

The *Qualidex* System—Measuring Project Performance

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Background

Quality management is nothing new to the design and construction industry. It has always had quality assurance and quality control (QA/QC) programs that involved the inspection of completed works and pre-qualification of vendors. The quality movement of the 1980's, with its focus on prevention and broad perspective of the entire organization, promoted Total Quality Management (TQM) as a new business philosophy. While it may have worked for some industry sectors, the widespread use of TQM created confusion of what role quality management has in the design and construction industry. Before that dilemma was resolved, the industry was further confused by various ISO certifications and their relation, if any, to TQM.

We determined that the people in the industry needed a visual model or graphical representation to enhance or maybe even initiate understanding of how all the elements of quality management, including ISO 9000, fit together. While understanding is a necessary condition to establishing a quality management program, it is not sufficient. Our pragmatic industry is unwilling to embark on a potentially costly program based on faith that the benefits experienced by the manufacturing and services sectors will be realized in their unique environment. On the basis that one can only manage what one can measure, any system that was going to be accepted by the industry had to provide a cost-effective method of measuring performance and identifying specific areas requiring improvement. Training and coaching had to be targeted on problem areas rather than applied over the entire organization.

The *Qualidex* Approach

The *Qualidex* model, first presented in Exhibit 1, separates the multitude aspects of TQM into two distinct categories—conventional or contemporary quality. Conventional quality is the industry's traditional quality management programs; it involves meeting specifications, schedule and budget by utilizing a series of processes with appropriate QA/QC measures. Conventional quality has a technical orientation and seeks increasing control of things to reduce variation and conform to requirements. ISO 9000, the internationally recognized QA standard, is a conventional quality process.

Because it is relatively new, the other dimension of quality is called Contemporary quality. As the approach to quality changed from catching variations after the fact to preventing variations before they occur, the focus of the quality movement shifted to involving people in improving their work processes to achieve better performance (conventional quality). In contrast to conventional quality, Contemporary quality has a psychological orientation and seeks to increase the competence and motivation of people. Contemporary quality can be considered as a measure of corporate culture or organizational effectiveness. It initially focuses on team competence to perform the required tasks and subsequently on team commitment to excellence through continuous improvement.

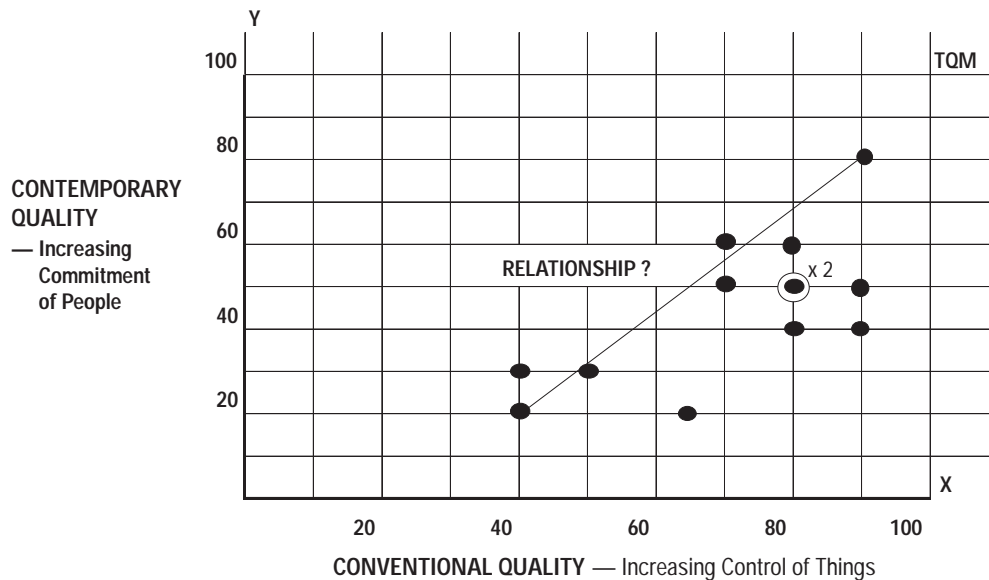
Although the “total” in TQM is considering the contemporary aspects as well as the conventional, the objective of any quality management program is improvement of conventional quality—the contemporary quality is only the means to that end.

The *Qualidex* model presents its two-dimensional results on a simple x-y plot. Conventional quality, measured on a 0-100 scale, is plotted on the x-axis while contemporary quality, also measured on a 0-100 scale, is plotted on the y-axis. The intersection of the two ratings is called the *Qualidex* rating and the co-ordinates are expressed as “xx/yy”. Exhibit 1 shows our *Qualidex* ratings for 13 projects. The *Qualidex* concept not only facilitates understanding of TQM and ISO 9000 but also proposes that there is a relationship between the two dimensions, i.e. the greater the involvement and commitment of the team to the project goals (Contemporary quality), the greater the likelihood of meeting project requirements of specifications, schedule and budget (Conventional quality).

The *Qualidex* for BC Hydro

B.C. Hydro, a government-owned utility, generates about 80 percent of the electricity in the province of British Columbia from a predominantly hydroelectric system with nameplate capacity of about 10,300MW (1000 MW thermal). About 1.4 million customers are connected by over 70,000 kilometers of transmission and distribution lines. The utility spends about \$450 million annually on capital projects to upgrade, reinforce and extend the existing electrical system.

Exhibit 1. The *Qualidex* Concept



The power supply business unit is responsible for the supply of electricity. The Project Services Department (PSD) in B.C. Hydro’s Power Supply Group is responsible for supplying project management, project support and environmental coordination. PSD sponsored the development of a *Qualidex* to identify areas requiring improvement in order that scarce training resources could be allocated in an optimum way. In order to develop the specific surveys for both the conventional and contemporary aspects for each of the three areas within PSD, a representative of each area was assigned to work with the consultant.

Survey Development

Conventional Quality (Controlling Things)

The starting point for the conventional quality survey was the life cycle diagram from the Project Management Policies as presented at Project Management Institute Seminar/Symposium 1995 in New Orleans (2). While the corporation’s Project Management Policies dictate that the project phases be identification, definition and implementation, this breakdown did not lend itself to measuring the quality control aspects as there were relatively few QC practices in place (or contemplated) in either the identification or definition phases but there are many in the Implementation phase. In fact, the QC for the detail design portion of implementation was quite different from the construction portion. The result was

that for the survey, the two early phases (identification and definition) were combined and the detail design portion of Implementation was treated as a separate phase from the construction portion of Implementation.

The detailed rating survey developed by the participants used the following components:

Performance of Tasks: The Pareto Principle was used to select the significant few from the trivial many. The critical project tasks are generally in sequence as they occur during the project life cycle.

QA/QC: For each task that is selected and rated, the quality control measure for that task is identified and rated as is the quality assurance procedure for the QC activity. Quality Control, which is the practice of checking the performance of the tasks against the established standards or customer expectations, involves action by a team member or a person to whom a team member reports. Quality Assurance refers to the documented procedures that set out how work processes are conducted and identifies the standards or expectations to be used for QC. Once established, QA is a passive component of the process. For formal certifications like ISO 9000, the documentation and processes are audited to confirm compliance.

Following are some examples of typical task performance, quality control practices and quality assurance procedures:

Task Performance

- Identify customer requirements
- Recruit project team

Establish design/construction controls
Monitor design/construction progress

QC Practices

Confirm competent staff
Concept/design reviews
Organized records

QA Procedures

Internal documentation
Internal audit
ISO 9000 certification

Contemporary Quality (Motivating People)

We developed a detailed rating survey for Contemporary quality to suit PSD. There was some latitude permitted for selecting the items in the survey but, in order to facilitate benchmarking with other organizations, we were constrained to stay within the long list of items provided in Exhibit 1. The selected items are listed in a hierarchy with earlier items generally being prerequisites for later items. There are two groups of items—"Training for Competence" followed by "Motivation to Achieve Excellence". These groups are separated by a decision node—"Senior and Middle Management Commitment"—which is intended to ensure that the team is not wasting its time on a program to achieve excellence that management will not support.

The rationale for the division between the training and motivation is that there is no benefit to motivating the incompetent (inadequately trained) to strive for excellence. If they do not know how to adequately perform their assigned tasks, they require training and only when the competence has been obtained should the program enter the motivation phase. Similarly, once the team members have reached an acceptable level of competence in performing their tasks, there is limited value in continuing to provide further training for that task. Unlike Conventional quality, which has a different survey for each of the three groups, there was a single Contemporary quality survey for all members of the department.

Survey Results

Completing the surveys followed these steps:

Step 1—Each member of the department was asked to complete the Conventional quality survey for their specific group. This first pass asked how well they thought their group currently performed the listed tasks, how well the current quality control practices are applied and how effective are the current quality assurance procedures.

Step 2—Each member of the department was asked to complete the current activities column of the Contemporary

quality survey. The survey is the same for all members of the department. Numerical scores were preferred (increments of 5 adequate) but the survey form is set up to subjectively solicit opinions in 4 broad categories—nothing significant, some, extensive or very extensive activities.

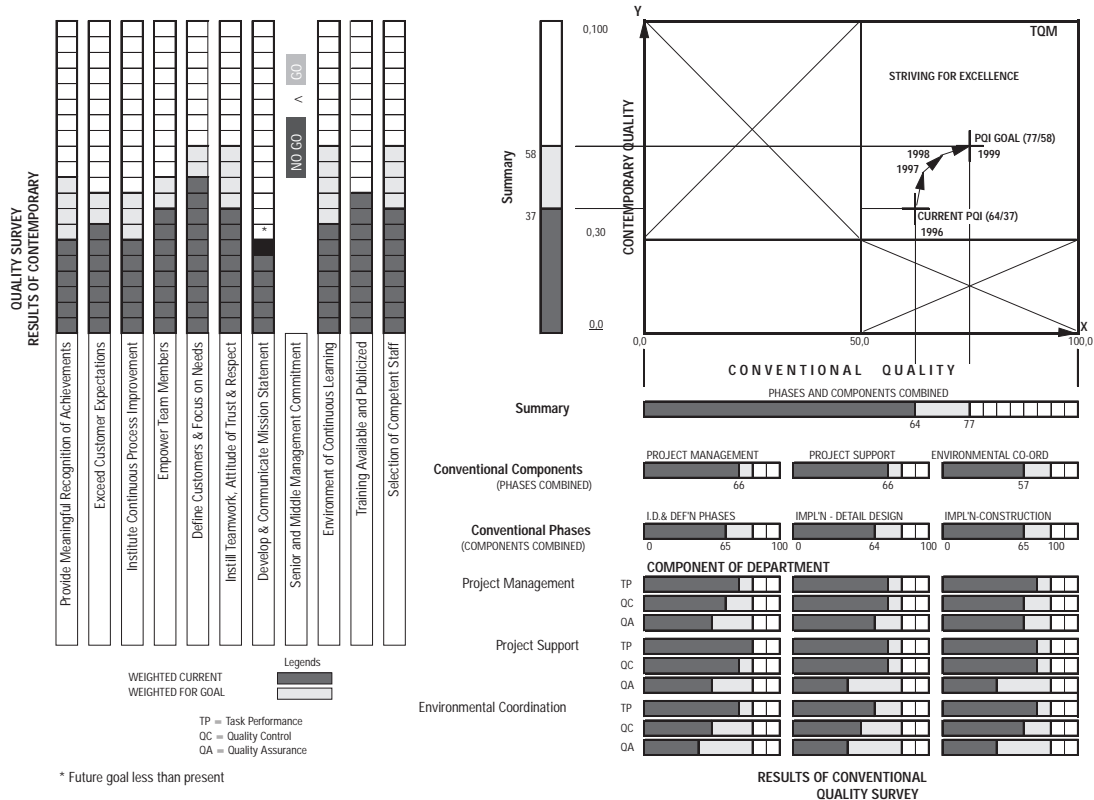
Step 3—For the first part of this step, management was asked to set the Conventional goal for a reasonable period of time. For PSD, the program goal was set at a conventional **Qualidex** rating of 75 percent in 3 years (October 1999). For the second part, the participants were asked how to best attain that goal. To facilitate timely completion of the survey, the scoring sheet shows default scores required to make the 75 percent target in each item. If they did not think that all items should score the same, they could change the default scores but where they increased one item by an amount, they should have decreased another by the same amount to keep the total the same.

Step 4—Establishing the requirements for Contemporary quality is the most significant step in the process and the most unique element of **Qualidex**. It asks the members of the Department what has to change in the organization structure/environment before management's desired goal for Conventional quality can be achieved. The theory is that improvements in Conventional ratings will come when the team gets to the Contemporary stage of continuous improvement. The items preceding that stage are the prerequisites to improvement.

Summary Level Results

The **Qualidex** chart on Exhibit 2 shows the complete picture of the department's current status and goals. The histograms show the survey results for each item as well as several roll-ups of survey items. The summary levels for the current and ultimate goal are plotted on the **Qualidex** (x-y graph) along with two interim targets to show our path to the goal. These are not just arbitrary points—they translate back to specific items (tasks, QC/QA, training, motivation) that need to be improved by specific amounts to achieve the goal. The current **Qualidex** rating for PSD is 65/37—that is 65 percent of maximum Conventional and 37 percent of maximum Contemporary. The PQI goal as determined by the department members is 77/58 by 1999. For the conventional goal where default scores were provided for the management selected total of 75 percent, some participants increased the score on some items without an offsetting decrease. These higher scores increased the conventional quality goal to 77 percent.

Exhibit 2.



Outcome

The survey recommended a three year program to achieve the program goal and provided the following recommendations for action in the first year.

With respect to Contemporary quality, which applies to all members of the department, the recommendations were:

1. Drop the development of a mission statement—The objective of collectively developing a mission statement was to “develop and communicate goals and values”. This requirement remains and generally, the collective development of a mission statement is still considered a valuable team-building exercise. However, in this case, the department rated the future requirement lower than the current score.
2. Management commits to the program—Management commitment had the highest gap between current rating and rating required to achieve the results. PSD management should demonstrate their commitment to excellence.
3. Address negative reaction to “Selection by Competency”—Due to reductions and re-organizations, PSD

are currently required to use what staff is available. This conflicts with one of the values set out by the department members but since PSD management is unable to change that corporate requirement in the short term, the issue should be set up as a future goal when the corporate environment changes.

4. Enhance the Environment of Continuous Learning—PSD management should determine if a reduction of the training budgets is the source of the large gap between current rating and rating required to achieve the results. If so, seek local low cost programs until budgets are re-established or determine other alternatives within the available funds.
5. Nurture “Teamwork, Trust and Respect”—As a minimum, establish several groups that have this critical aspect involved. For example, use a team of project managers and project support to implement several improvement programs.
6. Provide training in “Continuous Improvement”—The group does not appear to appreciate the role of continuous improvement. Assign one of the project

managers to develop a training session for presentation to the department.

With respect to Conventional quality, which is specific to the three groups in the department, the recommendations were:

1. Organized Records—This item scored low with all three groups. If the ISO 9000 program does not catch this item, PSD should set up a task force with one representative from each group to confirm the concern and to determine resolution.
2. Competent Staff—This item showed up as a weakness in the quality control sections of both project management and project support. We believe this reflects the same concern (3. Above) about having to work with available personnel regardless of their capability.
3. Quality Assurance—The cross surveys indicated that project managers and environmental coordinators understood the role of QA but project support personnel did not. If the forthcoming ISO 9000 program does not already incorporate training in the basics of QA/QC, PSD should consider their own program. This would not be a high priority item.
4. Risk Analysis—This project management issue consistently received a low rating (1/3). As described in 5 Above, set up a program and hopefully get benefits of both team building and performance enhancement.
5. Customer Acceptance—This unique project management issue had widely dispersed ratings. This item is not always included in the project procedures that may be why so many do not recognize the need. PSD to review their project procedures and, if appropriate, draft a new procedure to capture this item.
6. Feedback to Design—This is another item unique to project management where the rating was widely dispersed. PSD should review their project procedures and, if appropriate, draft a new procedure to capture this item.
7. In-house Reviews—This Environmental Coordination issue was rated low. PSD should review their project procedures and, if appropriate, draft a new procedure to capture this item.
8. Agency Feedback—This Environmental Coordination issue is rated less than 50 percent currently and in excess of 90 percent as a future requirement. PSD to confirm the deficiency, then ask the environmental coordinators to develop options to resolve.

ISO 9000—Certification

Concurrent with the *Qualidex* survey, Power Supply embarked on obtaining ISO 9000 certification for the engineering and project management functions. The *Qualidex* survey results indicated a considerable amount of confusion about ISO 9000 and QA/QC concepts in general. In addition, the survey indicated a number of process deficiencies (for example, Organized Records) and it is anticipated that documenting our process in relation to these items will greatly reduce the current confusion. The ISO documentation has been in place since October 1996 and already has added clarity and consistency to our processes. At the time of publication of this paper, PSD was embarking upon an auditing program with regard to ISO 9000 and results should be available for presentation at the PMI seminar/symposium.

Since the ISO 9000 program is also being introduced to PSD, the action plan for year 1 was limited to producing two training modules—one in continuous improvement (project management) and the other in risk assessment.

Future Developments

The *Qualidex* survey is scheduled to be repeated with the PSD in October 1997. Substantial improvements in conventional items are expected both as a result of the PSD action plan and the groups' steps towards ISO 9000 certification. The next step to be considered would be to survey PSD's internal customers and incorporate their ratings into the system.

Bramcon continues to work with other groups interested in improvement programs but we are finding that anything associated with "Quality" is passé. Business has moved on to other potential processes. The director of quality at one major corporation who has encouraged development of the *Qualidex* system prefers the labels "Performance Measurement" for our Conventional quality and "Organizational Effectiveness," for our Contemporary quality. Our next step may be a new name for the same concept.

Bramcon is working with a university to conduct a large survey that would confirm the proposed relationship between Conventional and Contemporary quality.

Exhibits

1. McConachy, B.R. 1996. Concurrent Management of Total Cost and Total Quality. *Proceedings of the Annual Meeting of American Association of Cost Engineers.*
2. Bourne, D.R., McConachy, B.R. and M.K. Strachan. 1995. One Size Conducts All?—PM Policies for an Electric Utility. *Proceedings.* Upper Darby, PA: Project Management Institute. pp. 728-735.