management (PM) tools/practices from the data collected in Israel, with theories and findings on quality management (QM) components and their operational results, from empirical studies. We begin by selecting, examining and integrating models and results of QM studies in two areas: manufacturing and logistics. A set of generic QM components emerges from this integration.

Next, an analysis of the PM data in Israel is carried out. The analysis enables to evaluate the "perceived" contribution of QM tools/practices in PM to a project success as well as relationships among the tools' usage. It also provides the means to assess the tool usage effects on a set of quality oriented variables. These "quality" variables are defined through appropriate "indicators", i.e. specific questions formulated to measure desirable characteristics of the PM process performance and of its output. By comparing the "perceived" contribution of these tools to a project success, with their "assessed" contribution, some critical quality needs of the project management process are identified.

A conceptual/generic interpretation of the QM tools in PM reveals their similarity with the generic QM tools identified from the QM studies. This makes it possible to integrate the results of the survey with the findings reported in the empirical QM studies and thus to offer some insight on the contribution of quality management tools to a project success. The modeling approach is described in Figure 1.

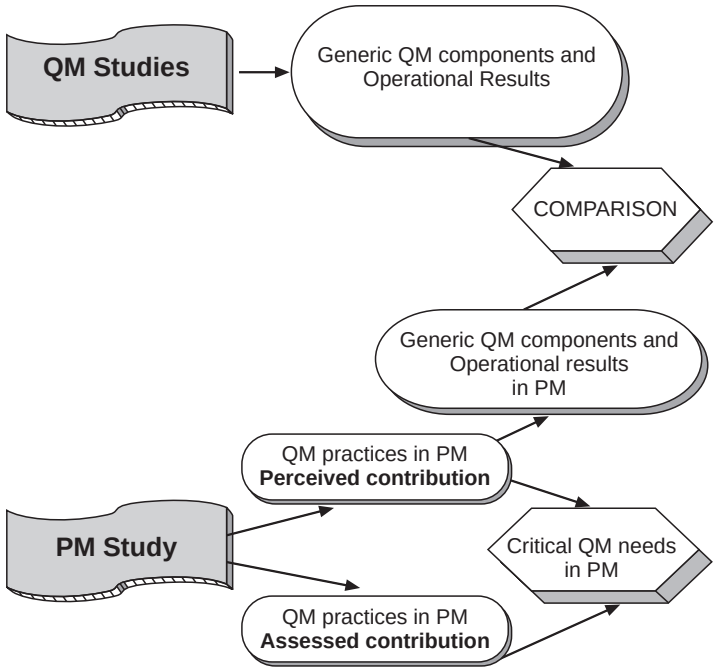


Figure 1.
Overview of the research approach

Quality management theories and practices – usage aspects

To better understand and analyze the application of QM practices to project management, we dwell on two usage aspects of QM theories and practices that we deem relevant to our work here "holistic usage of QM components" and "application of QM theories to specific areas".

Holistic usage of QM components and operational results

Garvin (1986) and Ebrahimpour and Withers (1992) reported that, in Japan, an holistic approach to quality management implementation was instrumental to achieving improvements of product quality. Schaffer and Thomas (1992) found that some of the implementation failures of quality management were linked to a piecemeal implementation approach and that in the USA as well companies started to implement an holistic approach to quality management.

We shall focus here on the work of Ahire *et al.* (1996) that specifically investigated the holistic usage of QM components and possible synergetic effects of this approach. The data were collected from the automotive accessories industry, i.e. from the manufacturing area.

Ahire *et al.* identified 12 QM components and developed items to measure them. The components list comprises:

(1) "management commitment";

(2) "internal quality information usage";

(3) "benchmarking";

(4) "design QM";
(5) "employee empowerment";
(6) "employee involvement";
(7) "employee training";
(8) "supplier QM";
(9) "supplier performance";
(10) "SPC usage";
(11) "customer focus"; and
(12) "product quality".

The data analysis included investigating correlation relationships among the components' usage. Their main results are:

- A "holistic" application of QM practices is likely to be reflected in the product quality. Evidence on this issue is provided by employee empowerment and by customer focus. The usage of these practices was highly correlated with five other QM components and with product quality as well. Conversely, the application of practices in isolation, such as SPC and benchmarking, was not highly correlated with product quality.
- The findings reveal the critical importance of the human aspect and its development (employee training, employee involvement and employee empowerment) relative to the other QM components. They imply that people are a key element in the successful implementation of QM strategies.
- "Management commitment" was found to be highly correlated with the practice of customer focus, supplier QM and employee empowerment but not so highly correlated with product quality. According to the authors this indicates that top management commitment is a necessary but not a sufficient condition for attaining superior product quality.

Application of QM theories to specific areas

Most of the empirical works in the literature consider single or multiple industries in the manufacturing area. Flynn *et al.* (1994) collected data from several industries such as machinery, transportation components and electronics industry, while the data used by Saraph *et al.* (1989) stemmed from manufacturing and service industries. These studies focused on measuring input QM components and did not investigate their causal results, nor their holistic usage or synergetic effects.

As mentioned in the introduction, applying quality management to project management, means enhancing/adapting the use of QM practices, originally developed for the manufacturing area, to fit the needs of this specific area that is different from manufacturing. To address this usage aspect, most relevant to

our work here, we select and examine the study carried out by Anderson *et al.* (1998) in logistics, another specific area different from manufacturing. The authors collected data from members of the American Society of Transportation and Logistics. They considered ten QM components that expressed the seven criteria of the Malcolm Baldrige quality award. The components were:

(1) "leadership";
(2) "information and analysis";
(3) "measurement";
(4) "training";
(5) "teamwork";
(6) "morale";
(7) "benchmarking";
(8) "supplier management";
(9) "operational results"; and
(10) "customer satisfaction".

The questionnaire was designed to enable assessment of QM influences on logistic performance. The data analysis was focused on fitting a causal model of the QM component practice. This approach provided results similar in structure with the results of Ahire *et al.* (1996) who investigated relationships in the usage of various QM components and their outcomes. The main findings were:

- There was no direct effect of "leadership" on operational results. The direct effect of leadership was reflected on team and training (human resource focus) and on benchmarking. Information, supplier management (process management) and operational results exhibited indirect effects of leadership.
- Supplier management, training and information did directly affect "operational results".
- Direct effects on "customer satisfaction" were exhibited by operational results as well as by morale and team organization (human resource focus).

A generic perspective on QM practices and results

Let us now try to integrate the building blocks of the two studies: Ahire *et al.* (1996) who considered a manufacturing area, and Anderson *et al.* (1998) who considered the logistics area. As mentioned above, both studies looked for linkages among input QM practices and between these practices and their outcomes (operational results and customer satisfaction) and thus provided our rationale for selecting them here.

Input QM practices

There is much similarity between the input QM components/practices as respectively defined in each study.

"Benchmarking", "supplier management" and "training" appear as such in both. "Management commitment" is similar to "leadership" while "internal quality information usage" is comprised in "information and analysis".

Under a broader classification, "measurement" pertains to "information and analysis", "design QM" and "SPC" are part of "process management", while "teamwork", "morale", "employee empowerment" and "employee involvement" are definitely part of the human resource aspect. Two remarks are needed here:

(1) "Supplier management" and "benchmarking" that by their definition are sub-components of "process management" and "training", that is a sub-component of "human resources" were nevertheless specifically investigated in both studies as separate components.

(2) The indicators used to define each input QM component were also similar. The only exception was the "information" component, whose indicators were differently formulated in each area (study).

Operational results

The operational results as considered by the two studies were formulated differently. Ahire *et al.* (1996), who investigated a manufacturing area, only referred to "product quality" while Anderson *et al.*, who investigated the logistics area referred to "operational results" from a broader perspective. These were expressed by three indicators:

(1) logistics cost performance;

(2) order cycle time; and

(3) effectiveness and efficiency of transaction processes.

The indicators used to express customer satisfaction were also specifically related to customer expectations in the logistics area.

We may conclude that from a generic perspective most of the QM components and their indicators as defined for a manufacturing area are equivalent with those defined for logistics, thus indicating their universality. Hence, we may hypothesize that they may fit other application areas and among them project management.

The differences between the two areas were reflected in the specific indicators needed to describe "information" and "operational results". The indicators of the logistic study were so developed as to specifically consider relevant information topics and desirable output characteristics of a logistic process. Again, these results may be applied to other specific areas including project management. They motivated us to extract and analyze quality management practices that were considered in a survey of project managers, as described in the next section.

Quality management practices in project management

Between April and June 1998 a survey was carried out in order to find out which tools and practices are associated with successful project management in general, and with effective project risk management in particular (Raz and Michael, 1999). The term "practice" was given a wide interpretation, meaning also special purpose tools and processes. The survey was based on a questionnaire, written in Hebrew, which was distributed either personally or via e-mail to a random sample of about 400 project managers from the software and high-tech sectors in Israel. At the end of the survey period there were 84 usable completed questionnaires.

The questionnaire consisted of several sections, each containing a number of brief questions to be answered on a scale of 1-5. Although the main emphasis of the survey was on project risk management, two of its sections are relevant to our analysis. The first section dealt with the extent of contribution of individual practices to project success in general, and included 13 practices normally associated with quality management. Our interpretation here of the term "perceived contribution" is that a practice of highly perceived contribution is likely to have a high usage level. Hence, we will alternatively make use of "perceived contribution" or "usage". This is supported by the findings of a pilot version of the questionnaire, where it surfaced that perceived contribution was highly correlated with extent of use in the organization.

The second section consisted of six questions dealing with the effectiveness and efficiency of the manner in which projects are managed in the respondent's organization and with project outcomes, such as product quality and customer satisfaction.

The data were analyzed in several steps. First, we attempted to assess the perceived contribution of each QM practice, and identified clusters of practices through highly significant correlation coefficients between pair of practices. Next, in order to assess the actual contribution of the practices, we calculated the coefficients of correlation between the practice perceived contribution and the project management outcomes. Finally, we compared perceived contribution with assessed contribution of practices.

Perceived contribution

Table I presents summary statistics of the perceived contribution questions for the 13 QM practices. The mean responses were also used to assign ranks, in descending order (the highest rank is 1), to the perceived contribution of the practices; these appear in the last column. Ranks 4 and 5 corresponded to two practices of equal mean responses, which were both assigned an equal (mean) rank of 4.5.

It is seen that "simulation", "subcontractor management" and "brainstorming" were perceived as the practices likely to contribute most to a project success, while "cause and effect analysis", "control of trend and deviations" and "training programs" were at the bottom of the list.

QM practices in PM		Mean	Standard deviation	Rank (by perceived contribution)
T1	Brainstorming	3.74	0.79	3
T2	Cause and effect analysis during planning	2.33	1.14	12
T3	Periodic review of reports and documents	3.18	1.01	9
T4	Control of trends and deviations	2.69	0.93	11
T5	Cause and effect analysis during control	2.27	0.99	13
T6	Simulation	4.00	0.85	1
T7	Benchmarking	3.58	0.87	6
T8	Requirements management	3.69	0.89	4.5
T9	Subcontractor management	3.77	0.96	2
T10	Quality control	3.69	0.76	4.5
T11	Quality management	3.39	0.76	7
T12	Training programs	3.11	0.82	10
T13	Customer satisfaction surveys	3.27	0.96	8

Table I.
Perceived contribution of the QM practices to the success of a PM

Analysis of practice clusters

Clustering of PM practices is conceptually equivalent to an holistic usage of QM practices, as investigated by Ahire *et al.* (1996). Hence, knowledge of practice clusters might be also useful as a basis for comparison between the findings here and those reported in the other studies. In addition, the identification of practice clusters will shed some light on the QM practices' usage in the organization.

Practice clusters were created based on the correlation between pairs of practices. Examination of the highly significant correlations among the usage levels of the 13 generic PM practices revealed six correlations with a significance level of $p \leq 0.001$. These defined three clusters of practices.

The larger cluster, say cluster one, contained six practices: T3, T4, T7, T8, T9 and T13. This cluster can be seen as an organized assembly of main practices associated with the processing core of a PM.

Let us now apply a conceptual interpretation of the PM practices with a view to match the generic QM practices emerging from the QM empirical studies. T7, T8, T9 and T13 are background practices respectively representing "benchmarking", process planning, "supplier management" and "customer focus", while T3 expresses usage of "internal information", and T4 indicates "process control". It is worth noting that "benchmarking", "supplier management" and "customer focus", though introduced as background practices, are perceived by QM researchers as building blocks of QM practices (see "a generic perspective on QM practices").

The second largest cluster contained three background practices: T10, T11, and T12. It is obvious that the usage of these practices reflects an organized QM orientation. We interpret here the practice of QM as similar to "management commitment" to quality as defined in the QM studies. Besides QM and QC where the name quality is explicit, in the third background

practice, associated with training programs, the name quality is implicit. However, "training" is a basic ingredient of the QM component described as "human resource focus", whose practice was specifically investigated in each of the QM empirical studies considered here (see "a generic perspective on QM practices"). Its very strong correlations with the two explicit quality practices, supports the findings of Anderson *et al.* in the logistics area, stating that quality management influences the practice of training.

The third cluster belongs to the problem solving domain and contains two analysis practices – T2 and T5 – used at different stages of the project. T2 and T5 respectively express planning analysis and process control analysis (process management).

The perceived contributions of T1 (brainstorming) and T6 (simulation) to a project success, were not strongly associated with that of any other practices.

Assessed contribution

The information at this stage will complement previous information and will enable organizational decisions and assignment of priorities for the development of QM components according to their suitability to meet the PM quality needs.

Having examined the contribution of the PM practices and their usage-based relationships as perceived by the respondents, we now look for significant correlations ($p \leq 0.01$) between the usage level of a practice and the "performance level" of the PM process. The overall "quality" level of a PM process is assessed here both through its "performance level" and through its "operational outcomes" such as quality of the resulting product, respondent satisfaction and customer satisfaction.

The PM "process performance" characteristics are assessed through three outcome variables:

- C1 – extent and frequency of plan changes;
- C2 – frequency of emergency meetings; and
- C3 – ratio of effort invested versus effort required.

Two process performance characteristics are involved: process stability and process efficiency. Both C1 and C2 measure the process stability, while C3 expresses the respondent's evaluation of the process efficiency.

C1, C2 were formulated in such a way that a higher value assigned to these variables expressed a higher process stability (lower frequency of plan changes/emergency meetings).

The last three outcome variables are used to assess the "operational outcomes" of the PM process:

- C4 – participation satisafction, including the project manager;
- C5 – customer satisfaction; and

- C6 – number of post delivery product changes, which measures product quality in terms of absence of product errors.

The summarized results are presented in Table II.

Let us now examine the scores received by each outcome variable. It is seen that process stability measured as plan stability (C1), received the lowest score. However, high levels of control analysis, process control and training, are likely to improve this. A higher level of training is also bound to improve the other performance characteristic of the PM process (C2 and C3). Similarly to process stability and process efficiency, product quality (C6) is also among the low scored quality variables. This outcome might be improved through a higher level of "supplier management" as well as through improved "training". It seems very interesting to note that these results are in perfect agreement with the findings of Anderson *et al.* (1998) in the logistics area.

Customer satisfaction (C5) was scored the highest and this result is not surprising. After all, this score is an expression of the customer satisfaction as perceived by the respondent, that is to say by the project manager. A highly perceived customer satisfaction is significantly correlated with usage of internal information (periodic review of reports and documents), quality management practices and customer focus. The satisfaction experienced by project managers (C4) is related to the usage of process control analysis and process control practices, benchmarking practices, usage of training programs and customer focus.

We may now use the above outcome-oriented findings to assess the individual PM practices by ranking them according to the number of their significant correlations with the six outcome variables (indicators) (C_i, i = 1, 2, ... 6). We obtain the ranks in descending order shown in Table III.

Table II.
Measured outcome variables of the PM process and their significantly correlated QM practices

Outcome variable	Mean	Standard deviation	QM practices with significant correlation ($p \leq 0.01$)
C1 (process stability by plan stability)	1.845	1.024	Process control analysis (T5) Process control (T4) Training
C2 (process stability by stability of meetings)	2.845	1.177	Training
C3 (process efficiency)	2.036	0.798	Training
C4 (project management satisfaction)	3.298	0.847	Process control Benchmarking Process control analysis Training Customer focus (T13)
C5 (customer satisfaction)	3.595	0.746	Usage of internal information (T3) Quality management Customer focus
C6 (product quality)	2.714	1.025	Supplier management Training

QM practice in PM		Highly correlated with	Rank (by number of significantly correlated outcome variables)
T12	Training programs	C1, C2, C3, C4, C6	1
T4	Process control	C1, C4	3
T5	Process control analysis	C1, C4	3
T13	Customer focus	C4, C5	3
T3	Usage of internal information	C5	6.5
T7	Benchmarking	C4	6.5
T9	Supplier management	C6	6.5
T11	Quality management	C5	6.5
T1	Brainstorming	none	11
T2	Cause and effect analysis during planning	none	11
T6	Simulation	none	11
T8	Requirements management	none	11
T10	Quality control	none	11

Table III. Assessed contribution of the QM practices in PM

It is seen that only eight out of 13 PM practices are highly correlated with one or more outcome variables. The highest rank (1) is assigned to "training", that by its outcome-oriented results is obviously way ahead of all the other PM practices. It is followed at a distance by three practices (ranks 2 to 4) – "process control" (T4), "process control analysis" (T5) and "customer focus" (T13) – each significantly correlated with two outcome variables. Hence, an equal (mean) rank of 3 is assigned to each. The remaining 4 practices (ranks 5 to 8) are each significantly correlated with one outcome variable and again an equal (mean) rank of 6.5 is assigned to each. The remaining 5 practices (ranks 9 to 13), were not significantly correlated with any outcome variable; they were each assigned an equal (mean) rank of 11.

Two sets of ranks are thus obtained for each generic PM practice. The first set (Table I), expresses the practice contribution to a project success as "perceived" by the respondents. The second set (Table III) expresses an "assessed" contribution of the practice according to its strong correlations with the outcome-oriented indicators. It seems interesting to calculate and analyze any discrepancies between the two sets of ranks. Such analysis may improve the project managers' understanding of the PM process.

Let us mark as underestimated practices, those practices whose rank by assessment is much higher than their rank by perceived contribution (usage) and as overestimated practices, those whose rank by assessment is much lower than their rank by perceived contribution (usage).

The underestimated PM practices are "process control analysis", "training" and "process control" (with respective discrepancy of –10, –9 and –8).

The overestimated PM practices are "simulation" and "brainstorming" (with respective discrepancy of 10 and 8). It is worthwhile mentioning that the respective use of these two (overestimated) practices was not significantly related to that of any other PM practices, i.e. they were used in isolation. This

result supports the hypotheses that a piecemeal implementation of QM practices is not likely to yield any outcome results and hence it is bound to failure.

Concluding remarks

The specific findings of the survey point out to certain critical quality needs of the project management process as identified by this study:

- Improvement of "process control" (control of trends and deviations) and "process control analysis" is likely to improve process stability (extent and frequency of plan changes).
- Improvement of training, whose currently reported usage was relatively not so high, is likely to improve all outcome oriented variables.

In general, the results of this study exhibit certain similarities with the findings reported in the manufacturing and logistics area concern:

- The importance of the human resources development (here training), on quality oriented operational results.
- The influence of management commitment (here quality management) on the practice of training and on customer focus.
- No direct effect of management commitment (leadership) on operational results.

From a methodological perspective, the analysis reported here suggests that most of the QM components in the manufacturing and other areas such as project management or logistics are equivalent, at least from a generic viewpoint. Accordingly, similar indicators can be used to describe them, regardless of the specific area of the empirical research. This is particularly true for "supplier management", "benchmarking" and "training", which are perceived by QM researchers as universal quality oriented practices of major importance in any application area and deserve to be investigated accordingly. Two exceptions were found – "information" and "operational results". These have to be described by indicators specific to the application area.

References

Ahire, S.L., Goldhar, D.Y. and Waller, M.A. (1996), "Development and validation of TQM implementation constructs", *Decision Sciences*, Vol. 27 No. 2, pp. 23-57.

Anderson, R.D., Jerman, R.E. and Crum, M.R. (1998), "Quality management influences on logistics performance", *Transportation Research-E*, Vol. 34 No. 2, pp. 137-48.

Benson, P.G., Saraph, J.V. and Schroeder, R.G. (1991), "The effects of organizational context on quality management: an empirical investigation", *Management Science*, Vol. 37 No. 9, pp. 1107-24.

Black, S.A. and Porter, L.J. (1996), "Identifications of the critical factors of TQM", *Decision Sciences*, Vol. 27 No. 1, pp. 1-21.

Ebrahimpour, M. and Withers, B.E. (1992), "Employee involvement in quality improvement: a comparison of American and Japanese manufacturing firms operating in the US", *IEEE Transactions on Engineering Management*, Vol. 39 No. 2, pp. 142-8.

Flynn, B.B., Schroeder, R.G. and Sakadibara, S. (1994), "A framework for quality management research and an associated instrument", *Journal of Operations Management*, Vol. 11 No. 4, pp. 339-66.

Garvin, D.A. (1986), "Quality problems, policies and attitudes in the United States and Japan: an exploratory study", *Academy of Management Journal*, Vol. 29 No. 4, pp. 653-73.

PMI (1996), *A Guide to the Project Management Body Of Knowledge*, Project Management Institute, Upper Darby.

Raz, T. and Michael, E. (1999), "Use and benefits of tools for project risk management", *International Journal of Project Management*.

Saraph, J.V., Benson, P.G. and Schroeder, R.G. (1989), "An instrument for measuring the critical factors of quality management", *Decision Sciences*, Vol. 20 No. 4, pp. 810-29.

Schaffer, R. and Thomson, H. (1992), "Successful change programs begin with results", *Harvard Business Review*, Vol. 70 No. 1, pp. 80-9.

Sitkin, S.B., Sutcliffe, K.M. and Schroeder, R.G. (1994), "Distinguishing control from learning in total quality management: a contingency perspective", *Academy of Management Review*, Vol. 19 No. 30, pp. 537-64.

Available online at www.sciencedirect.com

ScienceDirect

Procedia - Social and Behavioral Sciences 194 (2015) 192 – 200

Procedia
Social and Behavioral Sciences

28th IPMA World Congress, IPMA 2014, 29 September – 1 October 2014, Rotterdam, The Netherlands

Best Project Management Practices in the Implementation of an ISO 9001 Quality Management System

Helgi Thor Ingason*

Professor, Reykjavik University, School of Science and Engineering, Menntavegi 1, 101 Reykjavik, Iceland

Abstract

The implementation of ISO 9001 quality management systems in 21 organizations was studied through semi-structured interviews with the respective quality managers. In general, the organizations seem to look at the implementation of a quality management system as a project and they employ standard project management tools, albeit to a different extent and in different ways. The commitment and direct participation of management was a key factor for a successful implementation, as well as direct participation of the employees, and good preparation and goal setting. It can be concluded that organizations that planned for their internal cost of implementation, that is the cost of direct participation of the employees, were likely to implement their quality management systems in the time they expected—and their time of implementation was shorter than for organizations that didn't look at this internal cost.

© 2015 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).
Peer-review under responsibility of Scientific Committee of IPMA 2014.

Keywords: ISO 9001; implementation; project planning; key success factors; internal cost

1. Introduction

Quality management and project management are related disciplines. Project management has long been associated with the term “temporary organization” whereas quality management has been associated with the term

* Corresponding author. Tel.: +354 895 7340
E-mail address: helgithor@ru.is

1877-0428 © 2015 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).
Peer-review under responsibility of Scientific Committee of IPMA 2014.
doi:10.1016/j.sbspro.2015.06.133

"permanent organization". However, project management as a discipline has matured towards the management of permanent organizations. This orientation reflects a modern organization that brings value to its customers through projects and has chosen to organize its activities to a large extent by initiating, executing and delivering projects. This trend is driven by the business environment and the markets, which demand that organizations be increasingly responsive and dynamic.

Project management maturity is rising. PMI's Pulse of the profession in 2012 reported that 20% of participants in the annual global survey of practitioners and project management leaders described their organizations as having high overall project management maturity. The corresponding figure in 2006 was 11% (PMI, 2012). This observation is in line with another large survey by PWC, the Global survey on the status of project management where more than 62% of companies in the 2012 survey were operating in level 4 or level 5 of the maturity scale. The corresponding figure in 2004 was 21.9% (Clack, Fass, Graeber, Honan and Ready, 2012). The PMI report points out a clear correlation between higher maturity levels and on-time and on-budget delivery in projects (PMI, 2012).

Increasing project management maturity reflects a clear trend. Organizations are applying process approaches in their operations, in other words, they are using quality management in their project management. Organizations are increasingly standardizing their project management practices across all or most of their enterprise (PMI, 2012).

One aspect of this synergy is the way organizations implement quality management in their operations. As part of a research project into the perceptions of employees of ISO 9001 certified organizations regarding the quality management systems in their organizations, the way in which organizations had implemented their ISO 9001 quality management systems was assessed. The aim of this paper is to shed light on the implementation as a project and the project management practices that are applied in the implementation of ISO 9001 quality management systems.

2. Theory

Quality management as a management field is rich with research on different aspects and theories, empirical data from the field and theoretical elaborations. For a relatively young discipline, some of its basic aspects are well defined and established through well-known and widely used international management standards such as ISO 9001 and ISO 14001. ISO 9001 is applied in different kinds of organizations all over the world. Priede (2012) discusses the total number of issued ISO 9001 certificates and countries in the world in the period 1993-2010. This has grown from more than 46 thousand certificates in 60 countries in 1993 to 1.1 million certificates in 178 countries in 2010.

The focus in research has not been on the project of implementing a quality management. Sampaio, Saraiva and Rodrigues (2009) did an exhaustive literature review of ISO 9001 studies and analyzed 100 research papers in a quest to create an overview of ISO 9001 certification research. They defined 5 categories as the main themes for research in the area:

- ISO 9001 certification market evolution.
- ISO 9001 certification motivations and benefits, barriers and drawbacks.
- Impacts on organizational performance.
- Impacts on companies' financial performance.
- ISO 9001 and TQM – are they complementary or independent from each other?

Tang and Kam (1999) did a survey of ISO 9001 implementation in engineering consultancies in Hong Kong. Only 42% of the firms in the study employed external quality consultants in developing the management systems but quality consultants were considered helpful. The time it took to achieve certification by 19 firms in this study varies from 9 to 24 months and the average was 14 months.

Poksinksa, Eklund and Dahlgaard (2006) studied the implementation of ISO 9001 in small organizations with emphasis on lost opportunities, benefits and influencing factors. This was a case study with three small organizations. They concluded that many opportunities for improvement were lost in the way ISO 9001 was

implemented and operated as the standard was implemented by standardizing the practice and not by practising the standard.

Naveh and Marcus (2005) did a literature survey and a case study and identified two stages in implementing ISO 9000, Firstly installation, which has two dimensions: (a) external coordination and (b) integration. Secondly usage, which also has two dimensions: (a) in daily practice and (b) as a catalyst for change. Installation consists of concept development and preparation. It is both the attempt to set the management standard in place and the form of planning that occurs before the standard is used. It includes introducing the standard, establishing a system for carrying it out and developing the rules for how it will be applied.

Kim and Kumar (2011) did a three stage systematic review of literature and concentrated on three key aspects of ISO 9000 implementation; motivations, critical success factors and impacts of ISO 9000. Their findings are based on 100 studies. They propose a three part performance realization framework for implementing ISO 9000; conversion, enhancement and the competitive priority stage. The first stage aims at constructing a foundation to operate quality based systems, processes and culture. The main output of the conversion stage is improved systems, standardized processes and learning and communication environment. During the conversion stage, management should focus on such topics as leadership, training, involvement of everyone, provision of organizational resources, establishing a quality oriented culture and a customer based approach.

Many researches have focused on barriers to successful implementation. Al-Rawahi and Bashir (2011) did a comparative investigation on the implementation of ISO 9001:2000 in Oman. 42 ISO 9001 certified organizations of different size and sector were studied. No strong evidence was found to suggest that the motives for implementation, the process and cost of achieving certification, the perceived benefits and the shortcomings, differ significantly according to organization size or sector type. Zeng, Tian and Tam (2007) explored the barriers to implementation of ISO 9000 in China. They highlighted the problems in implementing the standard, some of them being short-sighted goals for "getting certified": over-expectation on the standard, a mandatory requirement rather than wholehearted commitment and following the trend in certification. 41 percent of the respondents reported that their companies had implemented the ISO 9001 standard seriously, while 52 percent of the respondents reported a more perfunctory implementation of the standard. Urbonavicius (2005) studied ISO system implementation in small and medium sized companies from new EU member countries. The research confirmed that initially the main motivation to implement ISO systems is different from the main benefits of its implementation—as perceived after the project completion. The motivational arguments most often are of marketing and sales nature, while the main benefits experienced after implementation have to do with management, for example operational efficiency. Bhuiyan and Alam (2004) did an empirical study on Canadian firms who had implemented ISO 9001 with focus on the difficulties they had to deal with. Larger companies faced fewer difficulties in the implementation process than smaller ones, but the number of years the companies had been in operation had no effect on the difficulties in implementation. Yahya and Goh (2001) found out that ISO 9001 elements that relate to an organizational quality system—such as corrective and preventive actions, design control, management responsibility, statistical techniques, process control and document and data control and quality systems—are hard to implement, compared to elements that relate to operational procedures. These findings are in line with the findings of Gunnlaugsdottir (2010) who studied the motives, challenges and benefits of ISO 9001 certification in more than 40 organizations in Iceland. She discovered that the difficult challenges in the implementation involved fulfilling those requirements of the standard that have to do with control of documents and records. Boiral (2011) came to similar conclusions. Based on qualitative interviews with 189 managers and employees working in ISO certified organizations, his results showed that the positive or negative impacts of ISO management systems depended on specific factors. The main pitfalls are inappropriate or excessive documentation and lack of follow-up and system continuity. Al-Najjar and Jawad (2011) did an empirical study on ISO 9001 implementation barriers and misconceptions in the service and manufacturing sectors in Iraq. Examples of important barriers to ISO 9001 implementation are a lack of top management commitment, employee resistance,

difficulty of performing internal audits, absence of consulting boards, ISO 9001 requirements are unrealistic, lack of financial and human resources, insufficient employee training and insufficient knowledge about quality programs. According to the findings of Sampaio, Saraiva and Rodrigues (2009), ISO 9001 motivations and benefits can be categorized as being primarily external—related to marketing and promotional issues—or internal—related to internal organizational improvements. They furthermore conclude, based on the literature, that companies maximize their benefits if they achieve ISO 9001 certification based on internal motivations. Lack of involvement by top management is considered to be the main obstacle faced by companies during ISO 9001 implementation and certification.

3. Method

The research was undertaken in Iceland. The total number of ISO 9001 certified organizations in the country is 50 at the writing of this paper. For this research, 21 organizations were chosen. The organizations were chosen to represent all business sectors and give a very good cross section of certified organizations in the country. They consist of consultancies, contractors, production companies, IT companies, private service companies and official institutions of different kinds, e.g. schools, utility companies and service companies. A total of 21 quality managers, or managing directors, were interviewed about the implementation of the ISO 9001 standard in their organizations, the extent to which project management was applied, what tools and techniques were used and what the most important success factors were in their implementation. A semi structured question list was applied; the interviews were arranged as a mixture of closed questions and more open questions where the participants described specific strategic attributes, methods and practices that related to their organizations.

4. Results

The organizations are of very different types and sizes but to some extent, project management methodology was used in the implementation of the quality management systems in all of them. An overview of the organizations is given in Table 1.

Table 1 Overview of the organizations that participated in the research, their classification according to NACE (Nomenclature of Economic Activities—the European statistical classification of economic activities), the year of certification and the number of employees.

NACE listing	Year of certification	Employees
Manufacturing	2013	1-49
Manufacturing	1994	250-299
Manufacturing	2012	50-99
Manufacturing	2008	50-99
Electricity, gas, steam and air condition supply	2009	50-99
Construction	2009	150-199
Transporting and storage	2013	100-149
Transporting and storage	2010	300-
Information and communication	2009	1-49
Information and communication	2002	1-49
Information and communication	2002	300-
Professional, scientific and technical activities	2011	1-49

Professional, scientific and technical activities	2012	1-49
Professional, scientific and technical activities	2004	150-199
Professional, scientific and technical activities	2009	250-299
Professional, scientific and technical activities	2007	50-99
Public administration and defense; compulsory social security	2012	1-49
Public administration and defense; compulsory social security	2006	150-199
Public administration and defense; compulsory social security	2011	50-99
Education	2005	1-49
Education	2009	100-149

There are differences in the extent to which different methods of planning were applied, and the time it took the organizations to implement the system varied a lot. On average, the time for implementation was 18 months, the maximum time was 48 months but three organizations reported that the implementation had taken 6 months. The participants were asked to choose between statements that described their perception of the time it had taken to implement the system, as compared to the planned time.

Fig. 1. Participants' perception of the time it took to implement the system, as compared to the planned time.

Some common factors contributing to a successful implementation could be found for many of the organizations. The participants were asked specifically to what degree project planning had been applied in the implementation. 29% said that the implementation was carried through by following an initial plan. Another 29% stated that the implementation was carried through by following an initial plan that had to be changed frequently. However, 33% of the participants stated that the implementation was carried through using continuous and regular communication between the relevant parties; there was no formal plan. In 10% of cases, the implementation was primarily in the hands of one person, namely the quality manager. Table 2 gives a more specific overview of the degree of project planning that the organizations applied in their implementation.

Table 2 Answers to closed questions that relate to the degree of planning that was applied in the implementation of ISO 9001. The closed questions are statements and the participants could choose to agree, disagree or be neutral.

Statement	Agree	Neutral	Disagree
The implementation of ISO 9001 was considered to be a project	90%	5%	5%
In the beginning, a project plan was created representing the tasks and the estimated date of project close-down	76%	10%	14%
In the beginning, a cost estimate was made for external cost such as the cost of the certification body	76%	10%	14%
In the beginning, a cost estimate was made for internal cost such the time spent by the employees for the implementation	29%	10%	61%
In the beginning, a project organization was defined, stipulating e.g. who was leading the implementation	86%	0%	14%
In the beginning, the scope was well defined, e.g. what parts of the organization were included in the implementation	95%	5%	0%
In the beginning, a communication plan was defined, e.g. for the meetings to be held	62%	14%	24%
In the beginning, a plan for storing relevant project information was made, e.g. minutes of meetings and other formal documents	85%	5%	10%

The participants were asked to list tools and techniques they had applied in the implementation. A list of tools was given to choose from, but in addition, the participants could add tools to the list. An overview of the results is given in fig. 2.

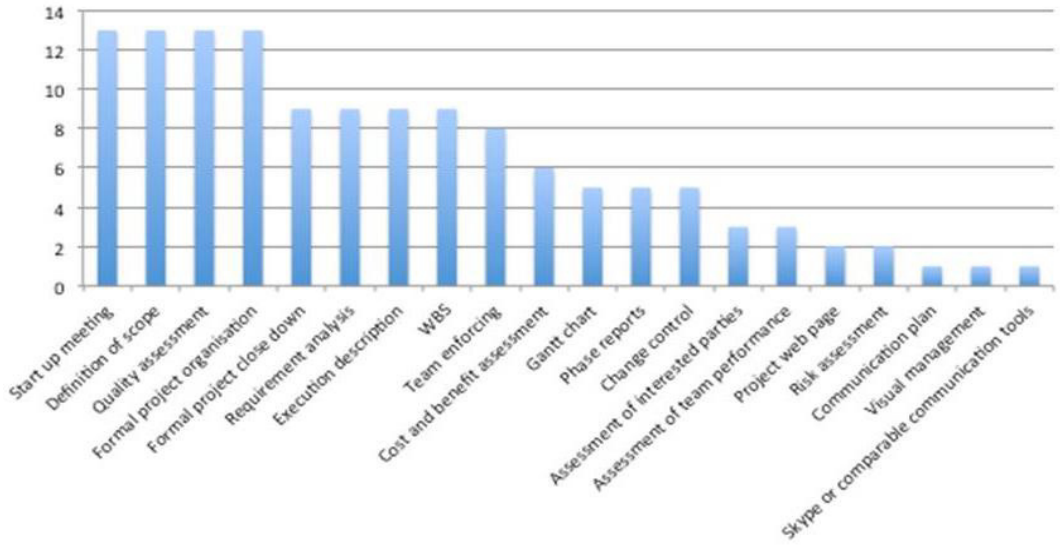


Fig. 2. Overview of project management related tools and techniques that were applied in the implementation. Participants could select one or more tools. The y-axis shows the number of times a specific tool was chosen.

Finally, the participants were asked to identify some key factors that had contributed to success in the implementation.

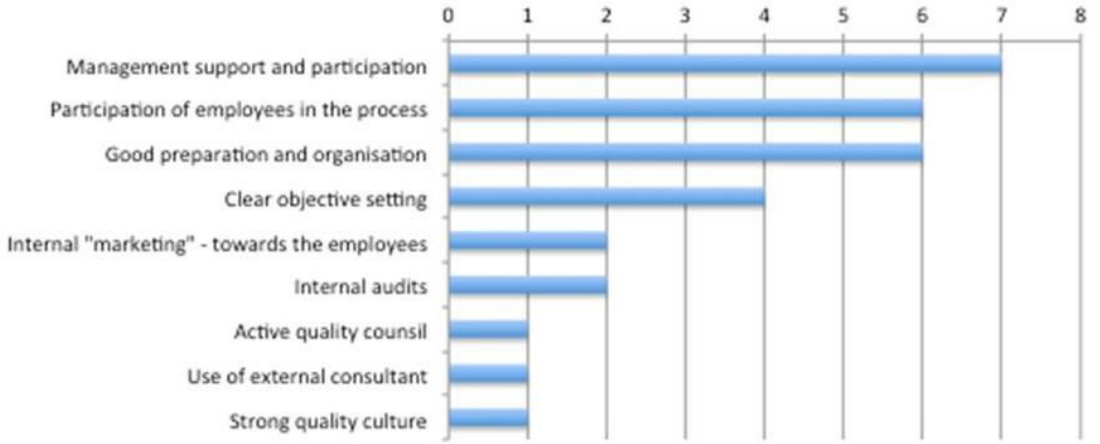


Fig. 3. Overview of key success factors in the implementation, as indicated by the participants. The scale shows how often a particular success factor was mentioned.

The data set was categorized and a group of organizations that fulfilled two conditions was created.

- The group included organizations that agreed to the statement that in the beginning, a cost estimate was made for internal cost, such as the time spent by the employees for the implementation.
- The group excluded organizations that stated that the implementation was carried through without any project planning but by using continuous and regular communication between the relevant parties.

A total of 5 organizations fulfilled these conditions. The same organizations were likely to be also applying other project management tools such as having a start-up meeting and formal project close-down, formal project description, WBS and scope definition. The average time for implementation in the case of these organizations was 13 months; in all cases, this was the time that had been planned for the implementation.

Seven organizations stated that the implementation was carried through without any project planning but by using continuous and regular communication between the relevant parties. Most of them claimed that the implementation was seen as a project. These organizations were however not likely to apply standard project management tools, except for a start-up meeting (4 organizations) and a formal project organogram (5 organizations). The average time for implementation for these organizations was 24 months and this was always a longer time than the organizations had expected.

5. Discussion and conclusions

The implementation of an ISO 9001 quality management system can easily be seen as a project, with a limited time span and specific deliverables. Yet the literature does not contain much research on the application of project management in the implementation of quality management systems and this aspect is excluded in the overview of

ISO 9001 certification research by Saraiva and Rodrigues (2009). Navey and Marcus (2005) and Kim and Kumar (2011) present frameworks where the implementation is defined but these frameworks are quite general and provide no specific information on the implementation as a project.

The present research is based on semi structured interviews with quality managers in 21 ISO 9001 certified organization in Iceland—this is more than 40% of all certified organizations in the country at the writing of this paper. The organizations are of different sizes and they work in different areas and half of them have been certified since 2010 or later. The organizations give a good cross section of ISO 9001 certified organizations in Iceland.

A vast majority of respondents in this study stated that the implementation was seen as a project and they employ standard project management tools, albeit to a different extent and in different ways. On average the implementation took 18 months, this is not far from the 14 month average time of implementation reported by Tang and Kam (1999). A formal time plan was made in most cases and a formal project organization created. The scope of implementation was well defined, external cost was estimated and plans were made for storing of project information.

Standard project management tools and techniques were applied in many cases: e.g. start-up meetings, scope definition, quality assessment, defining of a formal project organization, formal project close down, requirement analysis, execution description, WBS and team enforcement—these were the most frequently used tools according to the participants. The key success factors in the implementation were support by the management and direct participation of management, as well as direct participation of the employees in the implementation process. These observations are in line with the results of Zeng, Tian and Tam (2007), Yahyta and Goh (2001), Al-Najjar and Jawad (2011) and Sampaio, Saraiva and Rodrigues (2009).

The present study also shows that good preparation and organization of the implementation is considered a key success factor; this might in fact be classified as the application of project management. At first sight, most of the organizations claim to apply project management in their implementation and it is thus difficult to do any comparison of the success of organizations who apply project management and those who don't.

A closer look at the data, however, shows that only a part of the organizations looked at the internal cost of implementation: the time spent by employees in the implementation process. The literature and the present study agree that direct and active participation of the employees is a key success factor in the implementation, and a professional project management approach to the implementation would include this cost in the early planning stages of the project.

The results clearly show that organizations who planned for the internal cost of implementation concluded their ISO 9001 certification in 13 months, and in all cases this was according to their plans. On the other hand, organizations that did not use project planning but based the implementation on continuous and regular communication, concluded their ISO 9001 certification in 24 months, and this was in all cases a longer time than the organizations had expected.

Realizing that direct participation of employees in the implementation of an ISO 9001 quality management system is essential from a quality management perspective is one thing; but understanding what this means in terms of planning an implementation project is another thing. A famous quote to Winston Churchill is an appropriate ending to this paper; "If you fail to plan, you plan to fail." In other words, if organizations fail to understand that the essential direct participation of employees takes time—and include this in their plans—they are bound to be disappointed and attain their ISO 9001 certification later than they expected, and at higher cost.

References

Al-Najjar, S. M., & Jawad, M. K. (2011). ISO 9001 Implementation Barriers and Misconceptions: An Empirical Study. International Journal of Business Administration, 2(3).

Al-Rawahi, A. M., & Bashir, H. A. (2011). On the implementation of ISO 9001: 2000: a comparative investigation. The TQM Journal, 23(6), 673-687.

Bhuiyan, N., & Alam, N. (2004). ISO 9001: 2000 implementation–the North American experience. International Journal of Productivity and Performance Management, 53(1), 10-17.

Boiral, O. (2011). Managing with ISO systems: Lessons from practice. Long Range Planning, 44(3), 197-220.

Clack A., Fass S.G. Graeber M., Honan D. and Ready J. (contacts) (2012). Insights and Trends: Current portfolio, programme and project management practices. The third global survey on the current state of project management. PwC. Retreived from www.pwc.com on February 1st 2014.

Gunnlaugsdóttir, J. (2010). Vottað gæðakerfi. Hvatar og áskoranir. Þjóðarspegillinn 2010. Félagsvísindastofnun Háskóla Íslands.

Kim, D. Y., Kumar, V., & Kumar, U. (2011). A performance realization framework for implementing ISO 9000. International Journal of Quality & Reliability Management, 28(4), 383-404.

Naveh, E., & Marcus, A. (2005). Achieving competitive advantage through implementing a replicable management standard: installing and using ISO 9000. Journal of Operations Management, 24(1), 1-26.

PMI (2012). PMI's Pulse of the Profession - Driving success in challenging times. Project Managemen Institute. Retrieved from www.pmi.org on February 1st 2014.

Poksinska, B., Eklund, J. A., & Dahlgaard, J. J. (2006). ISO 9001: 2000 in small organisations: Lost opportunities, benefits and influencing factors. International Journal of Quality & Reliability Management, 23(5), 490-512.

Priede, J. (2012). Implementation of Quality Management System ISO 9001 in the World and Its Strategic Necessity. Procedia-Social and Behavioral Sciences, 58, 1466-1475.

Sampaio, P., Saraiva, P., & Rodrigues, A. G. (2009). ISO 9001 certification research: questions, answers and approaches. International Journal of Quality & Reliability Management, 26(1), 38-58.

Tang, S. L., & Kam, C. W. (1999). A survey of ISO 9001 implementation in engineering consultancies in Hong Kong. International Journal of Quality & Reliability Management, 16(6), 562-574.

Urbonavicius, S. (2005). ISO system implementation in small and medium companies from new EU member countries: A tool of managerial and marketing benefits development. Research in international business and finance, 19(3), 412-426.

Yahya, S., & Goh, W. K. (2001). The implementation of an ISO 9000 quality system. International Journal of Quality & Reliability Management, 18(9), 941-966.

Zeng, S. X., Tian, P., & Tam, C. M. (2007). Overcoming barriers to sustainable implementation of the ISO 9001 system. Managerial Auditing Journal, 22(3), 244-254.