

Case studies

Starting the journey: team-based QI in a university laboratory

*K.S. Chin, K.V. Patri, K.F. Pun,
W.H. Yeung, L.T. Poon and
K.K. Poon*

The authors

K.S. Chin, K.V. Patri, K.F. Pun, W.H. Yeung, L.T. Poon and K.K. Poon are the QCIMEL Steering Committee, based at the City University of Hong Kong, Hong Kong.

Abstract

Describes the design and early implementation of a team-based quality improvement campaign in progress within the Department of Manufacturing Engineering at City University of Hong Kong to improve the performance of its laboratory services. Midway into a two-year implementation plan aimed at fostering a worker-oriented group culture to achieve the quality targets, a working committee representing the "Quality Campaign in Manufacturing Engineering Laboratories" (QCIMEL) discusses the rationale of the programme design and structure, and reports progress at the end of the one-year mark.

About the Manufacturing Engineering Laboratories City University of Hong Kong

Since being established in 1990 within the Department of Manufacturing Engineering of City University of Hong Kong, the Manufacturing Engineering Laboratories (MEL) has gone through a number of structural and organizational expansions to become a complex organizational entity. Today, MEL covers about 3,500 square metres, employs more than 31 staff members, and houses high-tech equipment worth in excess of \$7 million. MEL's 31 staff members include 21 technicians and programmers, six artisans and skilled labourers, and one clerical staff person.

MEL serves more than 700 customers and delivers a diverse set of services. MEL supports more than 30 academic modules of BEng, MEng and MSc coursework. The laboratories provide the facilities and supervision for a large number of final-year undergraduate student projects and MSc and MEng dissertations. MEL provides basic industrial training for undergraduate engineering projects as well as the facilities and support needed for MPhil/PhD students and research projects.

Used both for pure and applied academic research, the laboratories also work collaboratively with local industries, and supply support services related to government-funded projects, such as providing rapid prototyping services to local industries through the Hong Kong Rapid Prototyping Technology Centre, and investigating emerging global manufacturing technology in the Desktop CIM Centre.

Group activity approach in Quality Improvement

The development of people and generating their involvement in improvement activities

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For information about this article, contact K.S. Chin, chairman of the QCIMEL Steering Committee, Department of Manufacturing Engineering, City University of Hong Kong, Tat Chee Avenue, Hong Kong. (Fax: 852 2788 8423).

through group activity is a key feature of modern quality management [1] and one that can be approached in a number of ways. Introducing quality improvement task forces (QITF) and quality control circles (QCC) are among the most popular.

A quality improvement taskforce is a work group usually established by management to solve quality problems selected by management. A taskforce is well-structured with formal scope and authority within the organization. Its members are appointed by management and their contributions to the group and its result are considered as part of their formal, personal performance assessment. They meet on a regular basis on the company time and receive training and support from management. Taskforces may be permanent work groups in areas where problem solving is ongoing and where the problems are common to group members. Other taskforces may be of the *ad hoc* variety where members meet to solve a particular problem, but do not normally work in the same area.

QCCs are another form of group activity directed towards quality improvement. A typical circle is a voluntary group of six to eight employees from the same work area. Although some circles meet on company time with support from management, circles usually meet after working hours to solve problems related to their routine work activities and environment. Circles are one means of providing employees with the opportunity to solve problems, and implement and monitor their solutions. The QCC approach has been very effective in Japan and increasingly is used outside Japan because of three main success factors [2].

- (1) Workers like talking about their work.
- (2) Workers are interested in their work and want to contribute.
- (3) Workers welcome the opportunity to use their own skills and experience to identify and solve the problems they have to live with that nobody seems to care about.

In contrast to the taskforce approach, QCC members join a circle voluntarily and can opt out when they wish. Circle members select the problems and projects they want to tackle, while a taskforce works within a limited scope defined by management.

Following an institution-wide quality awareness initiative in 1994, conducted a staff appraisal exercise. Results revealed a genuine

interest in quality improvement. Many staff members had taken the time to think seriously about problems concerning their work and to make a number of positive suggestions. The responses, coupled with a general sense among MEL management that the laboratories needed their own mechanism for continuous quality improvement in order to provide world-class service to its customers, prompted Professor K.V. Patri, head of the Department of Manufacturing Engineering, to launch the "Quality Campaign in Manufacturing Engineering Laboratories" (QCIMEL) in mid-1994. The intention being to:

develop a more lively culture oriented towards quality improvement through group effort so that the traditional, hierarchical and top-down ethos of laboratory management could be complemented by a worker-oriented and bottom-up activity [3].

At the heart of the decision is a teamwork-focused philosophy. MEL management believes that the effective solution of problems through group activity facilitates the process of team building and this – along with improved communication and understanding, and involving people in ways that maximize their personal development – is more important than the result. In order to build the type of "culture" defined by these values, MEL management decided to leave the quality campaign entirely in the hands of the MEL staff. The staff involved would decide what form of group activities they would "commit to". It would be management's responsibility to develop a broad understanding of quality improvement so that the workers could make an informed choice. Once the workers committed themselves to a particular plan of action, management would demonstrate their belief in the plan and not only visibly support, but actively be involved in the ongoing process.

Philosophy: from manpower to team-power

Like other organizations, what MEL wants and needs from staff members is the delivery of timely, high-quality services at minimum cost. Teamwork allows people who work together in an interdependent way to discuss mutual or individual concerns, to exchange ideas for solving problems, and to share experiences. Effective teamwork can provide a satisfying, stimulating and enjoyable working

environment which can make things happen, solve problems and achieve results[4-6].

Converting from a traditional organization with its emphasis on manpower to a team-power organization takes time and effort[7]. Team-building efforts go through a series of steps – goal definition, data gathering and analysis, action planning, implementation and evaluation, etc. Revitalization or increase of work teams' effectiveness is the core purpose, and team relationships, roles, goals, and processes all have a direct bearing on the results a team produces[5]. A variety of factors affect the team efficiency, including the organization's willingness to devote time and money to improving the team, the individual's desire to participate in team activity, the availability of outside assistance for team-building, and the existing knowledge that members have about team-building. Conflict, arguing, misunderstanding, poor interpersonal relationships, not sharing information and trusting one another, etc., all lead to the ineffective use of productive time and deteriorate team efforts[5]. It is crucial for management to understand these factors and to provide facilitative support for effective team-building.

Understanding and embracing these concepts at the outset, MEL management committed to a teamwork-based approach and in the fall of 1994 implemented QCIMEL by initiating small group activities in the laboratories.

Structure: getting started

Implementation began with the formation of a steering committee chaired by one of the university's academic lecturers who specializes in quality management, but who is not deeply involved in routine MEL activity. Committee members included the department head, laboratory manager (representing the laboratory staff), a lecturer (representing the academic staff and research/undergraduate students – the major user groups), and three additional lecturers from the quality management area.

The steering committee set the following guidelines for QCIMEL improvement efforts:

- identify improvement needs at a non-managerial level;
- obtain definition and agreement among MEL staff and management regarding the

scope and objectives of improvement efforts;

- focus on improvements within MEL operations;
- address process issues rather than strategic and organizational changes;
- develop an employee-led process for improvement (within the agreed scope and objectives).

The steering committee designed a two-year implementation programme (Figure 1) consisting of three distinctive phases:

- (1) awareness and team-building;
- (2) pilot run; and
- (3) full-scale implementation.

The awareness and team-building phase would last approximately six months and be composed of a series of training seminars, company visits and action-learning workshops aimed at stimulating an awareness of quality concepts and culture among the MEL staff. Particular emphasis would be given to small-group activities and team-building. The pilot run phase would last about eight months and would focus on trial implementation of an action plan to which MEL staff would commit

Figure 1 Phases of the QCIMEL implementation programme

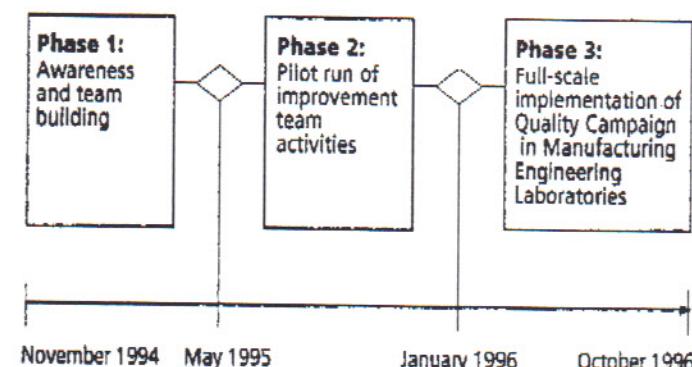


Figure 2 Action plan formulated for phase two

Phase: 2 Pilot run of improvement team activities

Formation of improvement teams	Ongoing team meetings/activities to identify, solve, implement and monitor the quality improvement projects	Successful cases presentation	Overall review
Continuous support by facilitators, training seminars/workshops and periodic review from steering committee			

themselves in phase one (see Figure 2). The steering committee would provide all the support and training required to implement the plan. The committee would also be responsible, at the end of phase two, for evaluating QCIMEL results, consolidating the experience gained, and sharing it with the MEL staff. Full-scale implementation – anticipated to take approximately ten months – would commence after the pilot run had been reviewed.

In addition, the implementation plan called for a formal suggestion, assessment, reward and recognition mechanism to be established to nurture and sustain quality improvement effort among the MEL staff. At the time of writing, QCIMEL is in the pilot run which began in May 1995.

Phase one: awareness

Phase one began in November 1994 with a series of seminars conducted about once a month by members of the academic staff of the university's Department of Manufacturing Engineering and by external quality professionals. The purpose of the seminars was to convey modern quality concepts and the idea of the worker-oriented teamwork approach to the MEL staff. The seminars were interlaced with – and reinforced by – experience-sharing talks by external companies. Seminar topics included:

- *Bottom-up quality culture.* A fundamental belief underpinning the QCIMEL effort is that voluntary employee participation and ownership are vital factors of any successful quality improvement programme. The seminar introduced the basic features of bottom-up quality activities. Group discussion afterwards focused on MEL-specific objectives and the steps necessary to promote these activities within the laboratories.
- *Team spirit.* The natural human desire to be part of a successful team working towards meaningful solutions for problems can be a powerful driving force. This seminar described the importance of team spirit and how it could influence the partnership process in MEL.
- *Leadership.* Successful team-based activities require not only active and committed individual team members, but also the availability and commitment of a trained

and skillful team leader. This seminar explained leadership roles, styles and skills.

- *Quality control circle.* This group-based approach has been used extensively by many world-class companies to encourage employee involvement in the process of continuous improvement. This seminar introduced the concepts, structure, operation and benefits of quality control circles. Discussion afterwards focused on how MEL staff could implement circles.
- *5S concepts and implementation.* This seminar discussed in detail the Japanese management philosophy of *Seiri* (organization), *Seiton* (neatness), *Seiso* (cleanliness), *Seiketsu* (standardization) and *Shitsuke* (discipline). Its purpose was to enhance MEL staff's consciousness with regard to improving service quality through better housekeeping within the laboratories.

In addition to the seminars, MEL staff also heard presentations from representatives from the three leading Hong Kong companies – the Kowloon-Canton Railway Corporation (KCRC), the Mass Transit Railway Corporation (MTRC), and Motorola Semiconductors HK Ltd. MEL staff visited KCRC and Motorola, where they heard first about the firms' experiences with corporate-wide group-activity-based quality improvement programmes. The first part of each presentation introduced the company's quality culture and organization, implementation tactics, and the benefits of its customized group-activity-based quality improvement programmes. The second part featured a representative work group who described a successful improvement project they had implemented. The presentations gave MEL staff an understanding of how workers carry out an improvement project and, more importantly, why the workers participate in group-based improvement projects and the benefits that workers realize through these activities. In addition, some MEL staff members attended the annual award ceremonies at KCRC and MTRC, at which the best improvement projects are recognized and described.

Lessons shared

These experience-sharing activities supported what the MEL staff had learned in the seminars. Feedback from the MEL staff following the activities are summarized below:

- They had a clearer idea of how to actually implement team-based quality improvement programmes. Shared lessons reinforced the concepts they learned during the training seminars.
- They were impressed by the huge tangible as well as intangible benefits that resulted from some of the projects.
- Successful cases inspired them and gave them practical insights into possible improvement projects within their own workplace as well as the steps and techniques of problem solving within a team.
- The presentation and award ceremonies were an eye-opening demonstration of the invaluable rewards of successful team-working, e.g. the audience's ovation, top management's recognition, and the morale boost the whole team received.

Team building

Concurrent with the seminars and experience-sharing programmes in the first QCIMEL phase, a series of team-building workshops – two half-day “in-house” workshops and a two-day “residential” workshop – were held to initiate the teamwork-based approach into the MEL environment. These MEL-wide workshops were also intended to help ascertain whether the staff would be receptive to team-building activities. The results would help determine whether it was worth developing the work teams in MEL, whether these teams could cope with the demands of team-building, and whether the wider organization would be supportive of a team-building approach.

Three months into phase one, in January 1995, the first QCIMEL half-day workshop was held. Its purposes were to:

- stimulate the staff's active participation in team building and in future QCIMEL endeavours;
- stress the importance of team spirit, effective communication and good teamwork for successful groupwork; and
- provide facilitative guidance on team-building, leadership and personal development through activity-centered games and exercises.

In general, the workshop was a proactive effort to promote the staff's awareness of quality improvement and to reduce any potential resistance to the QCIMEL project.

The second action workshop – 5S Day – was held in February 1995 after the 5S seminar. Its purposes were first, ~~was to provide~~ MEL staff with “hands-on” experience in formulating and practicing a 5S approach in their workplace, and, second, to reinforce team-building principles. The workshop had four parts: preparation of a team 5S plan, presentation of the plan, execution of plan, and a review session. The teamwork-based approach proved useful. Promising results included an appreciation of team efforts and real improvements in the workplace.

A two-day “residential” workshop, held at the end of the first phase, April 1995, aimed to improve participants' awareness of the major factors relating to the effectiveness of teamwork in quality improvement, and to reinforce team-building by sharpening their analytical and problem-solving skills. The workshop consisted of a series of stimulated games, experimental exercises and case studies in areas of team-building and communication, and several group projects that integrated the knowledge and skills learned during the workshop. Group processes and team behaviours were monitored and evaluated.

Judging by the feedback, the workshop largely achieved its objectives. One participant said that “this is a fantastic experience for us to work as a team to pursue our goal”. Another said “teamwork is a ‘must’ to get work done... We gain many things from the workshop, particularly we know one another, understand others more, and are more considerate... We thank our team members for their active participation and support”.

Looking ahead to phase two

Teamwork means enabling employees to manage themselves in pursuit of their goals. With effective teamwork, employees can become competent and committed to the extent that their work challenges them, lets them control it, and provides them with the opportunity to co-operate one aneach other. The first QCIMEL phase, particularly the team-building workshops, provided an awareness of the need to build effective teams, and created a motivating environment in which staff members voluntarily apply more discretionary effort and boost their performance.

The pilot run, the second QCIMEL phase, commenced in May 1995. All the technical staff in the laboratories were divided among

three teams. The QCIMEL steering committee selected team leaders based on their seniority in MEL, their leadership abilities, and their understanding and commitment to the QCIMEL programme. The steering committee appointed for each team a facilitator familiar with the concept of "quality first" and knowledgeable about team-building, leadership training, motivation, and quality improvement techniques. Facilitators are the academic lecturers of the Department of Manufacturing Engineering but are not directly involved in the routine laboratory work. The QCIMEL steering committee continues to organize QCIMEL activities, review its progress, and suggest changes related to better use of the external resources.

To strengthen organization-wide commitment to quality improvement in the laboratories, it has been necessary for management to confront the employees' skepticism and resistance to changes. "Business-as-usual" must become totally unacceptable to the entire staff, and there must be a clear understanding that the laboratories are going to undertake changes. Change must be fundamental and pervasive, and must involve everyone in the

laboratories from the management to technicians. No one can be immune; and all must contribute. One of the most effective weapons is to build a satisfying, stimulating and enjoyable teamwork environment. Without effective teamwork, it is unlikely that the full potential of MEL will be reached.

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Commentary

Here's a case example for any readers in academia, or with design or research facilities. You can play too!