QUALITY MANAGEMENT WORKS

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Introduction

I remember sitting at my desk one day half-way through the project. It wasn't a particularly busy day and things were going well. As usual, the project team was busily working away on their tasks and meeting their commitments. They were very focused and self motivated on what they had to do, and they seemed to be enjoying their work judging by the smiling faces passing by the open door of my office. A thought flashed by. "The Project Team didn't need me!" It was a strange feeling, but I distinctly remembered that it felt good. As the project manager, I knew that I would only be as good as the people who worked for me and that they were the keys in making this project a success. I also knew that this quality management stuff works!

As Project Managers, how often do we get to apply the many quality theories we have been exposed to in the execution of our projects. More importantly, how do we know that they will work? On this particular project, I had the opportunity to apply and test many of the theories on total quality management, and I found, not surprisingly, the theories work fine!

A quality management approach was used and various management techniques were implemented to accommodate this approach on the project. This called for an open, democratic management style, fully supportive of team-based activities with empowerment filtered down to the people who took ownership and commitment to execute the work and to meet the project objectives. People were encouraged to feel good about their work and their participation as part of the team. The theory works fine when all the elements are put in place and everyone wants to make it work.

This paper will deal with *specific* management techniques which were done on a practical level and the principles which were followed to make this project a very successful and satisfying experience. Although many of these techniques relate to the execution of engineering work, they can apply to the execution of any project as the theories on quality management remain the same. The important thing is to recognize that the benefits are there for the taking if you try them out. You, too, can be pleasantly surprised at the outcome.

The Project Background

ARCO is an industry leader in the United States in the development of cleaner burning fuels. This project was part of their current initiatives with their California Air Resources Board (CARB) Clean Fuels Projects for a major upgrading of their Los Angeles Refinery to meet the stringent air emission standards for the State of California. The CARB Project totalled over $400 million in installed cost and the CARB gasoline had to be in production by March 1, 1996. ARCO is also a strong proponent of total quality management on their projects and they supported many quality improvement initiatives. The project had a significant performance incentive to encourage and promote the use of quality management in the engineering work.

Cross-discipline engineering was required to complete the design and drawings for the installation of four new pentane storage spheres and a new flare stack system. This work was initially started by Bechtel in the U.S. and the balance of the work was transferred to Bantrel Inc., Bechtel's Calgary office, to complete the detailed engineering work. This project was schedule driven, totalling about 33,000 hrs. over a seven months period with manpower peaking at about 40 people. The engineering disciplines involved were systems/mechanical, civil/structural, piping, instrumentation and electrical.

Bantrel was the first engineering company in Canada to be registered to ISO-9001 back in 1993. This meant that the company had in place established procedures on how it does its work, quality control and quality assurance programs to ensure that the work is done correctly, a procedure to identify and correct deficiencies to achieve continuous improvement and adequate training programs supporting these procedures. Call these the hard measures of quality management as all these items can be physically measured.

However, a true quality management system must include more that just the hard measures of a quality system. The soft measures such as teamwork, empowerment of the people, management style and working environment become critically important if the full benefits of any quality program is to be achieved. With the full support of Bantrel management, it was decided to implement as many of the soft aspects of quality management on this project so that its results and benefits could be assessed.

Quality Issues

Quality Management is a term used interchangeably with Total Quality in our company to describe an

organization's system for continual improvement and its commitment to the quality process. Quality Management challenges the three paradigms common in our business:

- Errors and rework are inevitable
- Workers have only their labour to contribute
- Today's methods will be adequate to meet tomorrow's challenges

Quality gurus such as Deming, Juran and Crosby agree that:

- *Quality improvement requires a shift in management philosophy.*
- *True improvement results from a focus on the quality of the work process (ie. the system and not blaming individuals for problems).*
- *A culture conducive to continuous improvement is required.*
- *All functions and departments must be included.*
- *Training is critically important.*
- *Recognition of achievements is necessary.*
- *Improving quality leads to improved productivity.*
- *The person doing the job is generally the most knowledgeable about that job.*
- *People want to be involved and to do their jobs well.*
- *More can be accomplished working together (teamwork) to improve the system than individuals working around the system.*
- *The adversarial relationship between the workers and management is counterproductive and outmoded.*
- *Everyone must be involved to improve the way things are done.*

The quality theories derived from these authors are shown in *italics*.

People & Trust

Quality theory states that *"management must recognize that people are the organization's most valuable and long-term resource. Management must help their people through training which will result in quality improvement. Management must not blame workers for problems in the system, and it must remove barriers that rob the people of their pride of workmanship. People want to work for the overall good of the organization and to share in its success".*

People are not dumb and they don't give away their trust freely just because you are the project manager. Trust needs to be earned as reflected by actions supporting the words. The strange thing about trust is that you have to give it first before you have any hope of getting it back in return. People need to be trusted as much as they inherently want to do a good job. To promote an atmosphere of trust and co-operation, an open and democratic management style was used and along with it an "open door" policy. In other words, the project manager's office was always open for anyone on the project team to discuss any issues, work-related or otherwise.

Early in the project, the discipline leads were told that they would not be blamed if anything went wrong with their work and that if they failed, then collectively as a team, we all failed. Furthermore, the project manager would be ultimately responsible and he would accept the blame for all the work done by the team. It took a long time for the leads to believe this as they were so used to being blamed for the failings of the project. Still after two months, written memos from various disciplines would be sent explaining why they couldn't do certain things, sort of covering their backside. And each time, no one blamed them even when they knew they were at fault and the problem was resolved together. In time, they realized that the project manager's actions were indeed consistent with his words and that he trusted them to do the right job and they could trust him to support and help them when they needed it. The biggest benefit to all this was that whenever a potential problem arose on the project, the leads were no longer afraid to bring it up and there was always enough time to implement corrective measures to prevent the issue from becoming a real problem.

The Quality Plan

A specific quality plan was implemented to train the project team on the various aspects of quality and continuous improvement. The basic quality requirements were covered in the company's Corporate Quality Manual. Client and employees questionnaires were used as a feedback mechanism to identify areas where quality improvements could be made. Quality training sessions on "What is Quality" and the "Need for Quality" were conducted to help the team understand the theories behind quality improvement and why we need to work as a team and how to focus our services to both internal and external customers. Teambuilding exercises were implemented, such as the survival "Alaskan Adventure" test to meld the team together and to have a bit of "fun" on the project. The project team reacted very well to these training initiatives as it showed that the company was serious about quality.

Team Concepts

When the project team was assembled, a specific request was made not to stack the team with high performers or "superstars". People who were available at the time were assigned to the project and it was left to the project manager to apply the quality theories and to put the team together. The initial group was quite diverse - this was the first big project for the piping lead, the project secretary was a recent hire and the instrument lead was an agency (contract) person. Actually, 30% of the project team were comprised of agency personnel , which is not unusual.

Quality theory states that *"if a team to be molded into a cohesive unit, all team members must be treated equally. If they contribute to the success of the project, they must all share in its benefits."* Typically, one quarter of the team will be the high performers. These individuals are generally self-motivated, committed and highly competent. The next half can be considered the competent middle group who will usually do a good job and work well in a team environment. The last group is the one that can make or break the project. If this group does not believe in teamwork and produces lower quality work with less effort and commitment, then it will drag the total team performance down. A team will consist of performers of all levels and to be effective, every participant must be committed to contribute to the best of their abilities and to try to continuously improve. That what makes a team.

To show how strong a bond teamwork can be, there was a time on the ARCO project that the civil/structural group had to work overtime to meet their scheduled commitments. As the project manager, I didn't ask them to work overtime, I only authorized it after the lead indicated that they needed to do so. When the lead asked his group how many would work Saturday, all 12 said that they would come. Can you imagine what the feeling would be on this team if only half showed up and the other half didn't care? They all cared. They were a team.

The agency people were a bit surprised that they were treated like the staff personnel. Like the rest of their team members, they shared the same team luncheons, they participated in the same quality training sessions and teambuilding exercises, they received the ARCO Recognition Awards along with everyone else and they were involved in key decisions affecting their work. On the project, there was no distinction. The agency people responded as if they were part of the team with the same commitment and desire to see this project a success.

Team Buy-in and Empowerment

Quality theory states that *"teams should take ownership of their decisions. They should be empowered to implement their recommendations and alter the system within the approved boundaries of their mandate. Management should not tamper with the team decisions, but should create the right environment to facilitate this process. All individuals on the team should be empowered in their accountabilities to the extent they become self-managing. And they should be empowered to fully communicate their concerns and know that they are being heard".*

Empowerment, it is such a powerful word... a cure-all to all our ills, like a magic pill. Speak the words "the people shall be empowered" and poof, it happens. If it were that easy, then everyone could be project managers! True empowerment takes work and time to make it happen.

On the ARCO Project, the discipline leads were expected to take full responsibility for their schedule commitments and their manhours. This is no different than for any other project; but here, a more integrated team approach was tried. The project controls person is generally responsible for schedules and for the measurement of the engineering progress based on jobhours expended and physical progress achieved. Traditionally, this individual was viewed by the disciplines as a "stoolie". In other words, his job was to find out what the disciplines weren't doing on schedule or overspending too many manhours and to report it to the project manager who would then put pressure on the disciplines to get things back on track. The disciplines disliked the time spent helping the project controls person status the schedule and work progress as they were in fact supplying information being used against themselves. Usually, there would be regularly scheduled formal status review meetings where all the leads attended and while it may benefit project management, the disciplines felt that this was a waste of their time.

To change this situation, the formal status meetings were eliminated. In its place, the project controls person was asked to work one-on-one on a regular basis with each discipline lead to help them plan their work, to define their deliverables, to establish their manpower requirements and to come up with realistic schedules the disciplines would accept. The schedules maintained the overall milestone targets required by the project, and it was the scheduler's responsibility to ensure the collective activities of all the disciplines were in a logical work progression to minimize rework as a result of out-of-phase inter-disciplinary work. It was the discipline leads' responsibility to identify their manpower and resources required based on the defined schedule and work progress and to advise project management of any deficiencies.

A simplified work progress measurement system was implemented to show the discipline leads on a bi-weekly basis how the jobhours were being expended and what progress, by defined deliverables (eg. drawings, data sheets, etc.) was achieved. The discipline leads were shown how to decipher and use the infor-

mation on their progress. There was a standing order that overtime work will be authorized whenever the discipline leads felt it was necessary, it was their responsibility. Furthermore if a certain deliverable was slipping schedule, the delay in completing that task was not to take longer than one working week to complete. This put some flexibility in the schedule to account for unforeseen delays.

This arrangement worked very well. In time, the discipline leads considered project controls as part of their own group. They were getting timely information which they now actively sought as it helped them better execute their work and identify problem areas. There never was a problem on the project which wasn't known at least two weeks in advance and resolved on schedule. The discipline leads truly took ownership of their work, management supported their efforts and they became empowered as a result.

Effective Communications

Open and honest communication is essential to build up trust and this type of communication must be encouraged at both the project level and the discipline levels.

Quality theory states that *"people must be treated with dignity, trained and supervised properly, and they must know what their job is so that their performance can improve. They must understand the process, the project expectations and where they fit in."*

To achieve this objective, a project orientation was given to every person working on the project, either full-time or part-time. This was done personally by the project manager as it gave the people a chance to meet the project manager directly, to ask him questions and to hear what the expectations are for the project, how it is going to be executed and why its success is important to the company. Project orientations were conducted throughout the duration of the project as long as new people came aboard. On the ARCO project, 68 people were oriented even though the project only peaked at 40 full-time personnel.

The Project Execution Plan was reviewed as part of the project orientation. Typically in the past, this document tended to be very voluminous, filled with lengthy project procedures and other boilerplate descriptions of the various discipline functions. It was not a very user friendly document and as such, people tended not to read them - even the project managers! The revised format of this document is now typically no more than a 1/4" thick and it has been rewritten to be very "readable" with the project team being the primary user. Basic workscope and responsibilities are covered, the method of execution by discipline, the key players and points of contact for the client and the project team, the project reporting requirements, the objectives of the quality plan and listings only of the applicable project procedures and project specifications and standards. Everyone on the project team was encouraged to read and use this document, which they did.

To achieve tighter communications amongst the disciplines, the physical layout of the project team members was made in such a way as to shorten the actual distance between those disciplines which had to work closely together. For example, all the project leads were put together with the piping lead sitting next to the civil/structural lead and the instrumentation and electrical leads adjoining. The systems/mechanical lead and the project controls lead were close by. In this way, there was no valid reason why they wouldn't be talking to each other.

Project communications were also optimized. The project files which included the relevant discipline and quality files were centralized as were the vendor print files. Project team members were encouraged to use these files for the latest data as opposed to keeping a separate set of files for their own use. The master mark-up of the Piping & Instrument Diagrams (P&ID's) were kept on a centrally located roller board. The disciplines were still responsible for keeping an up-to-date set of their drawings on stick files, but available for all disciplines to access for review. This worked well and it reduced the amount of rework needed because of wrong or outdated information being used.

A different approach was also tried for internal meetings which traditionally meant a formal status meeting of a sort once a week where the disciplines reviewed their progress for that period. As this project was scheduled driven with many inter-related activities happening immediately at the start, a daily meeting was convened first thing every morning and it lasted no more than 1/2 to 3/4 hr. The discipline leads attended as well as the project secretary and the document control representative. Each participant was asked to identify what information or help they needed from the others in the team to help them complete their work.

The project control lead kept the group informed of the schedule and estimating commitments and the input required for the various change orders. As project manager, I used this opportunity to keep the project team fully appraised of any developments with client and the latest company news. The discipline leads in turn were responsible to filter this information down to the rank and file. Formal meeting notes were not necessary because if the person didn't get some information needed that day, the same question will be raised the next day. These meetings were kept light and informal even though serious topics may be discussed.

This worked very well as the information was always current and relevant. It also freed the leads time from

having to attend too many meetings which in turn permitted them to spend more time in planning their work and supervising their group. As the project progressed, the frequency of these meetings decreased from daily to three times a week to once a week. Weekly status reports were still prepared for the client, but these were easily done by the project controls lead since the work status was always known. The only formal meeting involving the discipline leads was for the monthly status review meeting with the client in our office.

The Project Bulletin Board was also a constant source of information. The project roster and organization chart were posted and updated as changes were made. In addition, the latest project news and results of client and employee questionnaires along with a weekly office safety tip were posted. People awarded the ARCO Recognition Award were notified and recognized on the bulletin board. Humour was introduced by weekly cartoons or philosophical sayings (see attached examples) to draw the project team to the bulletin board and to keep the team atmosphere light and less stressful. People were always curious to see what was new on the board as the humour material was unpredictable.

The ARCO Recognition Program

The ARCO Recognition Program was set up to recognize individuals and groups who make outstanding contributions to the project in terms of costs savings, dedication, schedule adherence etc. People were recognized with plaques and prizes ranging from mugs, pens, caps, T-shirts, tote bags, clocks all the way up to cash awards dependent on the level of the award.

When I first saw the program, I questioned its value as I couldn't see why people should be rewarded "for simply doing what was supposed to be their jobs". Apparently in Canada, such programs are rare amongst engineering companies. However, this recognition program had an impact. People liked receiving the plaques which they proudly displayed and the gift, however minor it was, seemed to be appreciated. All awards were made in the presence of all the team members.

Quality theory states that *"all team members must share in project awards"*. Along this line, discipline groups were recognized en masse as their major work hurdles were achieved. First came everyone in the civil/structural group, then the piping group, followed by electrical and instrumentation. Even the secretary and document control personnel were recognized. In all, almost everyone on the project team was eventually recognized. ARCO initially thought it was very unusual to recognize such massive groupings since they didn't give awards to everyone. But they agreed as that's what was needed to reinforce teamwork. It was a positive experience for everyone.

A Lunch For No Particular Reason

As part of the quality plan and teambuilding program, a project luncheon or training session was scheduled once a month without fail. Normally, project luncheons or celebrations would be held only after certain milestones were achieved and then the "rewards" would be given. In this case, there were no strings attached. Sometimes the lunch was held just as part of teambuilding and to get the project team out together socially. And this included everyone - full-time, part time and agency members.

Every month there would be a luncheon, sometimes combined with a quality training session or a teambuilding exercise, but most often than not for no particular reason other than you were a member of the project team and you were sharing some of the benefits. After all, a happy worker will be a very productive one - so the quality theory says. In addition to these luncheons, the project team were treated to donuts at least once a month. So if nothing else, the project team was well fed! Everyone associated with the project were appreciative of this special type of treatment which they never expected to get.

Management Style - Autocratic Vs Democratic

Quality theory states that *"management style will be greatly influenced by the management approach adopted - either traditional or quality. The traditional management approach is considered to be an outdated style of running organizations, unable to use the full potential of their workers. Whereas a quality management approach focuses on creating a workplace that encourages everyone to contribute to the company"*. Here are some attributes of these approaches:

Traditional Management	**Quality Management**
Expecting people to know	Emphasis on education and training
Reactive	Preventative
Schedules/goals independent of reality	Goals based on system/resource capabilities.
Communications oppressed by fear	Breaking down barriers through trust and reduction of fear
Short term gains	Longterm focus
Management by objectives	Longterm relationships
Recognition of individuals best at fighting fires and problem solving	Teambased focus. People made to feel good about their work and contributions. Recognition of improving processes.

The traditional management style can be considered

to be autocratic, demanding and uncompromising. On the other hand, the quality management style can be open, democrative and people oriented. The question here is that if teamwork and people are to be very important variables towards the success of any project, then what management style will best foster teamwork and trust? Adopting an open, democratic and participative management style does not mean that the project manager will lose control and be less effective. On the contrary, he will have more control and be more effective because he will have the whole team supporting him throughout.

The Benefits

Corporate management is always interested in return on investment. This is no different for any quality management initiative. Is it worth it? Questions like "show us in tangible terms what benefits we will get using a quality management approach?" The argument here is that there are many examples of projects done the traditional way which met schedule and cost and which the company made money, so why change? The counter argument to this is "how much more profitable would this project be if quality management is used?" The best way to settle this would be to take two identical projects and execute them both ways and see the results. But this is not practical.

We should look at the longterm benefits. Quality theory states that *"there is too much emphasis on short term profits. Most North American executives think they are in the business to make money, rather than products and services. If you become the world's most efficient provider of whatever product and service you offer, the profits will follow."*

There are a lot of intangibles which do not readily convert themselves to cold hard cash. A happy worker is a more productive worker. How do you measure the productivity gains? Companies which are successful and people oriented will attract better people and , more importantly, keep their good people from leaving. What's the cost for training and personnel turnover? Quality management will minimize rework and that is measurable. On the ARCO project, the actual rework attributed to design/drawing errors, late vendor data, poor inter-discipline coordination and computer system downtime totalled less than 3.4% of the total engineering manhours.

The ARCO project was very successful. It met the manhour targets even including for some major design changes requested by the client. It met all schedule commitments and the team was flexible enough to accommodate a two month acceleration of the underground works. The amount of rework required in the field was negligible with only some slight problems encountered with the underground works due to unforeseen obstructions. The field installation costs came well below the budgeted costs, attributed in large part to the quality and completeness of the engineering work. This resulted in achieving 90% of the performance incentive, making this project exceed its financial projections. And the people? They said it was the best project they ever worked on! They felt good about their achievements and it was the closest thing they came to having "fun" at work. They looked forward to the next project like this. So how do you measure all this? The benefits are there when you put all the quality theories into practise.

The Project Manager's Responsibility

On any project, the Project Manager has the leadership and the ultimate responsibility for Quality. He should be a firm believer of the quality principles and be willing to adapt them to his projects. He must be a coach and a motivator to all project personnel. His actions must lead by example and demonstrate total commitment to participative management and customer satisfaction. Quality management will not happen if the Project Manager does not make it happen.

Quality management cannot be delegated. The Project Manager must be a hands-on quality champion on the project. He must be fully involved and must "Walk the Talk". He must lead, guide and coach. He must facilitate, listen, trust and be trusted with a highly involved work team. To improve his project management skills, he must be willing to change.

Which brings us to the saying, "If you always do what you've always done, you'll always get what you've always gotten....", which implies that improvements cannot be achieved without change. Think about it. If you believe that the quality theories are correct, then Quality Management works! The choice is yours.