

PARTNERSHIP WITH THE CUSTOMER

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PARTNERSHIP

This discussion will recount some historical observations about establishing partnerships with the customer. It will suggest that such partnerships are established as the natural evolutionary product of a continuous improvement culture. Those are warm, ethereal terms about a topic that some people think already suffers from an excess of hot air. We will focus on some real-world activities and workplace artifacts to show there are substantive concepts behind the TQM buzzwords.

PARAMAX MISSION

Paramax sustains and maintains the software and data systems for ground-based operations at Johnson Space Center. We are a member of the (RSOC) Rockwell Space Operations Company (RSOC) Team that provides Space Shuttle and Space Station operations for the Mission Operations Directorate.

Johnson Space Center owns a huge body of software (nearly 20 million lines of code) operating in a diverse mainframe, minicomputer and work station environments. The Paramax Mission is to ensure the operational suitability and readiness of this software baseline to meet the specific mission objectives of the Space Shuttle Program.

We maintain the software tools used for mission planning, which starts years before a launch, and those used to manage the data that define flight-specific reconfiguration requirements, as well as the real-time systems that simulate operational conditions for pre-mission testing and training. We are also accountable for the real-time software that provides command, control and communications capabilities in the Mission Control Center.

Maintaining the suitability and readiness of this operational software baseline for manned spaceflight missions is a sobering responsibility. Process management and continuous process improvement are essential to provide safe and reliable software services. Systematic and methodical approaches, with everyone's full and proactive participation, must be the norm.

GEORGE M. LOW

We have found that the George M. Low benchmarking process provides a comparison to the best practices used in the NASA contractor community. The judging process, which compares our practices systematically against standard criteria used industry-wide, allows us to find our areas of strength and weakness.

The systematic and objective characteristics of this evaluation process help us bring order to what can be a confusing as well as dynamic business. The resulting performance critique gives us feedback to provide lessons learned and establish improvement plans. Each year we have participated in the George M. Low award evaluation regimen, we have made significant improvements to our total performance as a direct result.

EXCELLENCE TEAMS

Our line organizations mesh directly with a set of formally established excellence teams that have a mandate to take ownership of a set of processes and focus on their improvement. Each team has a leader who acts as a coach or mentor to the team members. Every team member is expected to help define and improve processes, remove barriers that cause process problems, and in accepting accountability for the team's results.

Each Team maintains its own records, analyzes its own processes, implements improvements and interacts with management and other teams to define and resolve issues. Management and non-management employees participate in these teams. Management is responsible for the teams' success, but each team has a large degree of autonomy in setting its own agenda.

The teams communicate internally and externally by posting relevant information on bulletin boards called Excellence Boards. These boards identify the teams and display their respective priorities. Mission statements, metrics trends, corrective actions and other information relevant to the teams' activities and personalities are displayed as well.

We have some examples of these boards in our booth at this symposium. If you go by and take a look, you will see that a great deal of pride and creative energy has gone into the information displays, along with an overriding sense of utility and functionality. Excellence Boards are not departmental bulletin boards; they are working tools. The boards are structured and controlled communication vehicles that provide visibility for our continuous improvement efforts.

TQM IMPLEMENTATION

Over the six years we have been at Johnson Space Center, we have found that our TQM implementation has produced a strange dichotomy. As our TQM involvement intensified, two classes of activities emerged. There was what many referred to as the "Quality Stuff," which

seemed to consist of meetings, discussions, newsletters, goal-setting sessions and great periods of introspection. There also was what was often termed "real work," which consisted of people working to avoid errors, automating manual operations and generally advocating efficiency.

We found, in fact, that two camps evolved: the one doing "Quality Stuff" and the one doing "Real Work." The management team became agitated by this development and spent a great deal of energy worrying how to get the "Quality Stuff" people working together with the "Real Work" people to apply TQM in managing the business.

BOTH CAMPS

Eventually, both camps discovered that each was essential for a successful enterprise. We realized that some of our improvement activities were focused on what might be called "operational" things. These activities were aimed at classic process improvement and greatly emphasized doing things right the first time. People engaged in these activities believed they were doing the "real work."

Other activities were focused on what we have come to recognize as "enabling" things. Their intent was to remove barriers and make sure effort was spent doing the right things. People engaged in these activities were often referred to as doing "Quality Stuff."

The realization that both of these activities were part of the same thing was a major consciousness-raising milestone. It resulted in questions being asked that previously would not have been considered useful by people with the right information to pursue them. Doing things right and doing the right things are the inside and outside of the same circle.

METRICS

As we learned to improve processes and remove barriers, we also learned that appropriate metrics can support coherent goal-setting. By establishing program-level goals in the areas of quality, productivity, work flow and team-building, we were able to focus on processes and potential barriers at all levels within the organization. The program-level goals translated at all organizational levels into common metrics that aggregate naturally to provide a vertical metrics roll-up. Everyone's contribution to the top-level goals is measurable and actionable.

METRICS AGGREGATION

While vertical metrics aggregation is a matter of communicating goals at all levels in the organization, Metrics are aggregated horizontally by using the Oregon Matrix. This allows us to develop a performance index from a set of measurements that are mathematically unrelated. Each measurement is assigned a weight, and its matrix value is aggregated into a weighted average score. The matrix is calibrated periodically by setting current measurement trends at the matrix

value "3" level, the current goal at the "10" level and the unacceptable limit at the "0" level. Measurements are taken periodically, and trends for the matrix scores are calculated. There are many benefits in aggregating metrics this way. They help us understand complex relationships between seemingly independent variables, discern major contributions to problems or successes, and develop an overall sense of performance levels.

COMPOSITE TRACK

Composite averages, which we measured on our program-level metrics during the twelve months ending each July, show a flat trend through December, followed by a sudden drop and a steady improvement since.

Each December we analyze our metrics process, compare it to our goals and make adjustments as appropriate. Last December we found that some of our raw measurements were not good indicators of the factors they were meant to convey, and we found that other measurements were calibrated in such a way that changes did not appear in the composite index. We rebaselined our measurement definitions and recalibrated the matrices, and the scores (not performance) dropped as a result and then trended upward, reflecting improvements implemented in the spring.

PROBLEM PREVENTION

The goal of continuous improvement is to move from reactively solving problems to proactively preventing them. To people in the software business, a major question is: "How heavily is the customer affected by errors in the software?" Our goal is to prevent software errors from appearing in the operational baseline. We use a defect-density measurement (Software defects per million lines of code in the operational baseline) to track our performance.

This chart shows our defect-density since we started handling Shuttle software. You can see that the trend is in the right direction. Some people believe such density reductions are the natural result of the software's maturation, and there is some truth in this. If software is static, eventually all the defects can be found and corrected. However this baseline has not been static. It grew by almost 50 percent during the past six years and huge amounts of changes have been made in it. We keep defect-density data normalized to the quantity of software that has been changed, as well as to total software, and both measurements trend downward.

CUSTOMER RESPONSIVENESS

Metrics also support customer responsiveness. The length of dwell time required to resolve critical problems and the backlog of unresolved discrepancy reports are just two areas where our customer's expectations are highly visible. These are global measurements that are part of the top-level metric trends that tell us how we are doing.

TQM SEASONS

After pursuing continuous improvement for several years, we made another unexpected discovery. We went through seasons of awareness and opportunity much like annual seasons when certain conditions prevail and provide windows of opportunity. But unlike annual seasons, we found that as the TQM years cycled through their seasons, there was not an automatic progression. We found it was possible to get stuck, and no amount of process improvement and enabling activity would get us through that season until its major event had occurred. Imagine winter lasting until everyone has decorated a Christmas tree, or Fall until everyone had carved a pumpkin.

We began in a happy Summer of process optimization. Everyone had a favorite process improvement, there was tremendous enthusiasm and it seemed possible to dream of something almost like spontaneous combustion or perpetual motion, continuous improvement directly to the fabled field of zero defects. This was how we began.

Then we noticed the leaves turning brown. At first we reacted like a September butterfly, flapping our wings, making gaudy and colorful displays and trying to go on as before. However, we suspected things would not remain the same. Gradually, Management began to suspect that TQM was trickier than it looked. Behavioral change by our employees would not suffice; we would have to change as well.

We launched with renewed enthusiasm into an Autumn of management adaptation. We found that management had a role to play in continuous improvement that was different and much more difficult: it required more listening and leadership. This challenged the management team to redefine a value-added role in a world whose process owners could change our own way of doing business. After a while, we began to see that management could become an organic part of continuous improvement, and we felt much better.

Then the pond froze over. We suddenly entered a Winter of uncertainty as an unstated concern began to crystalize. The concern finally was expressed with the comment, "That's how we should do it, but the customer will never go for it." There was a widely held belief that process improvement was limited and that certain inefficiencies and absurdities could not be overcome because the customer demanded them. Voicing this concern enabled us to solve it, and we began - at all levels -- to work with the customer on things perceived as issues. The excellence teams in particular lead the way in customer involvement, establishing well-understood expectations and means to measure our performance in meeting them.

Then another surprising thing happened. Customer involvement lead to a springtime of renewed employee acceptance. Activities that had been considered extraneous or theoretical suddenly became bona fide customer requirements and, therefore, "real work." This renewed buy-in lead to

another Summer of process improvement and further evolution of the management team, to more sophisticated customer alignments, etc.

As New Englanders have always known, the key to the cycle was Winter. Customer focus was the essential ingredient to permit continued progress.

CUSTOMER INVOLVEMENT

Customer Involvement is not a buzzword. It is a definable process that can be formalized as a series of activities. The most important step is the first: customers must be identified. Our excellence teams are responsible for displaying, on their excellence boards, formal identification of their internal and external customers. This is by no means a trivial task.

The second step is to document a set of customer expectations that can be mutually understood by team members and customers. Getting customers to concur in writing is important, and displaying that agreement on excellence boards is essential.

Once expectations have been established, a process to assess them must similarly be accepted mutually. This ensures that teams and customers periodically review and agree on how well expectations are being met.

A customer score card is an important refinement of the assessment process. It allows metrics to be established that objectively depict the team's conformance to expectations.

Finally, the score card process should be made part of the normal performance metrics process. This ensures that meeting customer expectations is not deemed just another set of performance criteria, but are the criteria. Our excellence teams do this by developing Oregon Matrices of customer-related parameters, and incorporating these into the assessment and score card processes.

INVOLVEMENT PROCESS

Since customer involvement is a process, it can be measured like any other. Our excellence teams are progressing through the customer involvement steps, and many teams have developed some very effective tools to ensure clear communications between team members and customers.

Nearly all our excellence teams have formally identified their customers. In addition three-fourths of the teams have signed mutually accepted expectations with their customers, and approximately two-thirds have assessment processes and score cards in place. However, only forty percent of our teams have integrated their customer score cards into their normal metrics process, and our big challenge for next year is to increase this number dramatically.

CUSTOMER IDENTIFICATION

There are some examples of customer involvement artifacts that our excellence teams have developed. The first example shows tools used to make the customer identification formal and visible.

The first of these is from a team that provides definable products and services to a variety of internal and external customers. The second is from a team with a hierarchical structure organized around work functions. The third is a product-oriented list that goes a step further: expectation identification.

EXPECTATIONS

Expectations must be both written and accepted. The first example here is a "performance pact" document. The second takes the form of a creed (the sign-off was on the next page, which is not shown here). The third again carries expectations further, and includes measurements and analyses.

ASSESSMENT

The assessment process must routinely include the customer. The first example shows monthly feedback from the customer on specific expectations. The second is a very objective cooking survey. The last incorporates a score and the weighting of different assessment criteria.

SCORE CARD

The customer score card makes periodic assessments object and visible. The first example establishes success criteria and displays the customer's grade on each. The second is very similar. The third provides an aggregate or overall score that can be entered into a metrics process.

INTEGRATED METRICS

Finally, customer assessments should be integrated into the normal metrics process. The first example of this is a standard Oregon Matrix showing the customer's assessment, along with objective criteria important to the customer. The second illustration is a trend chart showing the Oregon Matrix index over time. The third is an example of a specific metric related to a customer expectation on rework that shows how the customer assessment process relates directly to preventive action and process improvement.

IN CONCLUSION

There really is no conclusion, since the only thing after continuous improvement is another opportunity. There are some observations, however. First, TQM is not a miracle; it is a change,

and change brings confusion to any organization. Management's role is more important than ever in dealing with this confusion, but the role is very different.

Success with TQM is uncertain. It can be done incorrectly. An overemphasis on either the "real work" or "quality stuff" without recognizing the importance of both will produce either highly centralized, authoritarian organizations which pretend TQM is enlightenment, or loose confederations of mobs and a management team in abdication.

But, the benefits are worth the risk. The guiding principle is a simple definition of success: a joint venture with customers.