Establishment and application of performance measure indicators for universities

Article in TQM Journal · April 2009
DOI: 10.1108/17542730910953004

CITATIONS
46

READS
514

3 authors, including:

Shun-Hsing Chen
Oriental Institute of Technology
34 PUBLICATIONS 445 CITATIONS
SEE PROFILE

All content following this page was uploaded by Shun-Hsing Chen on 01 December 2014.
The user has requested enhancement of the downloaded file. All in-text references underlined in blue are added to the original document and are linked to publications on ResearchGate, letting you access and read them immediately.
Establishment and application of performance measure indicators for universities
Shun-Hsing Chen, Hui-Hua Wang, King-Jang Yang (pp. 220-235)
Keywords: Balanced scorecard, Delphi method, Performance management, Performance measures, Universities
Article Type: Research paper

TQM: a knowledge enabler?
Maria Colurcio (pp. 236-248)
Keywords: Knowledge creation, Knowledge management, Learning, Total quality management
Article Type: Research paper

Total quality management and supply chain management: similarities and differences
Assadej Vanichchinhai, Barbara Igel (pp. 249-260)
Keywords: Quality management, Supply chain management, Total quality management
Article Type: Research paper

An empirical study of barriers to TQM implementation in Indian industries
K. Subrahmany Bhat, Jagadeesh Rajashekhar (pp. 261-272)
Keywords: Benchmarking, India, Quality awards, Total quality management
Article Type: Research paper

The implementation of a quality management system in the not-for-profit sector
G.R.T. White, P. Samson, R. Rowland-Jones, A.J. Thomas (pp. 273-283)
Keywords: ISO 9000 series, Non-profit organizations, Quality management, Quality standards, United Kingdom
Article Type: Research paper

Developing a European quality assessment tool for schools
Zdravko Pecar, Sara Cervai, Tauno Kekäle (pp. 284-296)
Keywords: Europe, Quality assessment, Quality improvement, Quality systems, Schools
Article Type: Research paper

Book Review

Lean Six Sigma: A Practitioner's Guide
Vol : 21 Issue: 3
Author(s): K. Narasimhan
Establishment and application of performance measure indicators for universities

Shun-Hsing Chen
Department of Marketing & Logistics Management, Yu-Da College of Business, Miao-Li, Taiwan, Republic of China

Hui-Hua Wang
Department of Applied Foreign Languages, Chin-Min Institute of Technology, Miao-Li, Taiwan, Republic of China, and

King-Jang Yang
Department of Applied Mathematics, Chung-Hua University, Hsinchu, Taiwan, Republic of China

Abstract

Purpose – To promote university education quality, performance measure indicators (PMIs) must be established. These indicators ensure the maintenance of university operating standards, encourage individual universities to work on inadequacies, and promote university competitiveness. The purpose of this paper is to address this issue.

Design/methodology/approach – A literature analysis was conducted and European, American and Taiwanese education evaluation indicators were used to develop the PMIs. Data were collected from the following sources: US-MBNAQ; US News & World Report; two renowned US education journals; UK University Committee Reports; UK-CVCP/UGC; three renowned UK education evaluation newspapers, opinions from the Ministry of Education and submissions from scholars in Australia and Taiwan. A total of 13 scholars were invited to participate in the literature review and analysis, which employed Delphi methods.

Findings – These indicators included 18 measurement dimensions, and 78 PMIs were developed. Applying these PMIs resulted in the creation of key performance indicators and a balanced scorecard (BSC) of performance measures. In addition, BSC represented a self-evaluation performance indicator that universities could use to achieve the objective of performance management.

Originality/value – The PMI by means of their integration into the BSC, allow management by objectives, a method to build the performance of each department and organization.

Keywords Balanced scorecard, Delphi method, Performance measures, Performance management, Universities

Paper type Research paper

Introduction

As international competition becomes increasingly fierce, numerous countries have enthusiastically invested in higher education in an effort to enhance their competitiveness. To adapt to the great competition from all over the world, there is an important and immediate required improvement to the quality of higher education
to meet international academic trend and raise overall academic standards and education quality. In response to growing concerns from stakeholders about poor or inconsistent quality, institutions of higher education are increasingly seeking ways to improve education quality (Lawrence and McCullough, 2001). Many colleges and universities have looked up methods from industry and adopt some type of total quality management (TQM) system to create competitiveness (Hubbard, 1994; Vazzana et al., 1997). In the USA, there is a tremendous pressure on universities in providing high-quality education and operating result. This is according to Tang and Zairi (1998), the result of:

- a decline in the traditional pool of higher education students;
- growing dissatisfaction and frustration with spiraling college costs and undergraduate teaching practices;
- many parents overwhelmed by the financial pressure; and
- government fiscal restraint.

In the UK the higher education sector is also facing unprecedented and increasing levels of market accountability precipitated by the legislative processes of subsequent administrations (Tang and Zairi, 1998). The stakeholders of higher education sector for managers justify their actions and demonstrate quality and effectiveness has never been greater as in recent years. These drivers have led the university focus on (Chen, 1997; Tang and Zairi, 1998):

- efficient and disciplined use of resources;
- achievement of value for money;
- increased productivity through the use of systematic planning, organization and control; and
- measurement of achievement against declared objectives by comparisons across institutions.

Therefore, UK and US universities are faced by the predicament that is to promote operating performance. To promote university education quality, measurement performance indicators are needed. These indicators ensure the performance of university operating, encourage each university to improve its' disadvantages, and ensure university competitiveness. University operating performance has become a reference for students and parents in choosing universities and allocating educational funds. This situation has promoted positive competition among universities and has developed a channel facilitating society to supervise the higher education system. In particular, few studies have focused on the establishment of evaluation indicators (EIs) for universities (Wang, 1993; Chian and Lee, 2001) and neglected the establishment of performance measure indicators (PMIs) in higher education organizations. This relative lack of attention is surprising and concerned, in view of the fact that performance management has been identified as the most crucial factor for universities. EIs are belonging to PMIs, but EIs are relatively narrow. The EIs are unable to show every aspect of school operating performance (Yang and Chen, 2004). This study is based on EIs combined with the perspectives of businesses operating to build up PMIs for universities.
A measurement process is necessary to enhance the quality of university education. Such a process should make sure to measure the performance of university operation, encourage each university to improve weaknesses, and ensure university education quality. A comprehensive measuring system should also measure each area of a university’s administration. Higher education institutions in many countries are currently protected and regulated by government legislation, and they are very conservative without the incentive to compete. Thus, it is a very important agenda to make clear and complete PMIs.

**Literature review**
The objectives of universities are to provide in-depth knowledge, seek academic development, educate students, and coordinate national development demands (Johnes and Taylor, 1990). The core functions of a university are basically teaching, research and scholarship (Tang and Zairi, 1998). Perkins (1973) pointed out that a university has three primary functions: education, research and service. Donald (1984) believed that universities should establish PMIs based on these functions to evaluate performance of related to resource allocation.

*The content of higher education PMI*
Performance measurement employs a quantitative standard to systematically measure an organization’s daily operational results as they relate to its overall objectives. Performance measurement in management is treated as a control category, in which an indicator is a measurement tool. By applying a set of complete indicator systems, a supervisor can measure organizational operating performance. Some scholars believed that an indicator represented a signal, which represented system performance (Spee and Bormans, 1992). The advantage of establishing an educational PMI is that it focuses attention on the primary aspects of an education system. Moreover, if this indicator was designed strictly, it could also be used as a tool for public communication and education reform (Elliott, 1991). Hence, the proposed PMI should contain the following characteristics:

- A performance indicator should have a monitoring function (Fitz-Gibbon, 1996).
- A performance indicator should be quantitative (Cuenin, 1986).
- A performance indicator should be objective related (CVCP/UGC, 1986).

The higher education PMIs should have the following functions:

- control and measure education quality;
- provide information to education policy decision-makers;
- provide references for education resources management and allocation; and
- provide each department with indicators of performance management.

Therefore, there are two primary objectives of measurement: to assist universities in improving education quality; and, to help universities meet customer demands and achieve their responsibilities.

*Higher education performance measurement literature*
Johnes and Taylor (1990) proposed that any measurement of university performance required the following information:
Johnes (1996) believed that these inputs and outputs could be used to measure a university’s performance and proposed four categories of output:

1. output from teaching activities;
2. output from research activities;
3. output from consulting services; and
4. output of cultural and social activities.

Johnes (1996) also identified the principal inputs:

- raw materials (students: A-level, attended a comprehensive school, foreign);
- labor services;
- human capital service;
- physical capital services;
- consumables;
- institutional characteristics; and
- environmental factors.

Sahney et al. (2004) proposed that TQM in higher education transformation systems included the inputs, process and outputs three aspects to measure university operation performance:

1. Inputs – human resources, physical resources and financial resources.
2. Process – teaching, learning, research, administrative activities and knowledge transformation.
3. Outputs – tangible outcomes, value addition and intangible outcomes.

University operational performance could be measured with these related resources of inputs, processes and outputs. Establishing these PMIs, everyone can understand the university’s operating performance and education quality level. Therefore, there is a need for clear and complete measurement dimensions and indicators.

**Higher education evaluation indicator**

European and US higher educational achievements are acknowledged as the best in the world. The EIs were collected from US, UK and Australia education organizations and reports published in press. To develop a comprehensive PMI, this study considered quantitative and qualitative indicators as indicators for university performance measurement as presented in the following literature:

- Malcolm Baldrige National Quality Award (MBNAQ, 2004).

UK University Committee Reports (Chen, 1997).

Committee of Vice-Chancellors and Principals of the United Kingdom/University Grant Committee (CVCP/UGC) higher education indicators (CVCP/UGC, 1987).

UK university education evaluation newspaper (include The Times, Guardian and Financial Times) (Chen, 1997).

Australia higher education indicators (Australia Higher Education Institutions, 2000).

Taiwan Ministry of Education (MOE) qualitative and quantitative indicators (MOE Highest Commander, 2003).


Balanced scorecard
The balanced scorecard (BSC) enables business to transform its overall organizational strategy into effective management. The BSC is a performance-measurement system (Kaplan and Norton, 2001a; Niven, 2002), a strategic-management system (Kaplan and Norton, 1996a, 2001c) and a communication tool (Niven, 2002, Kaplan and Norton, 1992). Apart from financial measurement, which is the essence of the BSC, it also emphasizes:

- the role of the customer;
- internal processes; and
- innovation and learning.

It thus provides a complete range of PMIs to measure the achievement of strategic targets. The BSC has four measurement perspectives (Kaplan and Norton, 1996b, 2001a).

1. financial perspective;
2. customer perspective;
3. internal process perspective; and
4. learning and growth perspective.

BSC has already been widely employed in manufacturing, and service industries, non-profit and government organizations, etc. with excellent effects (Kaplan and Norton, 2001b). Kaplan and Norton (2001a, 2001b) also proposed that although financial performance is not the main target of the majority of government and non-profit organizations, the sequence of BSC visions can be rearranged and customer or stakeholder perspective moves on the top.

Performance measure indicators
Performance measures are at the core of the BSC system (Niven, 2002). A complete and effective BSC must have proper key PMIs (Kaplan and Norton, 2001a; Niven, 2002).
PMIs are used to assess the achievement of strategic targets and to ensure that the overall strategic operation is workable. They can also provide direction for staff members on how they can contribute to an organization achieving overall targets (Niven, 2002). In the educational sector, each school will need to establish its core competencies on the basis of its mission and vision, and will also need to consider its current resources and state of competitiveness. Different strategic themes will have different strategic targets and different PMIs. As more strategic themes or targets are developed, the nature and number of the relevant PMIs will also increase.

With respect to PMIs, Kaplan and Norton (2001a) pointed out that each BSC perspective must have at least one target item and no more than 15 items of measurement. Niven (2002) indicated that US businesses typically introduce BSC with 20-25 PMIs, and suggested that these should be distributed among the perspectives as follows: 3-4 PMIs to the financial perspective; 5-8 PMIs to the customer perspective; 5-10 PMIs to the internal-process perspective; and 3-6 PMIs to the learning and growth perspective. This suggested distribution is the key to determining the number of PMIs to ensure an adequate description of an organization strategy across the four perspectives of the BSC. It must be able to connect strategies, quantitative, easy to understand, balance, etc. if it is able to use few indicators to measure organization performance there is no need to misuse.

Methodology
Delphi participants
Delphi participants were invited by means of recommendations including five administrators from education organizations such as Chief of Higher Education of MOE, Principle of Tai-Nan Normal College and Director of Special Education, Director of Education Curriculum of Chung-Yuan University, Dean of Higher Education Center of Tan-Chiang University. Second, five senior professors with administration experiences from different universities were added in. Finally, three scholars from education training institutions including one is the former Minister of MOE and two senior staffs from Education Curriculum of Chung-Yuan University. These three scholars’ professional areas included education administration; education measurement and organization communications; education strategy and organization behaviour. The total participants were 13 and well-known scholars of higher education in Taiwan.

Research process
The draft PMIs questionnaire referred international educational EIs to establish the indicators. The operating performance indicator questionnaire was developed using the Likert scale measured responses (range, one representing very unsuitable to seven representing very suitable). Mean value (ME) and standard deviation value (SD) of each indicator was calculated to provide a reference for professionals when deciding which indicators can be eliminated:

- The first Delphi questionnaire. Revision to the draft indicators established in this research were sought on certain measurement indicator, and was provided an open suggestion column where professional team members can make suitable recommendations and amendments to the questionnaire topics or other suggestions.
• The second Delphi questionnaire. Data analysis of the second Delphi investigation questionnaire was conducted by transforming each indicator into a percentage level as of 75 ($P_{75}$). When ME $\geq 5.25$ indicated that a particular indicator should be retained. When ME $< 4.0$, indicated that during the evaluation process, this indicator received very low scores and was, thus, eliminated.

• The third Delphi questionnaire. Data analysis of the third Delphi questionnaire was calculated from the ME and SD of PMIs whose suitability was determined by Delphi members and used to either amend or retain indicators. When ME $\geq 5.25$ and SD $< 1$, showed that the participants highly approved of the indicator during evaluation process and there was a very small variance; thus, this indicator should be retained. When $4.0 \leq ME < 5.25$ and SD $< 1$, were amended based on Delphi members’ suggestions. When ME $< 5.25$ and SD $> 1$, means that the indicator should be eliminated. After performing these analyses for each indicator, a final university PMIs was constructed.

Research results
After a literature analysis and three times of Delphi agreement, to compare the 18 measurement dimensions with general opinions of scholars in respective countries, it states in Table I and presented the complete list of PMIs in Table II. The appropriate order of the 18 measurement dimensions is as follows: school reputation; development target and characteristics; academy exchange; administration resources; teaching resources; curriculum planning; graduate’s career planning; research results; social responsibility; teaching quality; student retention rate; faculty resources; financial resources; financial donations; student quality; tutorship results; continuous education services; and student structure.

Application of performance measure indicators
Drucker (1990) argued that educational institutions are non-profit organizations that should learn from business for effective management models and that business should also learn non-profit organizations for models of how to manage with a mission (Drucker, 1990). Non-profit organizations have no survival pressure and external competition is limited. Thus, it is not easy to establish certain PMI while the society becomes increasingly pluralistic and competition increases; service organizations typically limit their focuses on mission, strategy, and performance management. Many businesses or organizations implement BSC or a six sigma method, etc. to promote organization improvement, which satisfies customer requirement and achieves a sustainable operation. Therefore, BSC is the best performance management tool. BSC has been widely used and achieved outstanding results in manufacturing and service industries, non-profit and government organizations (Kaplan and Norton, 2001b). Performance measures are the core of the BSC system (Niven, 2002). To construct complete and good performance BSC must have proper key performance indicators (KPIs) (Kaplan and Norton, 2001a; Niven, 2002). PMIs are the tools to measure strategic target achievement and ensure that strategic operation is workable. It specifies referent and it can also direct staff in how to contribute to an organization’s overall targets (Niven, 2002). Each school should establish its core competitiveness that based on its mission and vision and also its current resources and competitiveness conditions. Thus, different strategic themes will produce different strategic targets and the
resulting PMIs. When increasing numbers of strategic themes or targets are developed, the number of PMIs will also increase. Hence, this study employed the established PMIs to identify the important KPIs and then implemented four perspective of BSC as performance measures.
<table>
<thead>
<tr>
<th>Dimensions</th>
<th>PMIs</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>School reputation</td>
<td>School reputation</td>
<td>6.14</td>
</tr>
<tr>
<td></td>
<td>Customer satisfaction</td>
<td>6.14</td>
</tr>
<tr>
<td></td>
<td>Evaluation level examine by MOE</td>
<td>6.09</td>
</tr>
<tr>
<td>Development target and characteristics</td>
<td>Medium and long term plan of university</td>
<td>6.14</td>
</tr>
<tr>
<td></td>
<td>University education perspective and target</td>
<td>6.14</td>
</tr>
<tr>
<td></td>
<td>University development characteristics</td>
<td>6.09</td>
</tr>
<tr>
<td></td>
<td>Plan content and operation in each college</td>
<td>5.93</td>
</tr>
<tr>
<td>Academy exchange</td>
<td>Number of academy exchanges with university</td>
<td>5.81</td>
</tr>
<tr>
<td></td>
<td>Result of academy exchange with university</td>
<td>5.91</td>
</tr>
<tr>
<td>Administration resource</td>
<td>Student/staff ratio</td>
<td>6.13</td>
</tr>
<tr>
<td></td>
<td>Administration facilities expense</td>
<td>5.50</td>
</tr>
<tr>
<td></td>
<td>Staff expense/total expense ratio</td>
<td>5.62</td>
</tr>
<tr>
<td></td>
<td>Teacher and student satisfaction</td>
<td>6.24</td>
</tr>
<tr>
<td></td>
<td>e-process ratio</td>
<td>5.91</td>
</tr>
<tr>
<td>Teaching resources</td>
<td>Average facility expense per student</td>
<td>6.17</td>
</tr>
<tr>
<td></td>
<td>Average library cost per student</td>
<td>6.07</td>
</tr>
<tr>
<td></td>
<td>Ratio of total funding to each student</td>
<td>6.00</td>
</tr>
<tr>
<td></td>
<td>Average student per article in library</td>
<td>5.86</td>
</tr>
<tr>
<td></td>
<td>Teacher research space allocation</td>
<td>5.21</td>
</tr>
<tr>
<td></td>
<td>Classroom and learning space ratio</td>
<td>5.50</td>
</tr>
<tr>
<td>Curriculum planning</td>
<td>Curriculum planning</td>
<td>6.14</td>
</tr>
<tr>
<td></td>
<td>Curriculum development characteristics</td>
<td>6.07</td>
</tr>
<tr>
<td></td>
<td>Curriculum e-process ratio</td>
<td>6.14</td>
</tr>
<tr>
<td></td>
<td>Curriculum efficiency evaluation and improvement</td>
<td>6.00</td>
</tr>
<tr>
<td>Graduate's career planning</td>
<td>Graduate’s career</td>
<td>5.50</td>
</tr>
<tr>
<td></td>
<td>Alumnus performance</td>
<td>5.86</td>
</tr>
<tr>
<td></td>
<td>Popularity of alumnus in business</td>
<td>5.93</td>
</tr>
<tr>
<td>Research results</td>
<td>Integration research and planning</td>
<td>6.14</td>
</tr>
<tr>
<td></td>
<td>Average funding and number of grant per teacher</td>
<td>5.86</td>
</tr>
<tr>
<td></td>
<td>Paper published in journal per teacher</td>
<td>6.09</td>
</tr>
<tr>
<td></td>
<td>Paper published in renowned Journal per teacher</td>
<td>6.09</td>
</tr>
<tr>
<td></td>
<td>Books published per teacher</td>
<td>5.21</td>
</tr>
<tr>
<td></td>
<td>Sum of research plan per full time teacher</td>
<td>5.64</td>
</tr>
<tr>
<td></td>
<td>Number of paper published in conference per teacher</td>
<td>5.50</td>
</tr>
<tr>
<td></td>
<td>Average full time teacher license</td>
<td>5.21</td>
</tr>
<tr>
<td></td>
<td>Average full time teacher patent or invention</td>
<td>5.21</td>
</tr>
<tr>
<td>Social responsibility</td>
<td>Participate in social services</td>
<td>5.79</td>
</tr>
<tr>
<td></td>
<td>Participate local culture</td>
<td>5.50</td>
</tr>
<tr>
<td></td>
<td>Participate charity activities</td>
<td>5.64</td>
</tr>
<tr>
<td>Teaching quality</td>
<td>Student/teacher ratio</td>
<td>6.18</td>
</tr>
<tr>
<td></td>
<td>Concepts and practices for improving teaching quality</td>
<td>6.14</td>
</tr>
<tr>
<td></td>
<td>Curriculum planning of faculty</td>
<td>5.71</td>
</tr>
<tr>
<td></td>
<td>Full time teacher to student ratio</td>
<td>5.64</td>
</tr>
<tr>
<td></td>
<td>Part time teacher and student ratio</td>
<td>5.00</td>
</tr>
<tr>
<td></td>
<td>Implementation of teacher teaching evaluation system</td>
<td>5.21</td>
</tr>
<tr>
<td></td>
<td>Number of student in one class</td>
<td>5.79</td>
</tr>
</tbody>
</table>

Table II.
Higher education PMIs (continued)
Some KPIs are lead indicators or lag indicators distinction (Table III). Lead indicators can identify anteriorly symptoms of organization management, and lag indicators require time to reflect an organization’s management performance. Some indicators have different characteristics in the distinct perspective. For example, customer satisfaction is a lead indicator on customer perspective. When "customer satisfaction" is poor, then it would cause lag indicator to produce “temporary drop out rate” and “withdraw rate” as well as the “school reputation” of lead indicator. When school reputation is excellent, the “registration rate” of lag indicator would be fine. In an internal process perspective analysis, when the internal process of school has a complete mid – and long-term plan and PhD level staff, it can promote e-services and e-teaching. Then “e-process ratio”, “medium and long-term university plan”, and “ratio of teacher with PhD” are lead indicators. When the internal process planning is perfect, customers (students, teachers, parents, businesses) will be satisfied. In such a situation, customer satisfaction becomes a lag indicator. Schools should control lead indicators so that can surpass other universities and by applying KPIs to measure school management performance and promote school competition, a university can surpass its competitors.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>PMIs</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student retention rate</td>
<td>Average graduation rate</td>
<td>5.21</td>
</tr>
<tr>
<td></td>
<td>Freshman retention</td>
<td>5.50</td>
</tr>
<tr>
<td></td>
<td>Temporary drop out rate</td>
<td>5.93</td>
</tr>
<tr>
<td></td>
<td>Withdraw rate</td>
<td>5.93</td>
</tr>
<tr>
<td>Faculty resources</td>
<td>PhD ratio</td>
<td>6.14</td>
</tr>
<tr>
<td></td>
<td>Faculty personnel expense to income rate</td>
<td>5.50</td>
</tr>
<tr>
<td></td>
<td>Ratio of assistant professor</td>
<td>5.64</td>
</tr>
<tr>
<td></td>
<td>Full/part time teacher ratio</td>
<td>5.21</td>
</tr>
<tr>
<td></td>
<td>Ratio of full time teacher education’s level</td>
<td>5.50</td>
</tr>
<tr>
<td></td>
<td>Ratio of full time teacher job positions</td>
<td>5.29</td>
</tr>
<tr>
<td>Financial resources</td>
<td>Organization and activities circumstances in each course</td>
<td>5.32</td>
</tr>
<tr>
<td></td>
<td>Return on investment (ROI)</td>
<td>5.93</td>
</tr>
<tr>
<td></td>
<td>Economic value added (EVA)</td>
<td>5.93</td>
</tr>
<tr>
<td></td>
<td>Total ratio of other expense to income</td>
<td>5.00</td>
</tr>
<tr>
<td>Financial donations</td>
<td>Ratio of alumnus donation</td>
<td>5.14</td>
</tr>
<tr>
<td></td>
<td>Donation capital from business</td>
<td>5.93</td>
</tr>
<tr>
<td>Student quality</td>
<td>Conditions for student entry</td>
<td>5.00</td>
</tr>
<tr>
<td></td>
<td>Registration rate</td>
<td>6.09</td>
</tr>
<tr>
<td></td>
<td>Student entry methods</td>
<td>5.19</td>
</tr>
<tr>
<td>Tutorship result</td>
<td>Number of student attend societies</td>
<td>5.00</td>
</tr>
<tr>
<td></td>
<td>Society performance</td>
<td>5.64</td>
</tr>
<tr>
<td></td>
<td>Staff tasks promotion performance</td>
<td>5.24</td>
</tr>
<tr>
<td></td>
<td>Graduate career counseling and follow-up</td>
<td>5.50</td>
</tr>
<tr>
<td>Continuous education services</td>
<td>Ratio of part time teacher who promote education</td>
<td>5.07</td>
</tr>
<tr>
<td></td>
<td>Ratio of new class hours and proper course hours</td>
<td>5.14</td>
</tr>
<tr>
<td></td>
<td>Overall education continuous plan</td>
<td>5.00</td>
</tr>
<tr>
<td></td>
<td>Open different number continuous education</td>
<td>5.93</td>
</tr>
<tr>
<td></td>
<td>Number of conditions of business and school cooperation in education promotion</td>
<td>5.14</td>
</tr>
<tr>
<td>Student structure</td>
<td>Postgraduate/undergraduate ratio</td>
<td>5.14</td>
</tr>
<tr>
<td></td>
<td>Part time/full time student ratio</td>
<td>5.14</td>
</tr>
</tbody>
</table>

Table II.
Case study

The current conditions of higher education analysis in Taiwan

Globalization should effect the changes to the following areas: organizational structures, funding allocation, establishment of research-oriented universities; and, the development of educational partnerships and strategic alliances. Tang (2001) employed strength, weakness, opportunities and threats analysis to higher education operational strategy studies and emphasized the importance of establishing a university internal quality system and external targets to increase the competitiveness of a university.

Thereby, to ensure that education perspectives are in line with the current higher education situation, the following should be used in an analysis (Yang and Chen, 2004):

1. Aspects of growth affecting opportunity in higher education:
   - huge increase in the numbers of universities; and
   - Mainland China allows Taiwanese students to relocate for study.

2. Population enrolling in higher education is gradually decreasing.

---

### Table III.
KPI applying in the BSC

<table>
<thead>
<tr>
<th>TQM 21,3</th>
<th>230</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Customer perspective</th>
<th>Lag indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer satisfaction</td>
<td>Temporary drop out rate</td>
</tr>
<tr>
<td>Student/staff ratio</td>
<td>Withdraw rate</td>
</tr>
<tr>
<td>School reputation</td>
<td>Registration rate</td>
</tr>
<tr>
<td>Participate in social services</td>
<td>Ratio of freshman retention</td>
</tr>
<tr>
<td>Participate charity activities</td>
<td>Ratio of alumnus donation</td>
</tr>
<tr>
<td>Popularity of alumnus in business</td>
<td></td>
</tr>
<tr>
<td>Alumnus performance</td>
<td></td>
</tr>
<tr>
<td>Evaluation level examine by MOE</td>
<td></td>
</tr>
</tbody>
</table>

| Internal process perspective | |
| --- | |
| E process ratio | Customer satisfaction |
| Curriculum e-process ratio | Number of student attend societies |
| Medium and long term plan of university | Temporary drop out rate |
| PhD ratio | Withdraw rate |
| Student/staff ratio | Ratio of total funding to each student |
| Teacher/staff | |
| Average facility expense per student | |

| Learning and growth perspective | |
| --- | |
| PhD ratio | Average funding and number of grant per teacher |
| Integration research and planning | Paper published in Journal per teacher |
| Number of academy exchange with university | Sum of research plan per full time teacher |
| Integration research and planning | Staff obtaining qualification rate |
| Average library cost per student | Staff obtaining patent rate |
| Ratio of total funding to each student | Average full time teacher patent or invention |
| Curriculum e-process ratio | |

| Financial perspective | |
| --- | |
| Temporary drop out rate | Tuition incomes |
| Withdraw rate | ROI |
| Registration rate | EVA |
| Faculty personnel expense to income rate | Ratio of alumnus donation |
| Open different number continuous education | Donation capital from business |
(3) Aspects of education policy and legislation revision:
   • revision process for policies is too slow to head off potential problems and schools are unable to develop their own style and characteristics to conform to the communities culture.

(4) Aspects of education funding and expenditure:
   • government grants have been reduced every year and currently there is a funding allocation dilemma.

(5) Aspects of current reform to the school entrance system:
   • incomplete entrance system which causes numerous problems.

(6) Aspects of operational attitudes:
   • private schools operated as family businesses do not have uniform quality; and
   • non-profit organizations lack visions and missions.

(7) Aspects of integration strategy:
   • integrating universities unable to produce effective economies of scale; and
   • integration policy is unable to solve current urgent problems resulting in wasted precious national resources.

(8) Aspects of higher education becoming popular:
   • higher education is becoming increasingly popular as student proficiency levels fall.

These analyses assist in understanding difficulties faced by higher education sector, and further, lead to new management and improvement strategies.

_BSC framework of case study_  
The case study is a private university situated in central Taiwan. It is a higher-education technology institution that fits the definition of a non-profit organization. It now has a total of 14 departments, 6,300 students, and 324 staff members. The school studied in this case listed four major strategic themes in “adequate financial structure”, being in “accordance with customer expectations”, “excellent learning environments”, and “high-quality staff members” (Table IV). Each strategic theme had corresponding targets. The four major perspectives had their own PMIs, which were in accordance with the requirements of Kaplan and Norton (2001a) and Niven (2002). For example: To achieve the strategy theme of customer perspective (accord with customer expectation), the aim is to “increase customer satisfaction”. The KPIs have the customer satisfaction; student/staff ratio; temporary drop out rate; withdraw rate; and registration rate. The second strategic target of “promoting school image” aims to achieve recognition by attending public charities and community cultural events with a view to promoting the school image and reputation. The KPIs have the school reputation, alumnus performance, participate in social services and evaluation level examine by MOE. All strategic themes and targets, including PMIs, were discussed and confirmed by the BSC special team, and all were fully supported by senior supervisors. Moreover, the strategy themes with the combination of four major perceptive of BSC achieved performance measurement, strategy management and communications.
<table>
<thead>
<tr>
<th>Perspectives</th>
<th>Strategic themes</th>
<th>Strategic targets</th>
<th>KPIs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer</td>
<td>Accord with customer expectation</td>
<td>Increase customer satisfaction</td>
<td>Customer satisfaction</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Student/teacher ratio</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Student/staff ratio</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Temporary drop out rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Withdraw rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Registration rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Promote school image</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>School reputation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Alumnus performance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Participate in social services</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Evaluation level examine by MOE</td>
</tr>
<tr>
<td>Internal process</td>
<td>Excellent learning environment</td>
<td>Establish high quality service process</td>
<td>Student/staff ratio</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Administration facilities expense</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Customer satisfaction</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>E-process ratio</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PhD ratio</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Curriculum e-process ratio</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ratio of total funding to each student</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Average facility expense per student</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PhD ratio</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Integration research and planning</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Paper published in Journal per teacher</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff obtaining qualification rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff obtaining patent rate</td>
</tr>
<tr>
<td>Learning and growth</td>
<td>High quality of staffs</td>
<td>Increase staff quality</td>
<td>Tuition incomes</td>
</tr>
<tr>
<td>Financial</td>
<td>Adequate financial structure</td>
<td>Increase income</td>
<td>Donation capital from business</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ratio of alumnus donation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ROI</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EVA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Registration rate</td>
</tr>
</tbody>
</table>
The major benefits of the study achieved BSC can be summarized as follows:

- The university registration rate reached above 92 per cent in the past three years since the method was first implemented in 2005.
- The customer satisfaction reached above 87.3 per cent including student and faculty satisfaction.
- The e-teaching service performance ranked first in all university in central Taiwan.
- Emphasizing performance management and combining this with a proper budgetary system provided a suitable budget to encourage excellent faculty members.
- The case had passed ISO 9000 in managing education and training. Moreover, it satisfied customer demands, not just improve and centralize current activities.
- The university’s mission and vision were enunciated and communicated clearly, thus facilitating effective efforts were shared among students and staff in achieving the goals.

Conclusion
This study invited Taiwanese experts and scholars in the education organization that referred to both Taiwanese and international EIs to examine 18 dimensions, and 78 PMIs through the Delphi methodology. This study recommends that universities use these indicators for self-appraisal to measure the operating performance of each department. These indicators can be strictly designed as clear and complete as possible for checking the performance of each university. Therefore, the funding allocation can be based on the operated results. The final result engenders a competitive atmosphere among institutions, encourages each institution to develop a unique market niche, and improves operational efficiency. A best-performance measurement system can effectively connect organization perspective and strategies, integrate different operational targets and organization functions combined with faculty performance.

After establishing PMIs, these indicators can be transformed into four major aspects of KPIs in BSC. These indicators, on the one hand, can serve as a judgment to choose proper PMIs according to each country and higher education institutions and prompt the formation of new strategies as well as performance measurement on the other. Each university can then use this to develop its objectives and strategies that transfer to operation phrases as core of organization resources to fulfill each member’s daily task, focus on its education mission and vision, apply a strategy of major breakthrough, and promote service quality because high service quality can satisfy customer requirement and overcome customer expectations.

References


MOE Highest Commander (2003), “University evaluation”, available at: www.high.edu.tw/01/01.htm


**Corresponding author**
Shun-Hsing Chen can be contacted at: g9102409@cycu.org.tw

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

Maria Colurcio

Business Analysis, Magna Græcia University of Catanzaro, Catanzaro, Italy

Abstract

Purpose – The purpose of this paper is to investigate the role of total quality management (TQM) as a knowledge enabler in the creation and exploitation of organisational knowledge.

Design/methodology/approach – This qualitative investigation adopts a case-study methodology to analyse the role of TQM in knowledge creation in 21 prominent firms, utilising an investigation framework based on the “socialisation,” “externalisation,” “combination,” and “internalisation” model of knowledge generation.

Findings – TQM is shown to be an effective enabler of knowledge generation. TQM provides policies and tools (such as general involvement of all employees, teamwork, feedback mechanisms, and widespread communication) that are inherently useful as enablers of knowledge creation and dissemination.

Research limitations/implications – Future studies should investigate the specific causal nexus between TQM and product innovation.

Practical implications – TQM can be utilised to support an organisation’s utilisation of corporate knowledge as a real source of competitive advantage.

Originality/value – Empirical research on knowledge and quality management is scanty. This paper addresses the gap by empirically examining the relationship between TQM and knowledge creation.

Keywords Total quality management, Knowledge management, Knowledge creation, Learning

Paper type Research paper

1. Introduction

Firms have become increasingly interested in making effective use of the knowledge that continuously develops within their organisations. The capacity to organise and manage processes in a manner that facilitates the creation and sharing of knowledge within the organisation has become a significant competitive asset (Nonaka and Takeuchi, 1995; von Krogh and Roos, 1995; von Krogh et al., 1998). The important role played by intangible resources (such as knowledge) in gaining a sustained competitive advantage has been emphasised by various authors who have adopted a resource-based view (Itami, 1987; Vicari, 1991; Rullani, 1992; Barney, 1991) and by those who have applied Barney’s (1997) “valuable,” “rare,” “inimitable,” and “organised” framework to knowledge (Probst et al., 1998).

Against this background, the notion of “knowledge enablers” has received increasing attention from several authors (Ichijo et al., 1998; von Krogh et al., 2000). Knowledge enablers are organisational mechanisms that facilitate both the random occurrence and the systematic development of knowledge within an organisation. Five such knowledge enablers have been identified in the literature (Ichijo et al., 1998; von Krogh et al., 2000):

(1) instilling a knowledge vision;
(2) developing and managing an “organisational conversation”;

...
creating the right context by developing an organisational structure that facilitates knowledge creation;
managing caring relationships; and
disseminating local knowledge across several organisational levels.

Such enablers are especially significant in facilitating knowledge sharing and interaction among members of the organisation, thereby transforming individual knowledge into organisational knowledge (Ichijo et al., 1998). In the view of von Krogh et al. (2000), knowledge creation requires an enabling context.

Several authors have adopted such a knowledge-based view of total quality management (TQM) and its potential to facilitate knowledge creation and sharing (Grant et al., 1994; Zairi and Yousef, 1995; Thiagarajan and Zairi, 1997; Sitkin et al., 1994; Shiba et al., 1990; Graham and Shiba, 1993). In this regard, it has been noted that the implementation of quality systems is inherently linked to organisational learning (Fine, 1986; Colurcio and Mele, 2006). The adoption of quality principles and methodologies throughout an organisation is recognised as a necessary pre-condition for the development of a modern and successful enterprise; similarly, it is acknowledged that a primary source of competitive advantage is constituted by a continuous process of knowledge creation (Nonaka and Takeuchi, 1995; Mele, 2003). TQM would thus seem to have the potential to satisfy some fundamental organisational needs by facilitating the attainment of advanced levels of knowledge that exceed actual operational needs and that can be translated into continuous improvement processes and innovative solutions.

Despite the apparent affinity that exists between TQM and enhanced organisational knowledge, empirical studies of the link between quality systems and knowledge creation are scanty. The objective of this study is, therefore, to investigate whether TQM really is a knowledge enabler in practice. More specifically, the study aims to discover whether TQM facilitates knowledge creation in terms of new product and process development.

The remainder of this paper is organised as follows. Section 2 reviews the relevant academic literature on knowledge creation, with particular reference to Nonaka’s (1994) theory of knowledge creation. The paper then presents an integrated framework for the empirical study that follows. Using this framework, the paper then discusses the findings of the empirical study. Finally, conclusions are drawn and managerial implications are discussed.

2. Literature review
Researchers have often noted the role played by knowledge in various quality practices, but only recently have academics specifically related knowledge creation and learning to quality management (Linderman et al., 2004). In this regard, Fine (1986) studied learning in terms of conformity and failure costs (that is, the impact of learning on quality levels); Tapiero (1987) analysed the effect of learning on quality control; and Sitkin et al. (1994) attributed an important role to knowledge within TQM in advocating the need for a “total quality learning system” in parallel to a “total quality control system”.

Until the latter half of the 1990s, studies of quality and knowledge in the academic literature were primarily focused on explicit knowledge – that is, knowledge that is easily shared and imitated (Linderman et al., 2004). It was only relatively recently that
Dooley (2001, p. 135) noted that any consideration of TQM and knowledge must consider both tacit knowledge and explicit knowledge:

[...] since the ultimate value of firms depends on knowledge that cannot be imitated, it is reasonable to assume that knowledge which is tacit and not easily imitated, as opposed to explicit knowledge, will grow in importance. For this reason we might expect quality management systems will increasingly focus on tacit knowledge.

Several researchers have noted that a comprehensive theory of knowledge creation is required to develop an integrated perspective of the dynamic relationship between explicit knowledge and implicit knowledge (Colurcio, 2001; Linderman et al., 2004; Ichijo et al., 1998). In this regard, Nonaka’s (1994) four-step model of “socialisation,” “externalisation,” “combination,” and “internalisation” (SECI) proposed four modes of knowledge conversion from the tacit level to the explicit level (and vice versa). According to the SECI model (Nonaka, 1994; Nonaka and Takeuchi, 1995), organisational knowledge creation takes place in a dynamic way within an organisation when:

1. Feelings, experiences, and mental models are shared (that is, tacit to tacit via “socialisation”).
2. Tacit knowledge is exploited in a wider and more conscious way than in its original ambit and becomes conceptual knowledge (that is, tacit to explicit via “externalisation”).
3. Explicit knowledge of different types interact (that is, explicit to explicit via “combination”).
4. Explicit knowledge that is already “socialised,” “externalised,” and “combined” is again transferred into the tacit dimension as experience (that is, explicit to tacit via “internalisation”).

More recently, Linderman et al. (2004) integrated the quality dimensions proposed by Sitkin et al. (1994) and the knowledge-creation process proposed by Nonaka (1994) to develop a theoretical framework that links knowledge and quality. This integrated framework is shown in Table I.

3. Research methodology
3.1 Framework for the investigation
Figure 1 illustrates the framework adopted for this empirical study. The framework, which is based on the SECI model (Nonaka, 1994; Nonaka and Takeuchi, 1995), is focused on an organisational knowledge-creation process.

As shown in Figure 1, the socialisation phase is examined by identifying organisational actions that aim to promote interactive teamwork among individuals with a view to pre-existing tacit knowledge being shared.

To analyse the evolution from tacit group knowledge to explicit knowledge (that is, the externalisation phase, followed by the combination phase), the framework focuses on the formalisation of knowledge by the organisation and on internal communication actions that foster knowledge explication by each organisation member.

Finally, to investigate the internalisation phase, the framework focuses on feedback mechanisms to assess the effective implementation of elaborated procedures and tools.
3.2 Research design
The objective of the study was to explore the relationship between the adoption of TQM and the creation of knowledge in large enterprises. To obtain rich and varied data on these qualitative phenomena, the study adopted a case-study methodology (Yin, 1999).

The selection of cases for study was restricted to enterprises that had already adopted TQM and that had a reputation for excellence in quality issues through their involvement with the European Foundation for Quality Management. The final sample consisted of 20 large enterprises from a variety of industries, as shown in Table II.

The field study began with interviews with managers on the subjects of:

- the firm’s TQM model;
- the firm’s new product development (NPD) model;

<table>
<thead>
<tr>
<th>Quality</th>
<th>Knowledge</th>
<th>Externalisation</th>
<th>Combination</th>
<th>Internalisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer satisfaction Tacit → tacit</td>
<td>Extent of interactions between organisational members and customers</td>
<td>Tacit → explicit</td>
<td>Explicit → explicit</td>
<td>Explicit → tacit</td>
</tr>
<tr>
<td>Continuous improvement Extent of improvement between organisational members in improvement activities</td>
<td>Extent that improvement ideas are articulated in the form of theories, concepts, or cause-and-effect reasoning</td>
<td>Extent of information analysis conducted on customer data</td>
<td>Extent of ongoing process monitoring and control</td>
<td></td>
</tr>
<tr>
<td>System view Extent of interactions between heterogeneous organisational members</td>
<td>Extent that organisation conceptualizes the purpose and the aim of system</td>
<td>Extent that organisation synthesizes information from heterogeneous sources</td>
<td>Extent that organisation consistently acts in conformance with its purpose, aim, and strategy</td>
<td></td>
</tr>
</tbody>
</table>

**Source:** Linderman et al. (2004, p. 596)

<table>
<thead>
<tr>
<th>Tacit knowledge to Explicit knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tacit knowledge</td>
</tr>
<tr>
<td>Team work (socialization)</td>
</tr>
<tr>
<td>Organizational formalization (externalization)</td>
</tr>
<tr>
<td>Feedback mechanisms and procedures (internalization)</td>
</tr>
<tr>
<td>All employees involvement and sharing objective (combination)</td>
</tr>
</tbody>
</table>

**Table 1.** Integration of knowledge and quality management

**Figure 1.** The investigation framework
other relevant internal variables (operative procedures, organisational structure); and

other relevant external variables (competitive positioning, business image).

The interviewees were all responsible for their particular company’s quality-management practices and NPD processes. This ensured that the study’s data were derived from people with first-hand knowledge and experience of the investigated phenomena.

Data triangulation (Mari, 1994) was also employed using a variety of tools, such as documentary analysis, direct observation, and informal conversations.

### 4. Findings

#### 4.1 Socialisation stage

The socialisation process enables individuals to share experiences with each other and to share tacit knowledge (such as technical abilities and mental models). In the investigated firms, the key to the development of socialisation was identified as a form of on-the-job training, whereby individuals utilised observation and imitation to learn skills and work procedures.

In all of the firms studied here, the socialisation stage was dependent on leadership from senior management to engender a commitment to quality and to coordinate resources for the achievement of quality objectives. Several authors have noted the importance of leadership from senior management in this regard (Zairi and Youssef 1995a, b; Deming, 1986; Schoenberger, 1994; Scarnati and Scarnati, 2002). As Zairi and Youssef (1995a, p. 38) observed: “[…]leadership in the context of TQM is not about power, authority and control; it is more about empowerment, recognition, coaching and developing others”.

---

<table>
<thead>
<tr>
<th></th>
<th>Firms</th>
<th>Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>ABB-SAE</td>
<td>Power and automation technology</td>
</tr>
<tr>
<td>2.</td>
<td>Alcatel</td>
<td>Telecommunication</td>
</tr>
<tr>
<td>3.</td>
<td>Canon</td>
<td>Information technology</td>
</tr>
<tr>
<td>4.</td>
<td>Compaq</td>
<td>Electronic</td>
</tr>
<tr>
<td>5.</td>
<td>Hewlett-Packard</td>
<td>Information technology</td>
</tr>
<tr>
<td>6.</td>
<td>Honeywell</td>
<td>Electronic</td>
</tr>
<tr>
<td>7.</td>
<td>IBM Semea</td>
<td>Information technology</td>
</tr>
<tr>
<td>8.</td>
<td>Italtel</td>
<td>Telecommunication</td>
</tr>
<tr>
<td>9.</td>
<td>Kodak Italia</td>
<td>Optical</td>
</tr>
<tr>
<td>10.</td>
<td>Magneti Marelli</td>
<td>Electronic</td>
</tr>
<tr>
<td>11.</td>
<td>Motorola</td>
<td>Telecommunication</td>
</tr>
<tr>
<td>12.</td>
<td>Nestlé</td>
<td>Food</td>
</tr>
<tr>
<td>13.</td>
<td>Nokia</td>
<td>Telecommunication</td>
</tr>
<tr>
<td>14.</td>
<td>Pirelli</td>
<td>Rubber and cables</td>
</tr>
<tr>
<td>15.</td>
<td>Siemens</td>
<td>Automation</td>
</tr>
<tr>
<td>16.</td>
<td>Sodalia</td>
<td>Telecommunication</td>
</tr>
<tr>
<td>17.</td>
<td>S&amp;T Microelectronics</td>
<td>Automation</td>
</tr>
<tr>
<td>18.</td>
<td>Texas Instruments</td>
<td>Electronic</td>
</tr>
<tr>
<td>19.</td>
<td>3M Italia</td>
<td>Chemical</td>
</tr>
<tr>
<td>20.</td>
<td>Xerox</td>
<td>Information technology</td>
</tr>
</tbody>
</table>

Table II. The research sample
All of the studied firms fostered teamwork to facilitate the sharing of tacit knowledge and to encourage the involvement of employees.

In Siemens’ managerial guidelines (entitled “information for managers”), which contain managerial advice on TQM, all subsidiaries are encouraged to “share in house experience”. All business units are assessed annually with respect to the implementation of best practice with regard to the sharing of information. The leadership policy deployed by Siemens with respect to TQM and the management of human resources was systematic and effective in promoting teamwork.

At Texas Instruments, teamwork is understood to be a means of assisting employees in their individual careers, as well as being a means of helping employees to gain familiarity with the tools of TQM in their everyday tasks. Teams are trained in both “quality circle” techniques and leadership skills to ensure that TQM tools are shared for problem solving. Within each team, a leader is chosen, and when a particular project has been completed (or the problem that led to the team’s formation has been solved) the leadership role passes to another member.

Teamwork also played a prominent role in the socialisation process among organisation members at ABB-SAE. About four years ago, the company began an experimental project that aimed to stimulate the involvement of all employees in the sharing of objectives and cultural change. This involved the breaking down of all preconceived notions and mental habits. At the beginning, this project in teamwork and team building involved 80 employees who were chosen from among the youngest people in the organisation. Today, such teams are organised throughout the whole company, and teamwork is considered to be a daily routine by which all of the firm’s activities are managed. At ABB-SAE, team building has been developed concurrently with redesign and reengineering of all processes to facilitate learning and the sharing of experiences among all employees.

Teamwork also has a long history at Sodalia, where it is seen as an effective method for developing competencies, fostering knowledge interaction, and facilitating the development of a homogeneous corporate culture. More specifically, teams at Sodalia consist of six or seven individuals, of whom two-thirds have experience and knowledge of the particular matter under consideration whereas the remainder have absolutely no knowledge of it. This procedure highlights the role of so-called “tacit knowledge bags,” which are held by individuals who are not formally involved in specific activities and who are not usually inclined to share the experiences (for reasons of individual shyness or poor motivation).

Other methods to encourage knowledge sharing among employees have been trialled by 3M Italia and by Siemens, in which formal meetings have been constituted to stimulate individual knowledge and improve relationships among employees (Choi and Lee, 2000).

Table III presents a summary of the main actions implemented by the investigated firms to foster the socialisation process.

4.2 Externalisation stage

Formalisation of the knowledge that had been created by sharing and teamwork (in the socialisation stage) was a prominent feature (of the subsequent externalisation stage) in all of the investigated firms. Formalisation of concepts, routines, knowledge, and experiences facilitated the evolution of knowledge from the individual (tacit) level to.
the organisational (explicit) level. In this regard, it is of interest that formalisation is important within many quality systems for:

- legitimising the principles of the quality system; and
- overcoming any opposition to their implementation.

Moreover, formalisation is an important element in such regulatory models as ISO 9000, which had been applied in all of the investigated firms as a preliminary to the full implementation of TQM systems.

According to some of the interviewed managers, such formalisation of created knowledge stimulates access and consultation by everybody, and thus legitimises the crossing-over of functions and the formation of new relationships (Choi and Lee, 2002).

Interesting examples of “electronic formalisation” were apparent in Sodalia, 3M, and Xerox. With the support of efficient computer technology, formalisation in these firms overcame the bureaucratic obstacles that inevitably arise from written documentation. In these firms, formalisation through electronic networking ensured “leaner management” of the quality system because it enabled rapid interaction, consultation, and updating.

In other companies, such as Siemens, formalisation of quality policy was promoted by billposting and printed material delivered to employees with their salaries. Some companies (Nestlé, Kodak, Xerox, and 3M) distributed manuals of company procedure to both managers and employees. This is in accordance with common practice in the deployment of TQM, which, in general terms, is a strategy defined by corporate headquarters and then deployed throughout the organisation as the principles and action plan of TQM are formalised into specific documents, manuals, and quality plans.

Table IV summarises the main actions undertaken by the investigated firms in the externalisation stage.

<table>
<thead>
<tr>
<th>Actions</th>
<th>Level of implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brainstorming</td>
<td>+ +</td>
</tr>
<tr>
<td>Formal meetings</td>
<td>+ +</td>
</tr>
<tr>
<td>Informal events</td>
<td>+ +</td>
</tr>
<tr>
<td>Personalised teamwork</td>
<td>+ + +</td>
</tr>
<tr>
<td>Quality circle</td>
<td>+</td>
</tr>
<tr>
<td>Structured interfunctional conversation</td>
<td>+ +</td>
</tr>
<tr>
<td>Structured conversation</td>
<td>+</td>
</tr>
<tr>
<td>Traditional teamwork</td>
<td>+ + +</td>
</tr>
</tbody>
</table>

Table III. Actions to foster the socialisation stage

<table>
<thead>
<tr>
<th>Actions</th>
<th>Level of implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action plans</td>
<td>+ + +</td>
</tr>
<tr>
<td>Handbook</td>
<td>+ + +</td>
</tr>
<tr>
<td>Information for managers</td>
<td>+</td>
</tr>
<tr>
<td>Intranet procedures</td>
<td>+ +</td>
</tr>
<tr>
<td>Others</td>
<td>+ +</td>
</tr>
</tbody>
</table>

Table IV. Actions to foster the externalisation stage
4.3 Combination stage
All of the companies studied here had policies that aimed to ensure the sharing of knowledge and experiences among all members of the organisation. Human-resource training and management emphasised participation, individual knowledge development, teamwork, and interaction among individuals. Some of the companies had developed excellent programs for involvement of the whole organisation and the sharing of objectives, which stimulated the internalisation of a diffuse organisational culture among all employees and managers.

Within Siemens, senior management had created an enterprise culture based on trust and open dialogue through the *Führungsgespräch* (or “manager interview”), which aimed to optimise the collaboration between managers and their subordinates. The *Führungsgespräch* is a process of structured interviews during which subordinates inform their direct supervisors about what they have gained from their activities and the possibilities for improvement. The supervisor then uses this feedback from various subordinates to formulate the objectives to be achieved in the forthcoming year. This process supports the team-building process and enhances understanding between supervisors and dependants – thus optimising collaboration and the attainment of reciprocal trust.

In Texas Instruments, some programs were identified which, originating within the firm’s TQM system, explicitly recognised the value of cooperation and the results obtained by teamwork. In these programs, the authority to undertake actions is given to the employees. This empowerment moves decision making to parts of the organisation where it can effectively add value to the customer; however, this requires investment in training and communication.

Similarly, empowerment was a TQM factor that had been enthusiastically adopted by Kodak – a company that consciously sets out to stimulate employees’ creativity, encourages the development of quality teams, and promotes effective teamwork in pursuit of quality. A key element of management practice and philosophy in this company was open communication; formal and informal communication mechanisms have been deployed to stimulate an environment of open conversation, disseminated knowledge, and reciprocal trust.

Various other mechanisms for knowledge sharing and the transformation of individual knowledge to the organisational level were noted in 3M, Italtel, Nestlé, and Sodalia. These included such initiatives as:

- the promotion of individual ideas through the use of a suggestion box; and
- the design of a software program that enables all organisational members to express anonymous opinions freely through the company’s intranet.

All of the investigated companies promoted the involvement of employees in organisational sharing, with particular reference to quality targets. Appropriate training and education programs were apparent in all the firms.

Table V summarises the actions developed by the investigated firms to improve the involvement of employees.

4.4 Internalisation stage
Within their own TQM systems, the case companies developed appropriate feedback mechanisms regarding the degree of human resources involvement in TQM and...
employees’ perceptions of the company environment. Almost all of the companies conducted “climate surveys” to ascertain whether work procedures and routines had been transformed effectively. Such analysis enabled the firms to identify gaps in critical areas for which corrective actions were required to achieve desired organisational targets. In such “climate surveys,” all employees were required to complete an anonymous questionnaire about their opinions and perceptions of the current status of the organisation.

In Kodak, the implementation of enterprise resource planning has been used as launching platform for information-monitoring mechanisms. Texas Instruments has instituted an “attitude survey,” together with informal and formal staff meetings. At these meetings, which often originate at the request of employees, information is gathered through focus groups and question-and-answer sessions.

Table VI summarises the feedback mechanisms identified in the investigated firms. To avoid unnecessary repetition, some of the mechanisms identified in earlier stages have been omitted from this table.

5. Discussion
The study has demonstrated that there is a relationship between the implementation of TQM systems and principles and the capacity for knowledge creation within a company. The application of the SECI model (Nonaka and Takeuchi, 1995; Nonaka et al., 2000) in the present study has shown that the fundamental values and procedures of TQM stimulate the development of mechanisms that facilitate the conversion of tacit knowledge into explicit knowledge (and vice versa). Table VII summarises the knowledge-creation process in the firms investigated in this study.

The widespread application of teamwork appeared to be especially effective in exploiting the so-called “tacit knowledge bags” that exist within all organisations. Through inter-functional sharing in a participatory organisational climate, individuals were encouraged to make their tacit knowledge explicit. Moreover, by sharing their knowledge with others, individual employees have become appreciated as thinking

<table>
<thead>
<tr>
<th>Macro actions</th>
<th>Specific actions</th>
<th>Level of implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees training, empowerment, and employees satisfaction</td>
<td>Focus groups</td>
<td>+ +</td>
</tr>
<tr>
<td></td>
<td>Open-door policies</td>
<td>+ +</td>
</tr>
<tr>
<td></td>
<td>Teamwork</td>
<td>+ + +</td>
</tr>
<tr>
<td></td>
<td>Departmental meetings</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Climate interviews</td>
<td>+ + +</td>
</tr>
<tr>
<td></td>
<td>Teamwork</td>
<td>+ + +</td>
</tr>
<tr>
<td></td>
<td>Project team</td>
<td>+ +</td>
</tr>
<tr>
<td></td>
<td>Wide and diffused communication</td>
<td>+ +</td>
</tr>
<tr>
<td></td>
<td>Intranet</td>
<td>+ +</td>
</tr>
</tbody>
</table>

Table VI.
Actions to foster the combination stage

<table>
<thead>
<tr>
<th>Actions</th>
<th>Level of implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee motivation and satisfaction survey</td>
<td>+ + +</td>
</tr>
<tr>
<td>Attitude surveys (gathering perceptions)</td>
<td>+ + +</td>
</tr>
<tr>
<td>Climate interviews</td>
<td>+ +</td>
</tr>
</tbody>
</table>
persons who are capable of making a valuable personal contribution to the improvement of their organisations. There is no doubt that, in the companies studied here, the fostering of teamwork and the encouragement of individual initiative and innovative ideas has meant that the socialisation phase has stimulated the effective sharing of tacit knowledge.

With respect to the externalisation phase, TQM was again shown to have a synergistic role in knowledge creation. This was in accordance with common practice in the deployment of TQM, which is typically disseminated throughout organisations in documents and manuals that specify the principles and action plans of TQM. These practices contributed to the creation of explicit knowledge and the sharing of that knowledge within groups.

With regard to the combination phase, various intra-organisational programs to encourage internal communication and job enrichment were identified in the studied companies. These programs facilitated the development of a common knowledge platform within an organisational culture of trust and open dialogue. It has been noted by Warglien (1990) that organisational knowledge does not exist in itself; rather, it results from the dynamic interaction of the knowledge of various individuals. In this regard, it is apparent that TQM stimulated the sharing of individual knowledge through the involvement of all organisational members, thus combining their knowledge to form a valuable company asset. Moreover, the strongly formulaic nature of TQM appeared to act as a legitimising factor in facilitating the explication and combination of individual knowledge.

With regard to the most delicate phase, the internalisation of knowledge created by all members of the organisation, it emerged that the feedback mechanisms of TQM were eminently suitable for assessing the knowledge of individual employees and for identifying any required corrective actions for improvement.

6. Conclusions and implications
TQM can be understood as a systematic and global approach to enterprise management, based on the logic of management by process, with the aim of continuous improvement in an enterprise’s performances (especially with respect to the utilisation of human resources) in order to satisfy the explicit or implicit expectations of customers and other stakeholders (Shiba et al., 1990; Dean and Bowen, 1994; Grant et al., 1994). On the basis of this study, it is apparent that TQM (as defined above) can be a potent knowledge enabler within an organisation.

Customer satisfaction is at the heart of the whole TQM apparatus, and its dynamic and continuous nature has an inherent capacity to generate creative innovation and knowledge creation. Moreover, TQM’s emphasis on the involvement of all employees,
open communication, and the sharing of objectives stimulates individual ideas and empowerment.

The findings of this study have implications for future research. In particular, future research should investigate the specific causal nexus between TQM and product innovation.

In terms of managerial implications, the study clearly identified the fundamental role played by senior leadership in generating new organisational knowledge. An empowering and open-minded leadership, based on organisational values of sharing and trust, therefore represents an indispensable pre-condition to the generation of effective knowledge-creation mechanisms.

References


Mele, C. (2003), Marketing e Qualità nell’impresa che crea valore, Cedam, Padova.


Further reading

Corresponding author
Maria Colurcio can be contacted at: colurcio@unina.it
Total quality management and supply chain management: similarities and differences

Assadej Vanichchinchai and Barbara Igel
School of Management, Asian Institute of Technology, Pathumthani, Thailand

Abstract

Purpose – The purpose of this paper is to comprehensively review, contrast and compare the differences and similarities between total quality management (TQM) and supply chain management (SCM).

Design/methodology/approach – An extensive overview of the core concepts of TQM and SCM are examined from the literature and are then compared to explore how the philosophical perspectives, goals, evolution, and integration of these concepts could be further developed.

Findings – TQM and SCM have different starting points and primary goals, which can complicate an integrated implementation. However, they have evolved in similar ways to reach the same ultimate goal: customer satisfaction. TQM emphasizes internal (employee) participation and SCM focuses on external (business partners) partnerships but there is a need to emphasize both internal and external partnerships to further strengthen the emphasis on “total” TQM and the entire supply chain in SCM.

Originality/value – This paper is one of the first to discuss comparisons between TQM and SCM. Although both are critical to organizational competitiveness, research so far has tended to focus on either one or the other. A comparative understanding of the philosophies, goals, evolution, and integration of both approaches therefore could improve opportunities for integrated implementation and further research. Thus, this paper can be used as a basis for future empirical studies.

Keywords Quality management, Total quality management, Supply chain management

Paper type Literature review

Introduction

Total quality management (TQM) and supply chain management (SCM) have both played an increasing role in strengthening organizational competitiveness (Sila et al., 2006). In the continually changing global market, quality products alone are no longer enough. New challenges now include a focus on supply to determine the right time and place for product delivery (Chin et al., 2004; Robinson and Malhotra, 2005). International business competition is no longer limited to organizations but now includes the supply chains (Li et al., 2006; Kuei et al., 2001). Although both TQM and SCM are critical to organizational performance, they are rarely studied together (Gunasekaran and McGaughey, 2003; Robinson and Malhotra, 2005; Casadesus and Castro, 2005).

This paper aims to present a comprehensive review of, and comparison between TQM and SCM to identify their similarities and differences. The comparison includes a discussion of the philosophical perspectives, goals, integration, and evolutions of the two approaches. It is not always easy to implement either TQM or SCM on its own. Hence, the difficulties and risks increase when they are integrated. Understanding the conceptual similarities and differences of both approaches however, could improve the conditions for integrated implementation by achieving synergy and avoiding failure. It could also help identify areas for future research opportunities about an integrated TQM and SCM implementation. A comparison of both concepts is summarized in Table I.
Philosophical perspective

TQM has been defined in many ways (Sun, 2000), particularly as a management philosophy (Perry and Sohal, 2001; Khan, 2003; Chan et al., 1999; Terziovski and Samson, 1999) “that encourages cost reduction, the creation of high quality goods and services, customer satisfaction, employee empowerment, and the measurement of results” (Gunasekaran and McGaughey, 2003, p. 361).

Similarly, SCM could also be understood as a management philosophy (Tan et al., 2002; Chan and Qi, 2003). For instance, Lummus and Vokurka (1999, p. 11) reviewed Ellram and Cooper (1993)’s definition, which states that “SCM is an integrating philosophy to manage the total flow of a distribution channel from supplier to ultimate customer.”

Since management philosophy tends to be intangible and aims to describe an ideal, TQM and SCM could be further developed to include innovative management practices, tools, techniques, applications and anything else that would be in line with both conceptual approaches. However, the fact that there is still no consensus on conceptual definitions for TQM and SCM poses obstacles to practical implementation. Therefore, there is a need for a new framework, especially for SCM, since it is particularly difficult to clearly define and therefore, to implement.

Goal

Ultimate goal

Both TQM and SCM aim to achieve customer satisfaction (Gunasekaran and McGaughey, 2003; Gunasekaran et al., 2001; Mills et al., 2004 in Lamey, 1996). There are many strategies to accomplish this ultimate goal. Basically, customers require better product quality, faster delivery and cheaper costs, or quality-delivery-cost (QDC). Organizations must meet these requirements to achieve customer satisfaction.
Primary goal
Crosby (1984) defined quality as defect avoidance (Khanna et al., 2003). The British Standards Institute (BSI, 2000) EN ISO 9001: 2000 and Schroder and McEachern (2002) defined quality as the degree to which a set of inherent characteristics fulfils requirements. Conventional quality control (QC) focuses on specification-based performance or “small-q”. It emphasizes inspection to prevent delivering defect products to customers. Accordingly, Sun et al. (2004), Prajogo and Sohal (2004) as well as Prajogo and Sohal (2001) agreed that TQM focuses more on quality conformance by aiming to deliver error-free products and services. A term that embraces a wider scope for defining quality is the “big Q”, which includes additional customer requirements such as product safety, flexibility, and prompt delivery.

Unlike TQM, SCM basically satisfies customers in terms of delivery or time-based performance. Efficient delivery always leads to cost effectiveness in the supply chain. Chin et al. (2004) and Kuei et al. (2001) reviewed Jayaram et al. (2000)’s comprehensive overview of the SCM literature and concluded that the issue of timing receives special attention in SCM research. SCM aims to respond to customers as quickly as possible, at the right time and place at the lowest cost possible. Samaranayake (2005) also noted that SCM aims to achieve speed-to-market, agility and the flexibility to respond quickly to customer requirements at minimum cost. Moreover, several SCM researchers (Chase et al., 2007; Simchi-Levi et al., 2008; Lummus and Vokurka, 1999; Lummus et al., 2003) have agreed that SCM emphasizes the flow of materials and information throughout the entire supply chain. This might be because traditional SCM focused on physical distribution (Gilmour, 1999; Croom et al., 2000). Several other methods/tools applied in SCM practice include the following: the quick response (QR) in the textile industry; efficient consumer response (ECR) in the grocery industry and the just-in-time (JIT) approach in the automotive industry.

Although TQM and SCM share the same ultimate goal, which is customer satisfaction, their primary goals are different, as implied by the emphasis on “quality and supply.” Better quality and a faster delivery always lead to lower costs. Finally, better QDC enhances customer satisfaction and the competitiveness of the whole supply chain. In some cases, there may be a trade-off if conflict arises between quality and delivery performance, and this is when the difference in primary goals can present potential problems in implementing an integrated TQM and SCM approach. On the other hand, there is synergy in the ultimate goal, since both TQM and SCM aim to achieve customer satisfaction. Therefore, more research needs to be done to further explore the potential areas of conflict and synergy that practitioners need to be aware of in terms of methodology.

Origin and evolution
From quality inspection to TQM
Quality management (QM) first focused only on quality inspection, and then included QC, quality assurance (QA) and finally TQM. The traditional QM approach was reactive and result-oriented, whereas the modern approach to QM is broader and now also emphasizes quality at source or process control, at every stage, to prevent any errors that could cause defects. The latter is a proactive process-oriented approach (Mehra and Agrawal, 2003).

Quality inspection deals with counting, grading and sorting to ensure that customers do not receive defective products. QC, on the other hand, applies various
statistical QC techniques such as control charts and sampling plans to monitor processes (Lau et al., 2004). QA emphasizes process control to conform to customer requirements (Prajogo and Sohal, 2004). In 1956, Dr Feigenbaum presented a paper entitled, “Total Quality Control (TQC)”. Later, in 1968, Ishikawa (1990) introduced the concept of company wide QC (CWQC) in Japan. Conceptually there is no significant difference between TQC and CWQC (Martinez-Lorente et al., 1998). Later, the term “control” was replaced by “management” because quality is not only a control issue, but also a management issue. TQC and CWQC are now used interchangeably with TQM (Duffin, 1995; Akao, 1991). Many countries have developed this further by developing their own TQM frameworks, which are used as the basis for national quality award criteria, to promote quality awareness and to improve their business sectors such as the Malcolm Baldrige National Quality Award (MBNQA).

Some researchers have defined different levels of TQM development. For instance, Chin et al. (2002) identified five stages of development: unaware; uncommitted; initiator; improver; and achiever (Lau et al., 2004). Prabhu et al. (2000) classified QM according to another set of five levels: could do better; room for improvement; promising; vulnerable; potential winners; and world class.

From logistics to seamless SCM
SCM first appeared in 1982 (Lee and Kincade, 2003). It originated from the way in which Toyota managed relationships with suppliers and customers (Cox, 1999) and then it shared many common practices with Toyota’s JIT (Gimenez, 2004). Initially, SCM focused on logistics (Gilmour, 1999). After that, its evolution was still along the lines of physical distribution (Croom et al., 2000; Tan et al., 2002). Thus, several SCM researchers defined SCM as integrated logistics management (Romano and Vinelli, 2001). Dotson et al. (2003) also stated that SCM refers to logistics management. In some organizations, SCM and logistics are still used interchangeably (Varma et al., 2006). However, Mills et al. (2004) argued that Johnson and Wood (1996) and Cooper et al. (1997) found that the current scope of SCM goes beyond logistics. It has evolved to cover not only the operational level but also the strategic level of both internal functions and external business partners. This wider scope encourages synergy and cross-functional collaboration among all partners: customers, suppliers, marketing, purchasing, production, and logistics. Specific industries have also applied SCM methods/tools such as QR, ECR, and JIT to improve efficiency and the effectiveness of operational supply. At present, the scope of SCM also covers marketing, product development and commercialization, product return and recycling (Lockamy and McCormack, 2004b; Mills et al., 2004).

Some SCM researchers have attempted to define the levels of SCM development in organizations in ways similar to TQM. For example, Lockamy and McCormack (2004a) introduced the SCM maturity model, which has five stages: ad hoc; defined; linked; integrated; and extended. Stevens (1989) introduced the following four levels of SCM maturity: baseline; functional integration; internal integration; and external integration. The Performance Management Group and Pittiglio, Rabin, Todd and McGrath jointly identified these four stages of SCM maturity (Cohen and Roussel, 2004): functional focus; internal integration; external integration; and cross-enterprise collaboration.

It could be observed that the stages within these SCM maturity levels started when a stronger relationship developed among the internal functions. Therefore, since SCM
starts from a weak coordination among the internal functions, it matures into an ultimate integration among external business partners. Ideally, the entire supply chain should be viewed as a single system, or the so-called “seamless supply chain” (SSC), which is defined as “the state of total integration in which all players think and act as one” (Towill et al., 2002, p. 89). If TQM represents a superior QM, SSC could be a superior form of SCM. However, there is still no consensus on a common definition of superior SCM.

SCM has been described in various terms: supplier integration; partnerships; supply base management; supplier alliances; supply chain synchronization (Tan et al., 2002); network sourcing; supply pipeline management; value chain management; and value stream management (Croom et al., 2000; Romano and Vinelli, 2001); and as a demand chain (Kotzab and Otto, 2004 in Vahrenkamp, 1999; Blackwell and Blackwell, 1999). The primary goals of QM and SCM target quality and delivery, respectively. If the term QA is used to represent operational quality (e.g. ISO 9000, ISO/TS 16949, and HACCP), either supply assurance or delivery assurance might be employed to represent operational SCM (e.g. QR, ECR, and JIT). If the term TQM is referred to as the superior QM, total supply management or total delivery management might be used to describe the superior SCM.

Supply chain quality management
TQM and SCM are still being developed in terms of scope and applications. TQM in particular, has been broadened in scope to include all best practices. Thus, as a TQM framework, the MBNQA criteria represent dimensions of performance excellence. Since TQM was introduced and developed as a concept earlier than SCM, there are more universally accepted TQM frameworks now than there are for SCM. Widely accepted quality standards such as the ISO 9000 have led to a greater diffusion of QM approaches, while there is still no comparable standard framework for SCM (Casadesus and Castro, 2005; Lambert et al., 2005; Croom et al., 2000).

TQM and SCM have evolved along similar paths, even though they emerged from different starting points. They diverged in terms of the degree of integration. They both emerged in response to the need to develop tactical strategies for operational functions (inspection and logistics). They then were broadened in scope to gain synergy by integrating the concerns of all interrelated parties. These parties included all internal primary and supportive functions as well as the external business partners. Then, there was a shift in focus from operational concerns towards strategic issues. Consequently, supply chain quality management (SCQM) emerged as a new management concept that combined aspects of TQM with SCM (Sila et al., 2006 in Ross, 1998; Robinson and Malhotra, 2005). Ross (1998) defined SCQM as:

\[
\text{[...]} \text{the participation of all members of a supply chain network in the continuous and synchronized improvement of all processes, products, services, and work cultures focused on generating sources of productivity and competitive differentiation through the active promotion of market winning product(s) and service solutions that provide total customer value and satisfaction (Sila et al., 2006, p. 492).}
\]

When TQM and SCM are integrated, the business processes and the organizational structure will become more complex. For example, some focal organizations in the supply chain may need to establish a supplier development department to work with suppliers in quality improvement projects. The SCM department may need to include
QA unit or vice versa. The quality policy of individual supply chain members may need
to be aligned for consistency together to ensure a common quality policy of the entire
supply chain. There is a need, therefore, for more research into the implications of
integrating business processes into the organizational structure. Gunasekaran and
McGaughhey (2003) have suggested focusing on the following issues: management’s role
in TQM in SCM; how information systems and technologies can support TQM in SCM;
what impact the organizational structure can have on TQM in SCM; how education and
training can support TQM in SCM; and how cultural and behavioral issues can influence
the application of TQM in SCM. Since the concept of SCM was introduced so much later,
there is an even greater need for further research into how TQM can influence SCM. For
example, internationally recognized SCM standards or certificates should be initiated to
courage the development of SCM as a counterpart to the ISO 9000.

Integration (participation and partnership)
Both TQM and SCM offer unique frameworks to integrate participation and
partnership, since they require participation from all internal functions and continuous
collaboration with all external partners (Gimenez, 2004; Sohal and Anderson, 1999 in
Dean and Bowen, 1994). However, TQM focuses more on internal participation,
whereas SCM places more emphasis on external partnerships.

Internal participation
Lakhe and Mohanty (1994) referred to Oakland (1989)’s suggestion that the word
“total” in TQM refers to every department and every person at every level in an
organization. Although TQM requires involvement from customers and suppliers, it
places more emphasis on employee participation. The focus is on both internal primary
and supportive functions in an organization’s value chain. In the TQM environment, all
employees (including executive management) are treated as internal customers. If the
internal customers are not satisfied, external customer satisfaction is difficult.
Therefore, TQM emphasizes employee involvement and ownership (Khan, 2003).
Accordingly, the criteria for most TQM frameworks include the human resource
component, such as the MBNQA (NIST, 2007) and European quality awards (The European Foundation for Quality Management, 2007). Hoang et al. (2006) also
concluded that human resource management issues received the highest coverage in
TQM frameworks.

Yeung and Amstrong (2003) reported that the external focus receives less attention
and quality improvement efforts only concentrate on internal matters. However,
customer satisfaction could be achieved more effectively where quality was built into
the whole supply chain (Robinson and Malhotra, 2005). Therefore, the focus of modern
TQM has shifted from the traditional organization-centered setting to the whole supply
chain (Kuei et al., 2001; Robinson and Malhotra, 2005) which looks more like SCQM.

External partnership
SCM requires internal and external business process integration across the whole
supply chain (Gimenez, 2004; Towill et al., 2002). SCM effectiveness and efficiency
depend significantly on the degree of integration (Chin et al., 2004; Bagchi and
Skjoett-Larsen, 2005). Therefore, SCM aims to improve not only the performance of
the individual organization but also that of the whole supply chain (Li et al., 2006).
This external focus may be due to the fact that the organization itself must work with the customer and the supplier within the same SCM framework (Holmberg, 2000; Golicic et al., 2002 in Mentzer et al., 2001). SCM focuses on primary functions as opposed to supportive functions in an organization’s value chain. Most of the literature and SCM frameworks emphasize the relationship with business partners and almost ignore the human resource component, such as the SCM frameworks of the global supply chain forum (Lambert et al., 2005; Li et al., 2006; Tan et al., 2002). Accordingly, Gowen and Tallon (2003) concluded that little research has considered human resource management in SCM. Although SCM emphasizes external integration, the actual implementation must begin by integrating internal functions and then moving on to external integration among business partners. Moreover, practical SCM focuses on only a few strategic suppliers and customers. This is because most supply chains are too complex to achieve full integration of all business partners (Tan et al., 1998). This difference in emphasis can be a potential problem when implementing a synthesis of TQM and SCM, and more research is needed to explore these implications.

Conclusions
There are many similarities and differences between TQM and SCM. Understanding and comparing them could identify potential areas of future research as well as the development of a management framework that integrates the two concepts. First, both TQM and SCM could be viewed as management philosophies and from this perspective, there is an unlimited potential for scope and applications. In practical terms however, implementation is made difficult by the range of unclear definitions. Therefore, a new well integrated framework should be developed to facilitate implementation, especially since there is still no universally accepted SCM framework. The traditional approach to TQM emphasizes specification-based performance while SCM tends to focus on time-based performance. However, the ultimate goal of both is customer satisfaction. There can be synergy as they share the ultimate goal, but conflict can arise from the different primary goals. There is a need therefore for more research into these potential contradictions to explore how they can be reconciled.

Although TQM and SCM emerged from different starting points, they evolved in similar ways. Both originated at the tactical level of operational functions, which are the primary activities in an organization’s value chain and then widened in scope to cover all interrelated parties at the strategic level in order to gain synergy. When TQM and SCM are integrated, both business processes and the organizational structure will become more complex. Therefore, more research needs to be conducted into the alignment of business processes and organizational structure. Other management issues worth exploring include investigations into the following: management’s role in TQM in SCM; information systems and technologies to support TQM in SCM; the organizational structure and its impact on TQM in SCM; how education and training can support TQM in SCM; and both the cultural and behavioral issues that can influence the application of TQM in SCM. Future research into SCM and its potential contribution to TQM applications include developing universal SCM standards or certificates. Although TQM and SCM require both internal and external integration, TQM emphasizes the participation of all in-house employees, whereas SCM focuses on the external partnerships with business partners. Since these different approaches could cause potential conflicts when TQM and SCM are integrated for a simultaneous
implementation, there is a need to explore how the strengths of both frameworks could be integrated into a new management concept that would be more effective than either framework on its own.

References


**Further reading**


**About the authors**

Assadej Vanichchinchai is a PhD student in the School of Management, Asian Institute of Technology, Pathumthani, Thailand. Assadej Vanichchinchai is the corresponding author and can be contacted at: st103128@ait.ac.th

Barbara Igel is an Associate Professor in the School of Management, Asian Institute of Technology, Pathumthani, Thailand.
An empirical study of barriers to TQM implementation in Indian industries

K. Subrahmanya Bhat
Department of Mechanical Engineering, NMAM Institute of Technology, Karkala, India, and

Jagadeesh Rajashekhar
Team Quality, Mysore, India and SIET Institute of Management, Bangalore, India

Abstract
Purpose – The purpose of this paper is to identify the barriers of total quality management (TQM) implementation, in order to make them known to the managers of Indian industries.

Design/methodology/approach – In order to achieve this objective, an extensive literature review has been carried out to understand the barriers to TQM implementation. This was followed by a survey of quality award winning industries in India.

Findings – A total of 41 completed questionnaires were received and the overall response rate was 31 percent. The findings of this survey suggest that the most important TQM barriers in Indian industry are: “no benchmarking of other company’s practices” and “employees are resistant to change”. Factor analysis of the 21 potential barriers to TQM implementation revealed the following five underlying constructs: lack of customer orientation, lack of planning for quality, lack of total involvement, lack of management commitment, and lack of resources.

Originality/value – The findings based on this empirical research present a solution to the difficulties faced by the managers while implementing TQM effectively in their industries.

Keywords Total quality management, Benchmarking, Quality awards, India

Paper type Research paper

Introduction
Global competition and economic liberalization are creating opportunities for Indian organizations. They use “quality” to compete with other organizations to improve their market share. The well-known quality approaches like ISO 9000, total quality management (TQM) and Six Sigma have helped them to achieve their goal. TQM is one of the important quality improvement techniques, which many firms are using to achieve success. TQM has been widely implemented throughout the world across different industries and sectors. The implementation of TQM has given them positive results. Industries in India have been trying individually to improve their product quality, besides their overall performance through TQM practices (Rajashekhar, 1999). But organizations find it difficult to implement TQM in a satisfactory and efficient way. Also, they notice some barriers or obstacles, which hinder the implementation of TQM. Owing to these barriers, organizations have not achieved the benefits, which they have expected from TQM. Besides, poor results have given rise to the opinion that TQM does not work and in many cases the TQM initiatives have been abandoned.
TQM practitioners claim that if a company’s culture is not conducive to total quality, the culture must be changed before a total quality programme can be implemented. There appears to be a multitude of reasons why companies fail in their effort to implement a quality management system. However, two common problems appear to be a lack of strategic planning and a lack of appropriate culture supportive of TQM programmes (Sebastianelli and Tamimi, 2003). The study of Liu (1998) and Rahim and Whalen (1994) showed lack of top management support and lack of proper training as the main barriers for TQM implementation. The barriers to implementing TQM will show up in all sectors – manufacturing, services, government, and education. Therefore, it is important for all organizations to understand and avoid these barriers both before and during TQM implementation (Tamimi and Sebastianelli, 1998). An extensive literature review carried out by Masters (1996) found 15 distinct barriers to TQM that are common to all types of organizations.

Salegna and Fazel (2000) have listed 16 obstacles which companies have reported when implementing TQM. Further, Tamimi and Sebastianelli (1998) have identified many problems that companies might experience while implementing TQM. Their survey was aimed at determining the extent to which these obstacles were actually experienced by the responding organizations. They surveyed a national sample of quality professionals. Based on a review of the quality literature and personal interview with local managers, 25 potential barriers to TQM were identified. Jun et al. (2004) empirically investigated barriers that firms in the Mexico’s Maquiladora industry experience, based on 25 potential obstacles to TQM success and compared the findings with prior research done with US firms. The findings of their study suggest that a prevalent TQM barrier in the Maquiladora industry is “high employee turnover”.

The study of Amar and Zain (2002), established 11 factors seen to be the barriers against the successful implementation of TQM in Indonesian manufacturing organizations. Gunasekaran (1999) examined the enablers of TQM implementation in a British manufacturing company using structured interviews of employees from different functional areas of the organization. Emphasizing people-oriented factors,
such as teamwork and empowerment, he found that poor communication between departments was a real barrier to implementing TQM. A survey conducted in India in 1998 revealed the following as barriers impeding the implementation of TQM: lack of long-term supplier relationship, continued dependence on traditional incentive schemes, numerical targets, performance rating, slogans for improving productivity, and not identifying and providing the right type of training for each and everyone as demanded for every job (Rajashekhar, 1999). Finally, Ngai and Cheng (1997) derived the following four factors as the barriers for the implementation of TQM from their 17-item scale:

1. cultural and employee barrier;
2. infrastructure barrier;
3. managerial barrier; and
4. organizational barrier.

Table I shows the important barriers for TQM implementation identified by various authors.

**Quality awards in India and survey respondents**
A major boost to the growth of TQM is the promotion of quality award models in many countries. These award frameworks are used by many organizations to assess and benchmark their level of TQM implementation. The broad aims of these awards are described as follows (Ghobadian and Woo, 1996):

- Increase awareness of the importance of quality management because of its important contribution to superior competitiveness.
- Encourage systematic self-assessment against established criteria and market awareness simultaneously.
- Stimulate sharing and dissemination of information on successfully deployed quality strategies and on benefits derived from implementing these strategies.
- Promote understanding of the requirements for the attainment of quality excellence and successful deployment of quality management.
- Stimulate organizations to introduce a quality management improvement process.

Each award is based on a perceived model of TQM. They provide a useful audit framework against which organizations can evaluate their quality management methods, the deployment of these methods, and the end results. Quality awards are the standardized quality models used by firms as a guide for quality management or in order to carry out self-evaluation of their quality practices. As Hendricks and Singhal (2000) said, quality awards are proxy for effective implementation of TQM. A review of various quality awards criteria confirm that the core concepts and values emphasized in the awards are those that are widely considered to be the building blocks of effective TQM implementations. Awards are given after the applicant goes through a multi-level evaluation process where internal or external experts judge the applicant. A stringent process seems to be in place to ensure that winners are effectively implementing and practicing TQM. Therefore, in this research it was decided to focus the survey on
<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Methodology</th>
<th>Sample size and country</th>
<th>Barriers to TQM implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rahim and Whalen</td>
<td>Literature review</td>
<td>USA</td>
<td>Poor planning, Lack of management commitment, Resistance of the workforce, Lack of proper training, Teamwork complacency, Use of an off-the-shelf program, Failure to change organizational philosophy, Lack of resources provided, Lack of effective measurement of quality improvement</td>
</tr>
<tr>
<td>Masters</td>
<td>Extensive literature review</td>
<td>USA</td>
<td>Lack of management commitment, Inadequate knowledge or understanding of TQM, Inability to change organizational culture, Improper planning, Lack of continuous training and education, Inability to build a learning organization that provides for continuous improvement, Incompatible organizational structure and isolated individuals and departments, Insufficient resources, Inappropriate reward system, Use of a prepackaged program or inappropriately adapting TQM to the organization, Ineffective measurement techniques, Short term focus, Paying inadequate attention to customers, Inappropriate conditions for implementing TQM, Inadequate use of empowerment and teamwork</td>
</tr>
<tr>
<td>Ngai and Cheng</td>
<td>Principal component analysis and correspondence analysis Hong Kong Industries</td>
<td>Hong Kong Industries Hong Kong Industries</td>
<td>Cultural and employee barrier, infrastructure barrier, managerial barrier, and organizational barrier</td>
</tr>
<tr>
<td>Tamimi and Sebastianelli</td>
<td>Questionnaire survey</td>
<td>188 industries of USA</td>
<td>Used in this research (continued)</td>
</tr>
</tbody>
</table>
“quality award winners” to find out the issues connected with the implementation of TQM. It was surmised that these companies have demonstrated their ability to achieve higher quality levels in their organizations and hence would be better to point out the barriers they encountered in implementing TQM. This presupposes that the criteria followed by these awards in identifying these winners matches with the spirit of TQM in principle and practice.

Some of the important quality awards won by companies in India considered in this study are:

- Deming Application Prize.
- Rajiv Gandhi National Quality Award.
- Golden Peacock National Quality Award.
- CII-EXIM Bank Award.
- Ramakrishna Bajaj National Quality Award.
- JRDQV Award.
- RPG Quality Award.

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Methodology</th>
<th>Sample size and country</th>
<th>Barriers to TQM implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salegna and Fazel</td>
<td>Questionnaire survey</td>
<td>109 industries of USA</td>
<td>Lack of a companywide definition of quality, Lack of a formalized strategic plan for change, Lack of a customer focus, Poor inter organizational communication, Lack of real employee empowerment, Lack of employee trust in senior management, View of quality program as a quick fix, Drive for short-term financial results, Politics and turf issues, Lack of strong motivation, Lack of time to devote to quality initiative, Lack of leadership</td>
</tr>
<tr>
<td>Amar and Zain</td>
<td>Questionnaire survey</td>
<td>78 industries of Indonesia</td>
<td>Human resource, management, attitude towards quality, organizational culture, interdepartmental relations, materials, machines, equipment, information, method and training</td>
</tr>
<tr>
<td>Jun et al.</td>
<td>Questionnaire survey</td>
<td>43 industries of Maquiladora</td>
<td>Same as Tamimi and Sebastianelli study</td>
</tr>
</tbody>
</table>

Table I. Study of barriers to TQM implementation
Table II shows the number of industries which have won the quality awards listed above and the number of industries, who have responded to this study.

Table II. List of quality award winning industries till 2005

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Quality award</th>
<th>No. of industries</th>
<th>No. of industries responded</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Deming Application Prize</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>Rajiv Gandhi National Quality Award</td>
<td>46</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>Golden Peacock National Quality Award</td>
<td>52</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>Ramakrishna Bajaj National Quality Award</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>CII-EXIM Bank Award</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>RPG Quality Award</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>JRDQV Award</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>
Results and discussions

Respondent profile
A total of 42 firms out of 135 returned the completed questionnaire for an overall response rate of 31 percent. Since one questionnaire response was incomplete, only 41 responses were considered for analysis. It is considered to be adequate for this kind of survey. Table III presents various respondent firms characteristics.

Descriptive statistics
Table IV presents the mean and standard deviation values for each of the questionnaire items in descending order by their mean. The higher the mean, the greater is the importance of the barrier. Majority of the quality managers perceived “the best practices of other companies are not benchmarked” and “employees are resistant to change” as the most significant barriers to TQM. Hence, these two factors received the highest mean rating of 3.00 and 2.92, respectively. These two items appear to be of central concern to Indian managers. The inadequate resources as well as ineffective quality measurement techniques were also found to be other important barriers for many Indian firms. The mean values for the questionnaire items ranged from 2.14 to 3.00 with an overall mean of 2.54. As a comparison, according to Tamimi and Sebastianelli (1998), American managers in US firms identified five barriers (items with a mean score > 3.00) to TQM:

1. Management’s compensation is not linked to achieving quality goals.
2. The best practices of other companies are not benchmarked.
3. Employees are not trained in quality improvement skills.
4. Employees are not trained in problem identification and problems solving techniques.
5. Employees are resistant to change.

Therefore, the findings of this study show some similarity with the study done by Tamimi and Sebastianelli in USA.

Factor analysis
Factor analysis groups variables (i.e. single questions) into factors based on their common correlation. Those variables, which are correlated with each other, will be

<table>
<thead>
<tr>
<th>Type/size</th>
<th>No. of responses</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Company type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Manufacturing</td>
<td>27</td>
<td>66</td>
</tr>
<tr>
<td>(b) Process</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>(c) Service</td>
<td>10</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>41</td>
<td>100</td>
</tr>
<tr>
<td>B. Size of the company</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) &gt;1,000 employees (large)</td>
<td>20</td>
<td>49</td>
</tr>
<tr>
<td>(b) Between 500 and 1,000 employees (medium)</td>
<td>10</td>
<td>24</td>
</tr>
<tr>
<td>(c) &lt;500 employees (small)</td>
<td>11</td>
<td>27</td>
</tr>
<tr>
<td>Total</td>
<td>41</td>
<td>100</td>
</tr>
</tbody>
</table>

Table III.
Responses received by type and size of the company

---

Study of barriers to TQM implementation

[267]
grouped together. Such a group of variables are called a factor (Saraph et al., 1989). In order to explain the intercorrelations among the 21 items representing barriers to TQM, factor analysis was performed to identify the underlying factors. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy for this analysis was determined to be 0.754. The KMO statistic varies between 0 and 1. A value close to one indicates that factor analysis should yield distinct and reliable factors. Furthermore, values between 0.5 and 0.7 are mediocre and values between 0.7 and 0.8 are good (Black and Porter, 1996).

Five factors were extracted that accounted for about 74.88 percent of the total variation. Table V shows the varimax rotated matrix with total and cumulative variance for each extracted factor. In developing this factor solution, items with loadings < 0.4 were dropped. Items with higher loadings were considered to be important and to have influence on the label selected to represent a factor. Hence, by examining all the items for a particular factor and by considering factor loading of items, the authors assigned a label to each factor.

Table IV.
A comparison of importance of barriers to TQM as perceived by Indian and US firms

<table>
<thead>
<tr>
<th>Item numbers</th>
<th>Questionnaire items</th>
<th>Indian firms</th>
<th>US firms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>02</td>
<td>The best practices and/or products of other companies are not benchmarked</td>
<td>3.00</td>
<td>1.32</td>
</tr>
<tr>
<td>20</td>
<td>Employees are resistant to change</td>
<td>2.92</td>
<td>1.47</td>
</tr>
<tr>
<td>13</td>
<td>There are inadequate resources to employ TQM</td>
<td>2.82</td>
<td>1.48</td>
</tr>
<tr>
<td>08</td>
<td>Quality is not effectively measured</td>
<td>2.80</td>
<td>1.53</td>
</tr>
<tr>
<td>06</td>
<td>Employees are not trained in problem identification and problems solving techniques</td>
<td>2.73</td>
<td>1.30</td>
</tr>
<tr>
<td>15</td>
<td>Employees are not trained in quality improvement skills</td>
<td>2.68</td>
<td>1.58</td>
</tr>
<tr>
<td>04</td>
<td>Quality is treated as a separate initiative</td>
<td>2.67</td>
<td>1.42</td>
</tr>
<tr>
<td>03</td>
<td>There are excess layers of management</td>
<td>2.65</td>
<td>1.25</td>
</tr>
<tr>
<td>18</td>
<td>Time constraints prohibit effective TQM implementation</td>
<td>2.58</td>
<td>1.16</td>
</tr>
<tr>
<td>01</td>
<td>Strategic plans do not include quality goals</td>
<td>2.55</td>
<td>1.48</td>
</tr>
<tr>
<td>09</td>
<td>Quality is not defined by the customers</td>
<td>2.51</td>
<td>1.32</td>
</tr>
<tr>
<td>19</td>
<td>There is frequent turnover of employees</td>
<td>2.51</td>
<td>1.12</td>
</tr>
<tr>
<td>07</td>
<td>There is no joint planning with suppliers</td>
<td>2.48</td>
<td>1.14</td>
</tr>
<tr>
<td>17</td>
<td>Management’s compensation is not linked to achieving quality goals</td>
<td>2.42</td>
<td>1.27</td>
</tr>
<tr>
<td>11</td>
<td>The strategic plan is not customer driven</td>
<td>2.37</td>
<td>1.37</td>
</tr>
<tr>
<td>16</td>
<td>Top management is not committed to quality</td>
<td>2.34</td>
<td>1.69</td>
</tr>
<tr>
<td>21</td>
<td>The high costs of implementing TQM outweigh the benefits</td>
<td>2.34</td>
<td>1.31</td>
</tr>
<tr>
<td>05</td>
<td>Quality is not everyone’s responsibility</td>
<td>2.31</td>
<td>1.54</td>
</tr>
<tr>
<td>12</td>
<td>Employees are not empowered to implement quality improvement efforts</td>
<td>2.30</td>
<td>1.39</td>
</tr>
<tr>
<td>14</td>
<td>Cross functional teams are not employed</td>
<td>2.25</td>
<td>1.23</td>
</tr>
<tr>
<td>10</td>
<td>Quality action plans are often vague</td>
<td>2.14</td>
<td>1.29</td>
</tr>
</tbody>
</table>

Note: SD, standard deviation
Source: The findings of Tamimi and Sebastianelli (1998)
The first factor is related to customer’s definition of quality, which has been called as “lack of customer orientation”. The second factor, which is related to quality planning, has been called as “lack of planning for quality”. The third factor has been termed as “lack of total involvement”, because it is related to employee empowerment and turnover of employees. The fourth factor, “lack of management commitment,” is related to those responsibilities of top management like benchmarking, involving everyone in quality and including quality in strategic planning. The fifth factor has been named as “lack of resources,” as it consists of the variables like time constraint and high cost of TQM implementation.

Reliability and validity analysis
The reliability analysis of a questionnaire determines its ability to yield consistent results. Reliability is considered as internal consistency, which is the degree of inter-correlation among the items which comprise a scale (Joseph et al., 1999). Internal consistency can be established using a reliability coefficient such as Cronbach’s α. α is the average of the correlation coefficient of each item with each other item. The reliability for each set of items of the five factors was calculated. Once the α was obtained for the whole measure, it was recalculated after eliminating one item, in order to verify if the scale improved (Table VI). Thus, for example, the α coefficient for the first factor is 0.876 and it can be seen that, after deleting the fourth item the α value has increased to 0.914; which is an improvement. The other constructs maintained their
original form and the values of $\alpha$ derived for all the five factors ranged from 0.755 to 0.914 indicating a high reliability of the evolved factors.

The validity of a measure refers to the extent to which it measures what it was intended to measure. Two types of validity are considered in this study: content validity and construct validity.

Content validity is not evaluated numerically. It is subjectively judged by the researchers (Quazi et al., 1998). Since the questionnaire was adapted from the literature, it is considered to have content validity.

Construct validity measures the extent to which the items in a scale measure the same construct. A measure has construct validity if it measures the theoretical construct or trait that it was designed to measure. This was evaluated by factor analyzing each factor individually using principal component analysis method. Each factor is assumed to be a separate construct. In this analysis, each factor must be one dimensional or unifactorial. The results showed that all the five factors are unifactorial, which confirms the construct validity of the instrument (Table VII).

The degree to which a data set provides empirical evidence for the appropriateness of a factor analysis solution can be assessed by determining a measure of sampling adequacy. The KMO measure of sampling adequacy, which is an option offered by SPSS, was used to measure the adequacy of the sample for extraction of the five factors in this study. The KMO measure was used to assess the suitability of the sample for each unifactorial determination. The KMO values for each factor were calculated separately and it shows they are satisfactory.

This study has some similarities compared to a study conducted by Sebastianelli and Tamimi in USA. The most important being the questionnaire used is the same and the final objective is that of finding the barriers of TQM implementation. The difference is mainly in the demography of the sample industries chosen for the study.

<table>
<thead>
<tr>
<th>Factor number</th>
<th>Original item numbers</th>
<th>Number of items</th>
<th>Item number deleted</th>
<th>Final $\alpha$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>01-07</td>
<td>7</td>
<td>04</td>
<td>0.914</td>
</tr>
<tr>
<td>2</td>
<td>08-12</td>
<td>5</td>
<td>None</td>
<td>0.797</td>
</tr>
<tr>
<td>3</td>
<td>13-15</td>
<td>3</td>
<td>None</td>
<td>0.863</td>
</tr>
<tr>
<td>4</td>
<td>16-18</td>
<td>3</td>
<td>None</td>
<td>0.788</td>
</tr>
<tr>
<td>5</td>
<td>19-21</td>
<td>3</td>
<td>None</td>
<td>0.755</td>
</tr>
</tbody>
</table>

**Table VI.**
Internal consistency analysis results

<table>
<thead>
<tr>
<th>Factor number</th>
<th>KMO</th>
<th>Item loading range for Factor 1</th>
<th>Eigenvalue</th>
<th>Percentage variance explained by Factor 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.829</td>
<td>0.855-0.894</td>
<td>3.049</td>
<td>76.23</td>
</tr>
<tr>
<td>2</td>
<td>0.648</td>
<td>0.712-0.833</td>
<td>2.490</td>
<td>62.34</td>
</tr>
<tr>
<td>3</td>
<td>0.670</td>
<td>0.772-0.901</td>
<td>2.233</td>
<td>74.40</td>
</tr>
<tr>
<td>4</td>
<td>0.711</td>
<td>0.829-0.972</td>
<td>2.196</td>
<td>73.20</td>
</tr>
<tr>
<td>5</td>
<td>0.563</td>
<td>0.735-0.910</td>
<td>1.988</td>
<td>66.20</td>
</tr>
</tbody>
</table>

**Table VII.**
Summary of the factor matrix for each construct
It has been observed that the first ten importance rankings of the barriers of the current study are close to that obtained in the US study. Sebastianelli and Tamimi (2003) extracted five factors from their study, namely:

1. inadequate human resource development and management;
2. lack of planning for quality;
3. lack of leadership for quality;
4. inadequate resources for TQM; and
5. lack of customer focus.

These five factors accounted for about 58 percent of the total variation in the observed ratings. Comparing the results of the reliability analysis of this study with the US study – the $\alpha$ coefficient of this study ranged between 0.755 and 0.914 and for US study it ranged from 0.52 and 0.81.

**Conclusion**

The results from a survey conducted on the barriers of TQM implementation in Indian industries have been presented in this paper. A reliability and validity analysis on the survey instrument has been conducted and it is concluded that the survey is fairly reliable and valid.

The experience of industries implementing TQM can serve as an invaluable lesson to those companies that are planning to implement TQM. Companies currently implementing TQM, or thinking about implementing TQM, will improve their chances of success if they are more sensitive to these barriers.

The main barriers were found to be lack of benchmarking and employee's resistance to change. The industries should understand that benchmarking is a tool used to identify their strengths and weaknesses compared to the best in their class. And employee resistance can be overcome by proper training and by involving the employees in the planning and implementation phases of TQM. It was also found that inadequate resources was an obstacle for successful TQM implementation.

By understanding the potential severity of such barriers, industries are in a better position to anticipate and solve the problems which may arise in future. As a means of attaining higher efficiency, it is essential to recognize and understand the barrier that can hinder the success of TQM program. The barriers identified in this paper can be used to help guide Indian managers while implementing TQM in their organizations. While these barriers occur to varying degrees and with varying frequency, there is little doubt that they exist in every organization. Management must understand that they do exist and should deal with them while TQM implementation process. Therefore, the organizations can benefit from a better understanding of barriers of TQM.

**References**


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 implementation of a quality management system in the not-for-profit sector

G.R.T. White and P. Samson
Bristol Business School, University of the West of England, Bristol, UK
R. Rowland-Jones
Wrexham Business School, North East Wales Institute of Higher Education, Wrexham, UK, and
A.J. Thomas
Logistics Systems Dynamics Group, Cardiff Business School, Cardiff University, Cardiff, UK

Abstract
Purpose – The purpose of this paper is to examine the rationale for establishing a quality management system (QMS) by obtaining ISO 9001:2000 certification in a not for profit small to medium enterprise (SME) in the UK. The rationale for choosing this approach over others to achieve operational stability and ongoing improvement is explored and an evaluation of its effectiveness undertaken.
Design/methodology/approach – A case study approach is adopted with the paper outlining the process of ISO 9001:2000 implementation in a single not-for-profit SME. The paper identifies the process by which the organisation prepares for certification and appraises both the changes required by the organisation and the scope of opportunistic improvements that resulted.
Findings – Through the correct development of the QMS the company was able to generate bottom-line savings and business performance enhancement. The paper shows that when the QMS is developed as part of a coherent initiative, lasting performance improvements are achieved.
Research limitations/implications – The pursuit of ISO 9001:2000 in a not-for-profit company provides an effective framework for similar companies to follow suit. Further analysis of ISO 900:2000 implementation through its application in a range of similar companies is proposed.
Practical implications – The paper concludes that the act of preparation for ISO 9001:2000 in this type and size of organisation constitutes a radical change and proposes that a transitive version of ISO 9001:2000 related standard, scalable for SMEs, would benefit the continued growth of this economic sector.
Originality/value – This study highlights the potential benefits of creating and implementing a QMS in a not-for-profit SME through the pursuit of ISO 9001:2000 certification. It shows that the tangible benefits of such an approach alone do not ensure that ISO 9001:2000 remains the preferred quality standard.

Keywords ISO 9000 series, Quality standards, Quality management, Non-profit organizations, United Kingdom

Paper type Research paper

Introduction
The importance of quality to any and all organisations is well known and a multitude of philosophies, management systems, tools and techniques exist with which it may be embedded into everyday working practices (Rowland-Jones et al., 2005). Amongst these quality initiatives the ISO 9000 suite of standards is viewed as being able to
deliver significant improvements to organisations in a variety of business contexts and sectors by structuring and optimising the internal processes (Martinez-Costa and Martinez-Lorente, 2003; Khan and Hafiz, 1999). This has been seen to result in tangible improvement to product quality (Noori, 2004; Mahadevappa and Kotreshwar, 2004; Thomas and Webb, 2003). However, this has not always generated immediate financial benefits (Tsekouras et al., 2002; Wayhan et al., 2002).

It is also interesting to note that though the implementation of ISO 9000 has become a global phenomenon there still appear to be some areas where the adoption of the standard has lagged behind (Thomas and Webb, 2003). The growing concern over the ability of ISO 9000 to deliver quality improvements by way of improved business performance and greater customer satisfaction may in fact be due to its process-centric approach (Fisher, 2005; Schenkel, 2004). It has also been suggested that ISO 9000 be just the first step towards achieving a total quality management (TQM) system (Chang and Lo, 2005; Ruzevicius et al., 2004; Ho, 1993).

However, the greater demands and, in particular the higher TQM content of ISO 9000, are likely to lessen rather than improve the effectiveness of the standard’s implementation in the future and also reduce its rate of return (Casadesus and Karapetrovic, 2005; Conti, 2004). This may account for a large proportion of recent thinking that has tended to focus upon the needs of both for-profit and non-profit companies that have already implemented a formal quality management system (QMS). These organisations or industry sectors are now beginning to ask “what next?” and are considering options such as TQM, business process re-engineering, Six Sigma, balanced scorecard or combinations of these methods as options for driving their quality systems forward (Yang et al., 2005; Lupan et al., 2005; Hwang and Chou, 2004; Senthil et al., 2001). The omitting of the European Foundation for Quality Management (EFQM) excellence model from this illustrative example is due to the fact that the model is focussed toward overall business excellence.

Despite these concerns it is apparent that many organisations, particularly small to medium enterprises (SMEs), are continuing to consider ISO 9000 for the vehicle to structure and improve their QMSs. The purpose of this paper is to examine the process of establishing a QMS by working toward ISO 9001:2000 certification in a not for profit SME in the UK.

**The rational for implementing ISO 9001:2000**

The reasons for pursuing ISO 9001:2000 in the majority of organisations appear threefold. First, it may be driven by a customer request to conform with their internal quality control and supplier/vendor quality assurance systems. Second, it can be driven by the adopting organisation as a means or route to increasing home and overseas market share where ISO certification has a value that is somewhat transferable to product quality. Third, it can be seen as a means of improving internal processes and product or service quality.

Current research supports the view that customers in a supply chain have a preference for procuring goods and services from suppliers that are ISO 9000 certified (Corbett, 2006; Lee et al., 2003; Rao et al., 1997). Organisations have also pursued certification in order to gain entry to new overseas markets, improve competitive edge in their home market, improve their internal QMSs or as a direct requirement of their customers (Chini and Valdez, 2003).
The success of ISO 9000 implementation is dependent upon a variety of factors such as organisation size and employee preparedness as well as leadership ability and change methodology (Higgs and Rowland, 2005; By, 2005). Calisir et al. (2001) find that large companies are more satisfied with the results of ISO 9000 in terms of operational improvements, and Wilson et al. (2003) view that companies with higher sales are more able to absorb the initial cost of ISO 9000 and await the operational benefits. Barriers to implementation have been identified as the costs of training, consultation, registration and the practical difficulties of performing internal system audits (Stevenson and Barnes, 2001; Chini and Valdez, 2003). This, in part, explains why many companies, particularly SMEs, are dissuaded from pursuing the formal certification route of ISO 9000 because of its perceived resource cost (Briscoe et al., 2005; Fassoula and Rogerson, 2003; Nwankwo, 2000; Guilhon et al., 1998; Taylor, 1994). It is notable that even within the classification “SME” there appear to be links between firm size and QMS certification; and that more larger end SMEs (nearer to 150 employees) tend to be certified than smaller ones such as the micro-SMEs (one to ten employees) (Renuka and Venkateshwara, 2006).

The reason for organisations to adopt the standard also appear to have some effect upon the degree to which ISO 9000 meets organisational expectations. Bhuiyan and Alam (2005) find that Canadian companies implemented ISO 9000 due to market or customer influence. These companies subsequently experienced higher levels of benefit (primarily gained through greater market share, transition to higher value markets, etc.) than those companies which implemented it with the primary aim of making internal performance improvements. These findings contrast with other studies which find organisations that implemented ISO 9000 with the specific purpose of driving internal operational improvements tend to experience the best organisational performance (Arauz and Suzuka, 2004; Chin and Choi, 2003; Yeung et al., 2003; Martinez-Costa and Martinez-Lorente, 2003).

Contrary to previous research, Naveh et al. (2004) propose that organisations that benefit the most from implementation of ISO 9000 are not necessarily those that are the first in the marketplace to earn it. Instead they are the organisations that learn both from their own implementation experience and the experience of other implementers in their sector. This indicates that ISO 9000 has no uniform effect upon specific areas of functional excellence. Whether this is a property of the applicability of the standard to many different organisations and their varied needs, or signifies that it is a compromise solution that requires purpose and direction in its application in order to be effective, is debatable.

The increasingly significant non-profit sector whose unique operational conditions may not always be suited to the arbitrary application of management tools developed in other sectors (Myers and Sachs, 2003) tend to be more highly risk-averse than for-profits organisations. This is a factor which appears largely governed by the nature of their environment which often relies upon stability of service provision (Hull and Lio, 2006). This, coupled with the drivers for adopting a formal QMS that are a complicated mixture of pressure from sponsors, national governing bodies and an internal desire to standardise and improve, may make the seemingly intricate and expensive ISO 9000 standard appear unattractive (Cairns et al., 2004). Although there is little empirical evidence to describe the adoption of ISO 9000 in the voluntary sector and among non-profit organisations Renuka and Venkateshwara’s (2006) observation that ISO certified SMEs appear more willing to adopt new technology and modern management methods supports a view that the standard would only be considered an option by the...
less risk-averse non-profit organisations. Reflecting these potential concerns and speculations, it is not uncommon for many non-profit organisations to question the purpose and value of their choice of QMS after implementation (Cairns et al., 2004). Yet despite the perceived and actual barriers to implementation and even if ISO 9000 is not appropriate for the organisation, it has been suggested that is may still be used as a useful roadmap for developing existing internal systems (Stevenson and Barnes, 2001).

In summary, the paper has provided the reader with an overview of the effectiveness of ISO 9000 from a range of different perspectives (both manufacturing and service oriented). Whilst the standard aims to deliver greater bottom line savings in both product and service provision the authors clearly identify that the development of ISO 9000 in most not-for-profit organisations would benefit from further investigation and as such, experience and knowledge of developing a compliant QMS is lacking. This paper will therefore move towards outlining a case study on how a not-for-profit company developed their QMS while pursuing ISO 9000:2000 certification. It describes the change management issues and the benefits the organisation obtained from implementation of the QMS.

**Case study**

Founded in 1777 the Royal Bath and West (RB&W) Society was formed to “encourage agriculture, arts, manufactures and commerce” in the South West of England. In the nineteenth century the society established the RB&W show. The show has continually grown and diversified despite setbacks such as the outbreak of foot and mouth disease in 2001 and 2007 and has become increasingly attractive to non-rural communities. The event, now permanently hosted in 200 acres of grounds comprising concert and conference venues, attracts over 160,000 visitors each year. The decline of agriculture and increase in environmental awareness of the general public has prompted an expansion of its role whilst simultaneously created a needed to improve its competitiveness among growing numbers of environmentally and rurally focussed government and regional agencies. Modern objectives include the education of a wider audience in the “ways of the countryside”, contribution to the development of the South West of England’s regional strategy and promotion of environmental management and non-food crop opportunities among local farmers. The society has also embraced the technologies of the twenty-first century and established a virtual showground. This enables trade exhibitors and local small businesses that attend the annual show to continue trading online throughout the year.

The RB&W Society, its products, services and operations have gradually developed over its life of almost quarter of a millennium. Becoming increasingly focussed (and reliant) on delivering the annual shows for their considerable contribution to revenue and publicity, its processes, procedures and personnel skills had also become tailored toward delivering these events. Consequently, it lacked the modern management skills, tools and techniques with which to transform its operations to enable it to deliver upon its purpose of encouraging agriculture, art, manufacture and commerce in the South West of England. Recognising this deficiency and faced with the financial and social pressures of declining agriculture and increasing competition in a changing rural economy, RB&W began the integration of a QMS with other core business systems with the intention of bringing modernity to the 219 years old organisation. More effective and efficient use of society resources would decrease the society’s costs while increasing its revenues.
**Knowledge transfer project (KTP) rationale and objectives**

Through the establishment of new business processes to support development, foster continual improvement and bring enhanced customer satisfaction, it was envisaged that the organisation would be able to identify and develop new products, continually improve its performance and gain a greater share of the markets in which it operates. With new management systems in place, RB&W would seek to access wider opportunities to expand its business activities. Central to this was the establishment of a formal QMS that would become the core of the newly developed management system. With a QMS in place, it was expected that the new work practices would bring about greater efficiencies and effectiveness, thus enabling the society to feel more confident in offering a better service to its customers. The independently verified certification was also proposed as a means to illustrate to customers (both internal and external) that the society could effectively respond to requirements of new and existing clients groups and hence win more substantial contracts.

It was also proposed that the integration of the new QMS would also support the culture change that had been recently initiated to enable the society to become a more business-led organisation that capitalised on its creativity, making maximum use of its assets. The new system would allow functional planning, monitoring and control of processes and performance measurement and thus enabling decision-making at various levels and as a result freeing the chief executive from micromanagement. The performance of the executive team was expected to improve due to the new processes that would enable better collaboration and project management and through the improved availability of sound business information on which to base decisions.

The initial scoping phase of the KTP, undertaken by RB&W's management team and academics from The University of the West of England, determined that the ISO 9001:2000 standard would be an appropriate basis to develop the “new strategic business management systems” as the adoption of the standard would ensure that the new systems designed were built on sound, best practice principles. While meeting the basic requirements of the standard was considered to be a relatively straightforward process, it was recognised that it was the journey rather than the destination that was important in this project: the experience of adopting the underlying principles of the standard to enrich the society was far more testing than merely acquiring certification. Therefore, a merely compliant QMS would have done very little to either improve efficiency in the organisation or provide more information to management for use in decision-making and planning processes.

In order to drive forward a new management philosophy and system into the organisation a phased approach was undertaken by the project team. This phased approached consisted of introducing a series of business process improvement tools into the organisation that acted as “enablers” to the ISO 9001:2000 system, assisting its smoother transition into the organisation and ensuring that the company developed a holistic management system rather than just a “certification” system.

**Process mapping, analysis and development**

The process mapping activity was recursive in nature. In order to sufficiently detail a process, it was necessary to start with a high level map and review it several times, each time adding more information about the tasks and sub-tasks that constituted it. These high-level maps gave an accurate picture of the process. Figure 1 details the high
level map of the invoicing process. Additionally, in order to provide background context for the processes, map generation was accompanied by surveys through which employees were asked to provide some quantitative data pertaining to the tasks they performed, such as the length of time taken to execute the different tasks, technologies used, the type of inputs and outputs, etc. It was only after the processes had been identified and then mapped in detail (Figure 2) that it was possible to analyse them to identify weaknesses, inefficiencies and wastes. Measuring the existing activity durations allowed the resultant improvements to be quantified and provided useful objective evidence of the value of performing the re-engineering phase of the project.

The analysis of the processes revealed many weaknesses and inefficiencies. For example, it was possible for modifications to be made to company data in one database but since data was often duplicated in two or more separate databases some departments were operating using erroneous or out of date information.

The development phase was driven with two perspectives:

(1) Reconfiguring the business processes to remove unnecessary and duplicate activities to improve business effectiveness.

(2) Automation and waste elimination in processes to improve operational efficiency.
A major improvement was made in the accounting function through the adoption of new accounting software. Although the transition was to a less feature-rich software package the new system was a major improvement in several ways:

- It better matched the fundamental requirements of the organisation and thus supported the overall business strategy more effectively (Alter, 1996).
- It utilised a graphical user interface instead of a text interface which offered further productivity benefits.
- Numerous databases were rationalised into a single data repository, thereby improving data quality.

**QMS implementation at RB&W**

The route taken by the RB&W Society in its adoption of ISO 9001:2000 confirms much of the debate presented in the literature, i.e. that it is a vehicle for structuring and optimising internal processes, and that it produces tangible improvements to product quality but may also be very costly.

The process-based approach of ISO 9001:2000 suited the need of RB&W to focus upon a discreet sector of its business in order to effect the most necessary and beneficial change. Rationalisation of the accounting processes not only streamlined the method by which the tasks were completed but also had significant positive impact on the business system as a whole since it enabled a corresponding improvement in the quality of response to customer queries. Such a process-based approach is known to be a useful way to identify management practices (Kiraka and Manning, 2005) and thus forms the first step in generation of formalised process documentation that is vital for full accreditation.

The downside of such an improvement is the expense and risk of making the transition between accounting systems. Whilst it is conceivable that some degree of the benefits could be realised through rationalising the existing accounting systems the cost of creating new database structures, data testing and transference would not be insignificant. Furthermore, without the Accounts department being substantially revised by changing the accounting software the opportunity for recreating the previous environment of ad hoc dissociated data repositories remains. The act of re-inventing the accounting systems also provided momentum to the ISO implementation project, indicating that it was well-funded and backed by management commitment.

**Cultural and change management issues**

Whilst the costs of training, re-engineering, registration and consultancy have been identified as major inhibitors to ISO implementation, the most significant barrier in this instance was employee and resistance to change and management preparedness. RB&W's personnel and processes have developed throughout its lengthy existence, largely without exposure to modern business and management techniques and trends. The adoption of ISO 9001:2000 was preceded by extensive discussion and training, however, the moments of truth when individuals were expected to contribute to the redesign of their tasks proved to be a significant barrier to implementation. Although this did not prevent the changes being made it often caused significant delay and placed further demands upon the KTP and management resources.

The risk-attitude of organisations has also been cited as a factor that effects ISO 9000 adoption, highlighting that non-profit SMEs may be more risk averse, and less
likely to follow its prescribed path. The RB&W Society demonstrated a commitment to change, both in terms of expense and resource, which at first appeared to conflict with this concept. Whilst RB&W operates in a sector that is fiercely competitive and would appear suited to risk-averse activities it maintains the entrepreneurial spirit of its founders, to “encourage technological improvements through enquiry into existing practices and theories, and experimentation which could lead to improvement”. In this respect, the society may be seen as not highly risk-averse as it applies the maxim inwardly upon itself as well as outwardly to the wider community.

Conclusion
It remains the matter for debate, and is individually circumstance-specific, whether the ISO 9001:2000 standard is an achievable goal for many organisations, especially non-profit and risk-averse SMEs. The RB&W Society has undoubtedly gained much by the introduction and development of the standard, however, its value as a signposting of “quality” within the organisation in this sector is yet to be fully evaluated. Alternative standards or awards such as BS EN ISO 14001:2004, or the European Eco Management and Audit Scheme are currently being explored for business “value” in the marketplace that may be achieved more immediately.

However, in the short to medium term RB&W intends to continue with the current QMS approach in order to rationalise and improve its operating systems and recoup the rewards in terms of operational efficiency, effectiveness and product/process quality but without intending to gain the final ISO 9001:2000 certification. This does reflect the self-diagnostic effect of business excellence models such as EFQM, which may prove a more efficient use of resource for RB&W and may be adopted as complementary tools for ongoing strategic quality development (Russell, 2000).

Although the introduction of ISO 9001:2000 was viewed as necessary and was a valuable learning experience, there may be an alternative and more rewarding destination to reach. This supports the evidence that SMEs may appreciate the inherent value of ISO 9001:2000 but are unwilling or unable to embark upon it due to its perceived prohibitive scale and cost. This significant sector of the economy may then not benefit from the tangible and intangible benefits that the standard has been shown to deliver. It suggests that a scaled-down version or interim version of the standard is needed to encourage many more organisations to embark upon the journey toward establishing a formal QMS and associated benefit from significant operational improvements in the process.

References


Corresponding author
G.R.T. White can be contacted at: gareth.white@uwe.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
Developing a European quality assessment tool for schools

Zdravko Pecar
School of Public Administration, University of Ljubljana, Ljubljana, Slovenia

Sara Cervai
University of Trieste, Trieste, Italy, and

Tauno Kekälä
Department of Production, University of Vaasa, Vaasa, Finland

Abstract

Purpose – The purpose of the research was to develop a simple self-evaluation model and tool that would be based on the preferences of improvement areas of all the stakeholder groups and that also would be possible to use in all European countries.

Design/methodology/approach – The methodology starts with a survey to three school levels (primary, secondary, and vocationa) in seven EU countries, in which the opinions of important factors and their related importance are surveyed of the relevant stakeholder groups (school workers, pupil associations, parents, municipal education authorities, next higher school level, or employers). Total N of responses of stakeholder groups was 126. The relative importances are then built into a DEXi model with weightings generated from the responses, and finally a self-assessment tool that uses the DEXi structure developed for the use of the schools in their quality improvement.

Findings – The final tool works and the school headmasters who tested it found it easy enough for use.

Research limitations/implications – Naturally, the preferences change over time. A new survey of similar type should be conducted maybe every five years to keep the model up to date. There is also an ongoing development work of the self-assessment tool in a new EXPERO2EU project.

Practical implications – The model attempts to make self-evaluation so simple that all schools could find the motivation and time to make it a part of their annual planning. The tool itself is not the aim; the aim is to get schools to systematically discuss the issues that are important for their quality and to start improvement actions.

Originality/value – Both the stakeholder survey, the model and the tool are new constructs.

Keywords Quality assessment, Quality improvement, Quality systems, Schools, Europe

Paper type Research paper

Introduction: total quality management and school quality

There has been wide interest in total quality management (TQM) for the last two decades. Organizations of different types have applied its tools and methods in order to
increase their competitive advantage, but despite genuine efforts most have experienced the same difficulties they had before the introduction of TQM. This is especially true of public administration and service organizations, where the language is different from what is used in the industry. The public stakeholders have many, partially conflicting, goals (Saaty, 1988). Basically, the ideas of TQM are valid for all kinds of organizations, but the implementation must be done so that it fits the culture (Kekälä et al., 2004). In a recent action-research project we have noticed that this is especially true of school organizations (Cervai et al., 2004), which, as Weick (1976) stated, are loosely coupled systems. The recent development in the EU are pushing forward systems and philosophies that both improve the quality of the education and also make the schools systems more transparent and comparable with each other. As an input to the discussion about bringing the national methods of education and quality evaluation closer to each other, a Comenius project called Quality in Schools (QiS), coordinated by Dr Cervai, attempted to develop a general standard for quality in Europe by surveying a relatively big sample of different stakeholders in seven countries[1].

For the improvement of a school organizations, it is generally believed that a collective understanding that the current performance and the current processes are not effective enough can be created by evaluation of the correct situation. Good general guidelines for development of such evaluation activities include for example the ISO 9004 (2000) standards, as well as the Council for Higher Education Accreditation (2007) and the European Foundation for Quality Management EFQM (2007), and Malcolm Baldrige National Quality Program (2007) guidelines. Evaluation would be possible also by benchmarking against the industry standard (Camp, 1995). However, during our work with the QiS project we became increasingly aware that the existing guidelines and standards do not cover the needs of schools too well. They must be applied and adjusted quite extensively for school level and national purposes. They are also somewhat cumbersome for use on the side of normal school work by the school headmasters of teacher teams. We have during the years 2003-2006 attempted to develop a common European quality assessment framework (later refereed to as EQS, from the original name “European quality standard”) for three school levels to help initiate cultural change in school organizations. We have also developed a simple tool to do the actual benchmarking through self-assessment (later QiS-SA). The purpose of this paper is to explain the methodology used for developing these tools and to present briefly the tools themselves. It is hoped that a simple tool also would for its part lead to added self-evaluation activity in schools.

**Development of the European quality framework as the basis for an evaluation tool**

A problem with quality is that it can have as many metrics as there are meters. In the development actions according to the New Public Management (Hughes, 2003) doctrine, there typically is a wish to put some kind of generic metrics or guidelines in place, according to which all of the units would be measured. Next, the management should put a goal or target for the minimum acceptable quality. A quality standard is an example of such a benchmark, a “minimum level” target that must be reached, that can be assessed by “complies/does not comply” or “surpasses/falls short” decisions in each point. One of the original tasks of the project QiS was to develop a standard that
the whole Europe could accept, and the work was to be conducted by collecting and comparing national standards into one aggregate standard. It was however very quickly agreed that this was not the way to proceed. Very few countries actually have anything that can be seen as a “national standard” for schools. Most of the partner countries still relied on subjective school inspections. Some (the Danish school system and some German regions) recommend assessing the schools against self-selected benchmarks on the EFQM criteria (EFQM, 2007) that has come to be quite widely (but not unanimously) accepted as a framework for TQM. In Finland there are for vocational schools criteria, according to which the five best schools receive additional result-based funding. But these systems are very difficult to combine, and the tools available are on the average quite heavy and complicated for relatively lowly resourced and often small school organizations. Thus, there clearly was a need for a framework that would above all be easy to use but also comparable over countries and schools, even if these developments typically take place at the cost of level of detail (Nielsen, 1993).

In order to gain understanding of the variables that should be considered in “total quality of a school”, a survey in all participating seven nations was conducted. Opinions from all stakeholder groups, from the three levels of schools, were gathered through a questionnaire. The original questionnaire was developed in Slovenia together with the local schools, and then sent to the stakeholder groups identified[2] (school personnel, parents, pupils, employers, local school administration/government, and next higher school level). Altogether these six stakeholder groups from three school levels in seven countries were contacted by the researchers through school visits and full (100 percent) response obtained from each. Behind this number of 126 explicit stakeholder responses, an even bigger number of individual persons participated, e.g. in Slovenia only, nearly 700 persons discussed the questionnaires before preparing the responses. In each country the analysis had been conducted on the method that was deemed the most effective in order to appropriately collect the opinions. In some cases an association was contacted, in some others a group of 10 or 20 representatives of the stakeholder group were gathered together to discuss the list. In all cases, the responses were collected in by a questionnaire that operationalized the items are shown in Table I.

In the questionnaire, the respondents were asked to arrange the ten most important internal items affecting school quality in order by assigning them points from ten (most important) to one (tenth most important). There were also empty slots in the questionnaire (in case the other nationalities would have hugely differing opinions of what is important for quality in a school. As stated, the original questionnaire was based on the opinions of the Slovenian stakeholders). Each stakeholder’s opinion influenced the weight of the quality items directly (by filling in the questionnaire assigning the items priority points, representing weight of importance). Through this prioritizing work also the model would include the final weighting for the QiS-SA self evaluation tool.

Of the individual opinions within each stakeholder group, the average weight points per group (in regard to the quality items and their priorities) were then calculated in each country. The averages for all stakeholder groups were then summed in national cumulative tables, for all three levels of schools. In order to arrive to the EQS framework (again for three different levels of schools) the opinions of all seven participating nations
were summed. The network of the researchers and participating schools had several rounds of discussions by teleconference and face-to-face meetings for exchanging ideas.

We first thought out the relations of the variables to a causal model resembling the EFQM model of excellence. Some quality items are seen to be required first for some others to be able take place, and only together these quality items compose the quality of school (Figure 1). This causal model was then used to form the structured tree for the DEXi method (Figure 2) to be used later in the weighing and assessment tool. The structure is required in order to decide which are higher-level quality items and how the lower-lever items add up to these. While the EFQM has weights thought out by the EFQM committee in place, we have gained the weights from the stakeholder groups.

<table>
<thead>
<tr>
<th>Item</th>
<th>Primary</th>
<th>Secondary</th>
<th>Vocational</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resources</strong></td>
<td>Premises</td>
<td>Classroom</td>
<td>Infrastructure</td>
</tr>
<tr>
<td>Equipment</td>
<td>ICT</td>
<td>Laboratories</td>
<td>Vocational equation</td>
</tr>
<tr>
<td>Teachers</td>
<td>Competency</td>
<td>Library</td>
<td>Library</td>
</tr>
<tr>
<td>Leadership and management process</td>
<td>Promoting quality</td>
<td>Problem solving</td>
<td>Administration</td>
</tr>
<tr>
<td><strong>Processes</strong></td>
<td>Organisation and HRM</td>
<td>Organisational culture</td>
<td>Communication</td>
</tr>
<tr>
<td></td>
<td>Communication</td>
<td>Climate</td>
<td></td>
</tr>
<tr>
<td>Organisation of learning</td>
<td>Programmes/curricula (educational contents)</td>
<td>Degree of load of students</td>
<td>Transparency</td>
</tr>
<tr>
<td>and teaching process</td>
<td></td>
<td>Orientation and counselling, psychological support</td>
<td></td>
</tr>
<tr>
<td>Extra-curricula activities</td>
<td>Variety</td>
<td>Adequacy</td>
<td></td>
</tr>
<tr>
<td>Support services</td>
<td>Meals</td>
<td>Transports (and dormitory)</td>
<td>Safety processes</td>
</tr>
<tr>
<td><strong>Results</strong></td>
<td>Stakeholders’ Integration</td>
<td>Cooperation with local organisation/parents</td>
<td>Cooperation with firms</td>
</tr>
<tr>
<td></td>
<td>School achievement</td>
<td>Cooperation with other schools and educational institutions</td>
<td>International cooperation</td>
</tr>
<tr>
<td></td>
<td>Performance</td>
<td>Students/pupils and parents satisfaction</td>
<td>Teachers and staff satisfaction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>External stakeholder satisfaction (companies/unis/local authority)</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Final grouped list of quality items from the stakeholders
The final agreement shown in Table I was reached on the structure of items (11) and sub-items (32). At this stage some minor adjustments were made from the original cumulative tables (for example, “employment opportunity” in the vocational schools’ table was integrated in another item “stakeholder’s integration/cooperation with employers” because it had only a couple of votes). The final weights of these items (Table II) thus are specific for school levels but are arrived at by averaging first all stakeholder averages nationally and then summing all national averages. This may lose some data concerning the most extreme opinions but we were not able to
decide upon any other than equal weighting between the stakeholder groups or nationalities.

The slight changes and adjustments agreed upon had some influence on distribution of the weights of quality items. These were taken in account when transferring the quality items structure and weights into the DEXi software that should form the base of the self-evaluation tool (next paragraph). This was done by calculating in the final table the percentage proportions of every item from their sums. In the final DEXi weight tree, illustrated for elementary schools in Figure 3, the weights that were thus gained are under the heading “global norm” (for example, all the items under the resources heading together weighed 27.5 percent of the stakeholders’ votes; all the items under the subheading “capital resources” together, 9.6 percent; and the item “quality of classrooms” 2.6 percent). Differences in some issues from the DEXi-calculated to the original points (“global” in Figure 3) percentages are due to built-in DEXi requirements to rounding in automatic generation of various combinations of decision rules. For every set of decision rules upon which DEXi evaluates a set of three quality items, we fed in the recommended heading-level values of weights. After generating the tree results the DEXi software feeds back the actual weight (local and global) that was used in computing.

Using EQS to self-assessment

For the development of a simple self-assessment tool, the next task was to develop the scale for each quality item. This was required to be able to reasonably objectively assess the level of quality for each item at schools. Initially, it seemed easy to evaluate every item with the scale from one to five, but to find the common agreements on what is objective description of the level one and for all higher grades/levels upon the scale up to five was difficult. Another problem is that every country has its own relative understanding of what the levels mean. The EFQM points system has agreed on percentages of full points on each area, based on the level of development of an organization. For school use and the limited time resources the typically small schools have for evaluating their work, we have noted that this system is much too complicated. The idea for the first diagnose model was to use only three synthetic grades (1, not satisfactory; 2, good enough; and 3, excellent).

<table>
<thead>
<tr>
<th>Quality items</th>
<th>Finland</th>
<th>Slovenia</th>
<th>Lithuania</th>
<th>Italy</th>
<th>Germany</th>
<th>Denmark</th>
<th>France</th>
<th>Total points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good teachers</td>
<td>12</td>
<td>10</td>
<td>12</td>
<td>11</td>
<td>10</td>
<td>10</td>
<td>12</td>
<td>77</td>
</tr>
<tr>
<td>Good program</td>
<td>12</td>
<td>5</td>
<td>11</td>
<td>12</td>
<td>10</td>
<td>9</td>
<td>10</td>
<td>69</td>
</tr>
<tr>
<td>Good support services</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>10</td>
<td>8</td>
<td>10</td>
<td>7</td>
<td>50</td>
</tr>
<tr>
<td>Good facilities and equipment</td>
<td>9</td>
<td>7</td>
<td>5</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>37</td>
<td>32</td>
</tr>
<tr>
<td>Teacher satisfaction</td>
<td>8</td>
<td>2</td>
<td>6</td>
<td>9</td>
<td>8</td>
<td>8</td>
<td>41</td>
<td>41</td>
</tr>
<tr>
<td>Pupil, parent satisfaction</td>
<td>8</td>
<td>6</td>
<td>8</td>
<td>10</td>
<td>8</td>
<td>10</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>Integration (local and international)</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>8</td>
<td>6</td>
<td>10</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>Good leadership</td>
<td>8</td>
<td>8</td>
<td>10</td>
<td>4</td>
<td>10</td>
<td>10</td>
<td>5</td>
<td>55</td>
</tr>
<tr>
<td>Good results of school</td>
<td>7</td>
<td>9</td>
<td>4</td>
<td>7</td>
<td>10</td>
<td>8</td>
<td>10</td>
<td>55</td>
</tr>
<tr>
<td>Safety</td>
<td>10</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>10</td>
<td>10</td>
<td>2</td>
<td>42</td>
</tr>
</tbody>
</table>

Table II. An excerpt of a points table, illustrating the method of arranging the items from national stakeholder averages into EQS weights (elementary school level)
<table>
<thead>
<tr>
<th>Attribute</th>
<th>Local</th>
<th>Global</th>
<th>Loc.norm.</th>
<th>Glob.norm.</th>
</tr>
</thead>
<tbody>
<tr>
<td>QIS - QUALITY of ELEMENTARY school</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RESOURCES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Resources</td>
<td>34.8</td>
<td>9.6</td>
<td>34.8</td>
<td>9.6</td>
</tr>
<tr>
<td>Premises</td>
<td>45.7</td>
<td>4.4</td>
<td>45.7</td>
<td>4.4</td>
</tr>
<tr>
<td>(Classrooms)</td>
<td>60.0</td>
<td>2.6</td>
<td>60.0</td>
<td>2.6</td>
</tr>
<tr>
<td>(Infrastructure)</td>
<td>40.0</td>
<td>1.7</td>
<td>40.0</td>
<td>1.7</td>
</tr>
<tr>
<td>Equipment</td>
<td>54.3</td>
<td>5.2</td>
<td>54.3</td>
<td>5.2</td>
</tr>
<tr>
<td>(ICT)</td>
<td>35.3</td>
<td>1.8</td>
<td>35.3</td>
<td>1.8</td>
</tr>
<tr>
<td>(Gymnastics hall)</td>
<td>32.4</td>
<td>1.7</td>
<td>32.4</td>
<td>1.7</td>
</tr>
<tr>
<td>(Library, Laboratories)</td>
<td>32.4</td>
<td>1.7</td>
<td>32.4</td>
<td>1.7</td>
</tr>
<tr>
<td>Human Resources</td>
<td>65.2</td>
<td>17.9</td>
<td>65.2</td>
<td>17.9</td>
</tr>
<tr>
<td>Teachers</td>
<td>58.7</td>
<td>10.5</td>
<td>58.7</td>
<td>10.5</td>
</tr>
<tr>
<td>(Competency)</td>
<td>25.0</td>
<td>2.6</td>
<td>25.0</td>
<td>2.6</td>
</tr>
<tr>
<td>(Motivation and dedication)</td>
<td>17.9</td>
<td>1.9</td>
<td>17.9</td>
<td>1.9</td>
</tr>
<tr>
<td>(Effectiveness)</td>
<td>57.1</td>
<td>6.0</td>
<td>57.1</td>
<td>6.0</td>
</tr>
<tr>
<td>Leadership &amp; ManagementProc.</td>
<td>41.3</td>
<td>7.4</td>
<td>41.3</td>
<td>7.4</td>
</tr>
<tr>
<td>(+Promoting quality)</td>
<td>31.0</td>
<td>2.3</td>
<td>31.0</td>
<td>2.3</td>
</tr>
<tr>
<td>(Problem solving)</td>
<td>34.5</td>
<td>2.6</td>
<td>34.5</td>
<td>2.6</td>
</tr>
<tr>
<td>(+Administration)</td>
<td>34.5</td>
<td>2.6</td>
<td>34.5</td>
<td>2.6</td>
</tr>
<tr>
<td>PROCESSES</td>
<td>31.6</td>
<td>31.6</td>
<td>31.6</td>
<td>31.6</td>
</tr>
<tr>
<td>Organisation &amp; HRM</td>
<td>28.4</td>
<td>9.0</td>
<td>24.8</td>
<td>7.8</td>
</tr>
<tr>
<td>(Organizational culture)</td>
<td>30.0</td>
<td>2.7</td>
<td>30.0</td>
<td>2.4</td>
</tr>
<tr>
<td>(Communication)</td>
<td>35.0</td>
<td>3.1</td>
<td>35.0</td>
<td>2.7</td>
</tr>
<tr>
<td>(+Climate)</td>
<td>35.0</td>
<td>3.1</td>
<td>35.0</td>
<td>2.7</td>
</tr>
<tr>
<td>Educational program</td>
<td>43.2</td>
<td>13.6</td>
<td>50.3</td>
<td>15.9</td>
</tr>
<tr>
<td>Organisation of Learning</td>
<td>69.0</td>
<td>9.4</td>
<td>74.8</td>
<td>11.9</td>
</tr>
<tr>
<td>(Educational content)</td>
<td>36.4</td>
<td>3.4</td>
<td>36.4</td>
<td>4.3</td>
</tr>
<tr>
<td>(Degree of load of students)</td>
<td>20.6</td>
<td>1.9</td>
<td>20.6</td>
<td>2.4</td>
</tr>
<tr>
<td>(+Transparency)</td>
<td>21.5</td>
<td>2.0</td>
<td>21.5</td>
<td>2.6</td>
</tr>
<tr>
<td>(+Psихological support activities)</td>
<td>21.5</td>
<td>2.0</td>
<td>21.5</td>
<td>2.6</td>
</tr>
<tr>
<td>Extracurricular activities</td>
<td>31.0</td>
<td>4.2</td>
<td>25.2</td>
<td>4.0</td>
</tr>
<tr>
<td>(+Variety)</td>
<td>50.0</td>
<td>2.1</td>
<td>50.0</td>
<td>2.0</td>
</tr>
<tr>
<td>(+Adequacy)</td>
<td>50.0</td>
<td>2.1</td>
<td>50.0</td>
<td>2.0</td>
</tr>
<tr>
<td>&quot;Support&quot; services</td>
<td>28.4</td>
<td>9.0</td>
<td>24.8</td>
<td>7.8</td>
</tr>
<tr>
<td>(Meals)</td>
<td>25.0</td>
<td>2.2</td>
<td>25.0</td>
<td>2.0</td>
</tr>
<tr>
<td>(Transport)</td>
<td>25.0</td>
<td>2.2</td>
<td>25.0</td>
<td>2.0</td>
</tr>
<tr>
<td>(Safety processes)</td>
<td>50.0</td>
<td>4.5</td>
<td>50.0</td>
<td>3.9</td>
</tr>
<tr>
<td>RESULTS</td>
<td>40.9</td>
<td>40.9</td>
<td>40.9</td>
<td>40.9</td>
</tr>
<tr>
<td>Stakeholders' integration</td>
<td>21.9</td>
<td>9.0</td>
<td>21.9</td>
<td>9.0</td>
</tr>
<tr>
<td>(Cooperation with local org./parents)</td>
<td>33.3</td>
<td>3.0</td>
<td>33.3</td>
<td>3.0</td>
</tr>
<tr>
<td>(Cooperation with other schools)</td>
<td>33.3</td>
<td>3.0</td>
<td>33.3</td>
<td>3.0</td>
</tr>
<tr>
<td>(International cooperation)</td>
<td>33.3</td>
<td>3.0</td>
<td>33.3</td>
<td>3.0</td>
</tr>
<tr>
<td>School achievements</td>
<td>43.8</td>
<td>17.9</td>
<td>43.8</td>
<td>17.9</td>
</tr>
<tr>
<td>(Pupils and Parents satisfaction)</td>
<td>33.3</td>
<td>6.0</td>
<td>33.3</td>
<td>6.0</td>
</tr>
<tr>
<td>(Teachers and staff satisfaction)</td>
<td>33.3</td>
<td>6.0</td>
<td>33.3</td>
<td>6.0</td>
</tr>
<tr>
<td>(+External stakeholders satisfaction)</td>
<td>33.3</td>
<td>6.0</td>
<td>33.3</td>
<td>6.0</td>
</tr>
<tr>
<td>Performance results</td>
<td>34.4</td>
<td>14.1</td>
<td>34.4</td>
<td>14.1</td>
</tr>
<tr>
<td>(Final grades)</td>
<td>31.8</td>
<td>4.5</td>
<td>31.8</td>
<td>4.5</td>
</tr>
<tr>
<td>(Pupils achievement)</td>
<td>40.9</td>
<td>5.8</td>
<td>40.9</td>
<td>5.8</td>
</tr>
<tr>
<td>(Financial performance)</td>
<td>27.3</td>
<td>3.8</td>
<td>27.3</td>
<td>3.8</td>
</tr>
</tbody>
</table>

Figure 3. An example of hand-calculated and DEXi-calculated final weights for elementary schools
There have been many ideological texts downgrading the “good enough” thinking (e.g. the “zero defect” goal by Crosby, 1979) but the fact remains that most of the school organizations will never attempt to reach the uppermost points levels on the EFQM scale. This is because reaching EFQM points is not the mission of these organizations.

While we wanted to build a tool for the schools, starting from the mission of a school – to enable learning and to create good tomorrow-citizens – we aimed to make the tool such that the schools would take action whenever the main mission (learning) was hindered by some issue, but otherwise would concentrate first and foremost on this main task. Thus, the European “standards” for the three school levels can be said to be composed from all the areas to be assessed being considered at least “satisfactory”. The evaluation tool then gives verbal descriptions for what every item includes (an aggregate of what the closest respective translation of the wording for each of the names of the items implies; see Table I) and a narrative on what the “satisfactory” or “good enough” level might include. These were collected from the same schools as the items and the weights, but the different stakeholder groups were not addressed.

Using the proposed model, assessing the school quality is a quite simple process. Representatives of an individual school gather to discuss the quality items that are the basis of the standard. Wherever they feel the level of any item is non-satisfactory, they should write their concerns down and plan on improving the issue. Calculating how close the school is in points to the “European quality standard” level can be more difficult, because of the different importance levels attuned to the items. For example, a school may be much above the level of satisfactory quality in all the important items but somewhat below in the less-important ones. For the school, this would lead into improvement projects, but the school should still be able to feel the satisfaction of being above the European standard on aggregate level. The final web site version of the tool gives this gap information to the schools along with their analysis.

Assessment tool development

People in both the public and private sectors, if asked to, tend to cooperate well in defining and structuring their problems broadly and richly so that all the ideas can be explained. But when they have to explain what factors have the greatest impact on the outcome of the decision, they must compromise. The complexity of the social systems such as schools cannot await a full, logical analysis of the complete situation. As there is a new class of children in the schools to be taught every year, and the resources of schools are rather diminishing than increasing in many countries, a very simple quality assessment tool is needed. Because the evaluation of the quality items gathered is in many cases by its nature qualitative, a system was required that could handle multiple-criteria decision-making on qualitative data. The most well known of such systems is probably the AHP (Saaty, 1988), with a functional and simple software ExpertChoice (www.expertchoice.com), but being that school budgets are restricted, a non-commercial solution was sought.

DEXi (Bohanec and Rajkovic 1999; Bohanec et al., 2000) is such a non-commercial computer software for multi-attribute modelling and decision-making. It is aimed at interactive development of qualitative multi-attribute decision models and the evaluation of options. This is useful for supporting complex decision-making tasks, where the task is to select a particular option from a set of possible ones so as to satisfy
the goals of the decision maker. A multi-attribute model is a hierarchical structure that represents the decomposition of the decision problem into subproblems, which are smaller, less complex and possibly easier to solve than the complete problem. DEXi supports two basic functions:

1. the development of qualitative multi-attribute models; and
2. the application of models for the evaluation and analysis of options.

The models for DEXi are developed by first defining the qualitative variables that represent the decision subproblems (the quality items). For our purpose, this was already done when developing the model of quality items for the EQS framework, as explained in previous paragraph. These are then organized to groups and levels to a hierarchical tree of attributes (a hierarchical structure representing the decomposition of the decision problem; see Figure 2), such as in the AHP method (Saaty, 1988, pp. 28-32).

Where the DEXi development differs from the other methods is the utility functions. These are the rules that define the aggregation of attributes from bottom to the top of the tree of attributes. DEXi uses qualitative (symbolic) attributes instead of quantitative (numeric) ones (Figure 4). Also, aggregation (utility) functions in DEXi are defined by if-then decision rules rather numerically by weights or some other mathematical formula[3]. These if-then rules are, however, based on the numerical values gained from the weights (the sums: 500 points for primary schools, 550 for secondary, and 600 for vocational). The items that the stakeholders have considered more important are also more important in the DEXi decision-making. As a simple example, if there are three subitems in an item, and one of them is considered much more important by the stakeholders, a “good” level in all of them causes a “good” as a sum on the main item level, whereas “unacceptable” in the least important item and a “good” on the two most important issues can still lead to a “good” main item evaluation.

Based on the DEXi system, a computerized tool for the schools was developed within the project to help the schools to use the points-based EQS. While the schools assess their school using this tool, there is a web-based interface that both allows them to record their concerns of non-satisfactory items and other discussion that is seen to be of value for school development. The site then sends the assessments of individual items (on the simple non-satisfactory/satisfactory/excellent scale) to a DEXi server. After finalizing the assessment, the DEXi shows visually (red/green) in which items the school is above or below the European Average for their respective school level. Both the “score” and the discussion documentation can be saved for the next year, to be used for evaluation of improvement.

Findings
The experience of this work has shown that the EFQM, CAF, and Baldrige are not the only possible models for evaluating quality. Indeed, it might be useful for some areas of especially public management to make their own models instead of the industry-derived ones. The EFQM system is useful because it teaches us that quality items can be seen as good standard in elements and subelements of the system. Its drawback is that the language and the priorities presented in the model do not invite schools to use the model. The other alternatives are again somewhat more difficult to use; the correctness of the
final evaluation has dictated the format, not the usability concern. The resulting model and self-assessment tool are, to all the test people, easier to use and understand than the respective EFQM items. For comparison we drew our model of the top-level quality items in similar picture format as the EFQM, Baldrige and CAF models utilize (Figure 1).

Naturally, the views of stakeholders are often different but in the end they are aimed in the same direction. Each one represents one segment of interests, but the common interest is the quality of school. Thus, even in questions in prioritizing and cultural differences, the consensus is relatively easy to find. Even in case of disagreement, the same one/ones who should find the compromise in term of school policy makers, is/are the one/ones supposed to evaluate the final score of the item in the QiS-self assessment. As noted, the final tables of quality items and their relative weights served also for the creation of the practical self-assessment tools developed for three levels of schools. Since the Dexi program we used is based on the rigid, locked tree structure of three-item classes, it is possible to let individual schools to make the adjustments of the weights more to their national or other specific circumstances in their local environment.

Figure 4.
A screenshot of DEXi, illustrating the qualitative attributes (in the matrix) and the hierarchic structure of decision items (column to the left)
They can also use this tool in any other most productive way. This does not disturb the calculations made by the software; however, the comparability with other European countries or schools done by the server will then then lost.

The main part of the work in developing a branch-specific quality model is collecting the background data. In our case, this was done in levels too. In each country the referent collected opinions by each stakeholder group through the school. The dimension of the stakeholder samples differs on the basis of school's connection with the surroundings. Finally, each stakeholder has been represented, at local level, by one score that already could be a result of a consensus or an average from different positions. Data were then collected and analysed. At this stage, the difficulties in perceptions surfaced. The research group worked with material in English, which had then been translated to different languages for the stakeholder groups. This caused interesting differences in some concepts; e.g. the concept “safety” meant for the Slovenian school headmasters mostly a question of the equipment of the school not being stolen and the doors of the school locked after the school hours, but for the Finnish a question of the children not being harmed during their way to and from the school, during the breaks, or in outdoor activity. In the final self-assessment tool, small captions on what is meant with all the concepts were added. Similar problems surfaced during the classification/levelling discussions, or several words could be used of one item; the research group had to decide on the final concepts and what would be the higher-level concepts and what are the subgroups.

While one of the main criteria for the tool was user-friendliness, the construct and the tool (on CD-ROM) were presented to a meeting of European headmasters in Wien, Austria, in December 2005 in order to evaluate the prototype. There the about 30 test persons from seven different countries were seemingly satisfied with the hierarchy and the items. They approved of the three level scale of item evaluation and they also gave a positive feedback in the level of usability of the self-assessment structure. Next steps in the development of the tool consist in following-up the usability of the web interface by the school employees delegated for quality assessment.

Conclusion
In the final stages of publishing we have had a discussion with the reviewers of this journal about what a “standard” is. While we originally set out to make a standard, it is clear that a system that is not accepted by a standardization body would not be a standard. The final result is not an European Standard in the way that it is not accepted by European official bodies. However, we are also of the opinion that because the situations, countries and schools are so different a definite standard should not even be the goal. Thus, we have now in place a kind of “an adjustable standard” that includes the 11 quality items held to be of importance by the about 700 persons that have participated in the discussions in the seven countries. This makes it in a way similar to ISO 9000: what the school should keep an eye on. The final tool also includes the weights given to each of these by the about 700 persons. The “standard” level that the school management can easily evaluate by “yes/no” decision consists of being on “good enough” level on the aspects that the stakeholders held to be of importance, the “good enough” level depending on the weight of each item. The management can thus perform quite simple self-assessments against the level of other European schools. We feel that
the attempt to increase self-evaluation in European schools is a worthwhile goal and will continue developing the tools and methods in two ongoing projects EXPERO and EXPERO2EU specifically for the vocational school levels.

Notes

1. More information on the project and the participating schools can be found through the project available at: www.qualityinschool.net

2. The stakeholder groups to be considered was agreed upon among the research partners and headmasters from the seven countries in a focus group meeting in Copenhagen, September 2004.

3. DEXi runs under MS Windows operating system. It is implemented in Borland Delphi. DEXi is available free of charge for non-commercial applications. To obtain a fully functional Slovene version, download DEXi.zip, unpack it to your computer and run DEXi.EXE (this is the DEXi program itself – no installation is required). There is also a help file (in Slovene language) included in the package. The DEXi User's Manual is available in Slovene language as Jereb et al. (2003). An English version of DEXi is available in DEXi_ENG.zip. Currently, there are no help files or user manuals available for this version.

References


Nielsen, J. (1993), Usability Engineering, Morgan Kaufmann, San Francisco, CA.


Further reading

Corresponding authors
Sara Cervai and Tauno Kekälä can be contacted at: cervai@units.it and tke@uwasa.fi

To purchase reprints of this article please e-mail: reprints@emeraldinsight.com
Or visit our web site for further details: www.emeraldinsight.com/reprints
Book Review: Lean Six Sigma: A Practitioner's Guide

The Reviewers

K. Narasimhan, The University of Bolton, Bolton, UK

RR 2009/1

Review Subject: Lean Six Sigma: A Practitioner's Guide

I.D. Wedgwood

Publisher Name: Pearson Prentice Hall

Place of Publication:

Publication Year: Upper Saddle River, NJ 2006

ISBN: 0-13-239078-7

Price: £42.99

Article type: Review

Pages: 490 pp.

Keywords: Six Sigma, Logistics, Lean production, Manufacturing, Service industries, Performance

Emerald Journal: The TQM Magazine

Volume: 21

Number: 3

Year: 2009

pp. 297-298

Copyright: © Emerald Group Publishing Limited

ISSN: 1754-2731

Dr Ian Wedgwood, Executive Director of Six Sigma Breakthrough Technologies, has more the ten years experience in the field of Six Sigma and Lean Sigma. He has led and facilitated deployments in manufacturing and service industries and mentored executives, champions and belts.

The book comprises six chapters, grouped into three parts, and the introductory chapter. Chapter 1 clarifies what a process is and includes a flow chart that briefly illustrates how the rest of the book is structured. An integrated Lean Sigma Roadmap that follows the DMAIC (Define, Measure, Analyze, Improve and Control) approach of Six Sigma is included.

Instead of sequentially covering what is dealt in each of the parts, the review is covered in the reverse order. Part III is dealt with and then Parts I and II. Chapter 7, the sole chapter of Part III, deals with 55 Lean Sigma tools. First an overview of the tool is given for each tool. Then depending upon the tool Logistics, Roadmap, how to interpret the outputs and other options and considerations are covered. Part II
also comprises a single chapter and a very short one that briefly explains what tools are applicable and what sequence they are used for identifying projects for further scrutiny.

Part I comprises four chapters that describe the route to solution for a wide range of problems. Chapter 2 focuses on tools used in the define stage to prepare the Project charter. Chapter 3 covers 25 tools for Global process problems; first an overview of the tool is given. This is followed by areas where the tool is applicable, how to measure the performance and finally the sequence of actions required and a reference to the applicable tools covered in depth in Part III. Chapter 4 deals with the sequence of processes used for Individual step process problems. It follows the same pattern as Chapter 3, and covers three specific areas: a single process step that does not meet TAKT (Pace of customer demand), the Pace for a single process step is too slow, and too much variation in the Cycle time of a single step. Chapter 5 is a short chapter on tools used for demonstrating improved performance and closing the project.

I found the book interesting and useful. The other books I have reviewed before give detailed information about the tools. Though this book does not cover tools in such depth gives an explanations of what tools to use and in which order and why.