THE INHERENT DIFFICULTIES IN APPLYING TQM TO A PARTICULAR SERVICE INDUSTRY

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Introduction. Total Quality Management (TQM) is applicable "to small organizations as well as to large ones, to the service industry as well as to manufacturing."[1] To read W. Edward Deming's Out of the Crisis is to be told that there are no exceptions to the application of the TQM paradigm. Yet there are many people today who heartily endorse TQM for the manufacturing sector and either deny or severely criticize its application to the service sector. I am not either of these. However, there are service industries in which certain aspects of TQM are very difficult to apply.

This paper discusses TQM lessons learned at TRW's Government Information Services Division collected over many years of providing Systems Engineering and Technical Assistance (SETA) services to the Federal Government. It contrasts TQM in this service environment with other TRW divisions that provide manufactured products (e.g., automotive parts) and standardized, repetitive services (e.g., consumer credit reporting). In the SETA industry, the services provided are individualized and diverse, metrics are difficult to create and quantify, and statistical performance trends are hard to come by. It is the aim of this paper to illustrate the application of TQM to this service industry, to discuss the difficulties encountered, and to demonstrate how success can be achieved in spite of the difficulties.

Background. The United States Federal Government routinely contracts with private corporations. Procurement runs the gamut from standard pencils and paper clips to spacecraft and supercomputers—at a cost of $200 billion per year.[2] The most complex of these items are often produced as one-of-a-kind and/or as new development items.

The average consumer may not fully appreciate the difficulty in producing a new, complex item. This is because today's consumers are accustomed to buying mass-produced goods and take for granted the benefits that such mass-production brings. Take, for example, the purchase of an automobile. In purchasing that automobile a consumer is able to:

- walk into a dealer's showroom and examine automobiles with various styles, prices and accessory options;
- read literature on performance and safety tests;
- talk to owners with the same make and model; and,
- benefit from years of automobile manufacturing experience.

Contrast this experience with the procurement of a large, one-of-a-kind (or first-of-a-kind), complex piece of hardware. Imagine, for example, that cars don't exist and one desires to contract with a manufacturer to build the first one. Suddenly, all of the previous mass-production advantages do not exist. In fact, it is actually more difficult because now one must also:

- conduct a significant amount of research to develop the concept(s) of automobile construction;
- develop detailed specifications which describe what an automobile is, how it is to be built, and how it is to perform;
- oversee the manufacture of the first automobile;
- revise the specifications, as they are found lacking and/or implement improvements as they are suggested during manufacture;
- fully test the completed unit to ensure that it meets the specifications, is safe, etc.;

1If this sounds easy, I recommend the following exercise. Choose a friend who is willing to play the role of antagonist. Select a simple everyday object and try to write a description of how to draw it in such detail that your antagonist cannot find a way to draw anything but the item you have chosen. If your antagonist is doing his job, you will waste an inordinate amount of paper and ink describing the simplest of objects.
• identify and procure spare parts to support the vehicle's operation.

The list could go on and on.

While the Department of Defense (DoD) is usually the most visible federal agency involved in large procurements (with its ongoing acquisition of ships, aircraft, and other military hardware) there are many other agencies that must contract for similarly complex items. For example:

• the National Aeronautical and Space Administration (NASA) routinely contracts for satellites and spacecraft, and is currently (re)designing a new space station;

• the Federal Aviation Administration (FAA) is in the process of completely upgrading and modernizing its Air Traffic Control system;

• the Federal Bureau of Investigation (FBI) is procuring an electronic catalog and fingerprint matching system.

The SETA Industry. So what does all of this have to do with SETA services? Government procurement of large, complex and correspondingly expensive systems is orders of magnitude more difficult than an automobile. Management of such a procurement requires specially qualified personnel, usually in increasing quantities proportional to the complexity of the system. Government offices are routinely not staffed to manage all aspects of the procurement.

The current process usually entails a Government staff augmented by SETA 'support contractors' providing 'technical assistance.' The size of this augmentation varies with a number of factors, but it is not unusual to have a ratio of two or three support contractors to each Government employee.

As the name implies, the SETA contractor provides systems engineering expertise in addition to the technical assistance. Systems engineering involves looking at a large project as a whole, not simply as the sum of its pieces. Large projects and complex procurements, by definition, require multiple specialists working on many diverse parts of the project/procurement. Any Government office managing such an endeavor usually requires an independent perspective from an organization that can look at the big picture.

The SETA support contractor should not be confused with the "primary" contractor. The primary contractor is responsible for producing the item being procured (e.g., ship, airplane, air traffic control system). The SETA contractor works for the Government program office to help manage the procurement. In essence, the primary contractor is in the business of selling an item to the Government, whereas the SETA contractor is in the business of selling the technical expertise and services which help the Government manage the contract and procure the item.

For the purposes of this discussion, the focus will be on a single SETA contractor and its relationship to a particular Government agency.

TRW's Approach. TRW has implemented TQM practices throughout its business areas, which include a large automotive parts manufacturing business and a major consumer credit bureau. Supplying SETA services to the Federal Government is only a small business segment of TRW's vast commercial interests, employing approximately 2,000 out of more than 60,000 employees.

TRW Government Information Services Division (GISD) is headquartered in Fairfax, Virginia where it primarily serves the Federal Government in the metropolitan Washington, D.C. area. The GISD SETA work is broken down into projects which correspond to individual Government contracts. These projects operate as satellite offices and are geographically located in proximity to the customer Government agency. Because they are functionally diverse, each project usually exhibits individual traits and sometimes reflects the customer's culture as much as TRW's corporate culture.

In terms of a manufacturing analogy, one could imagine the Government owning a "widget" manufacturing facility. Out on the "shop floor," Government employees are engaged in manufacturing and assembling various types of widgets. In the accomplishment of this endeavor, the Government finds it necessary to hire temporary line workers and other types of technical assistants to help run the line, evaluate the line, and provide independent assessments. These temporary workers are employed by a contractor and are provided to the widget factory on an as-needed basis, much as office temps are routinely provided by companies to augment administrative staffs. (Although, in this case, the widget factory commits to a multi-year contract for a certain number of "temps".) Thus, in a very simple sense under this analogy, one could describe the SETA business as providing qualified temporary personnel to work alongside the Government in the Government's factory.

The day-to-day activities of the people working in a support contractor role vary considerably. The successful SETA project effectively becomes an inte-
The general part of the Government agency it serves. Tasking can encompass many things, for example:

- **technical tasking**, such as: technical reports or evaluations; engineering design and/or analysis; systems engineering assessments; computer simulations; draft technical documents; other technical and administrative items;

- **routine administration**, such as: computer system maintenance; meeting minutes; draft correspondence; action item tracking systems; travel order creation; other administrative items;

- **technical and non-technical personnel interaction**, such as: meeting attendance; participation in design reviews; technical or specialized consultations; briefing preparation and presentation; meeting facilitation, etcetera.

Primarily, as the above listing highlights, SETA is white collar, office-bound work. Using an office analogy, SETA is an office manager or administrative assistant. And, the common denominator in the SETA processes and products is **paper**.

**TQM Difficulties.** So what makes implementing TQM so difficult in this environment? If paper is the primary product, one then might naturally hypothesize that delivering improved quality to the customer is simply the result of delivering paper products of improved quality.

Given such a hypothesis, one can develop a variety of metrics to measure the quality of the delivered items:

- number of spelling errors;
- time to process/draft a document;
- number of corrections/changes made by the customer;
- sheer volume of the document(s), etc.

But consider the following scenario. A Government manager asks a support contractor to draft a response to, say, a Congressional inquiry:

**Support contractor #1** drafts a technically correct response, writes a proposed letter in proper format, free of typographical errors, and leaves it in the Government-customer's in-box. Support contractor #1's effort is fully independent and he correctly completes the task without interaction with his customer.

**Support contractor #2** drafts a reasonably correct response, quickly types a proposed letter without regard to format or typographical errors, takes the letter to the customer and discusses the draft. Support contractor #2 produces two more drafts, iteratively discussing each with the customer before producing a final letter.

Which support contractor's 'product' had the higher quality? The answer is that there isn't an answer; the better (i.e., higher quality) approach depends on the customer and the situation. Some customers prefer work to be fully staffed and presented to them in a completed, final form; others prefer to be involved in the drafting process. As well, some work should be fully staffed without bothering the customer; other work would be substandard without the customer's involvement. Quality in this environment becomes situationally dependent and a function of many subtle (i.e., unmeasurable) factors. Not surprising is that the quality of the paper product is important, but what is even more important is the **overall quality of the service**. And, one quickly finds that the customer’s perceived value of the overall product is a function of many things. For example:

- the intellectual or technical content of the document;
- the proper format and style for the intended audience;
- the customer’s perception of the person creating the document;
- the speed of response and its appropriateness for the product and to the customer;
- the method/style of document delivery;
- the 'chemistry' between the Government customer and a particular SETA contractor; and,
- many other factors too numerous and subtle to list.

There have been situations in which a document full of typographical errors and other measurable mistakes was perceived by a customer as having higher quality than an equivalent document without errors (because of content, service style, etcetera). So, clearly, the measurable aspects of the paper product produced by a support contractor are not sufficient nor accurate measures of quality.
What then is the SETA’s product and how can appropriate metrics be defined? In the SETA environment this is not a trivial question. On a superficial level, the paper produced by a project is a simple definition. But this definition is unsatisfactory because, even with perfect metrics and perfect product delivery, quality can still be found lacking by the customer.

Looking at the question of “what is the product?” on a higher level, one can define the SETA’s primary product as the people supplied to work with the Government agency. The paper produced by these people becomes a sub-product. This definition leads to some interesting philosophical questions. For example, if metrics are to be used to evaluate the ‘products,’ how do you measure a quality employee? (Certainly Deming would fervently denounce any attempt to measure people.)

Taking this idea one step further, one could also define the SETA’s product as a satisfied customer. At this level everything else becomes a sub-product. While this may sound strange under the manufacturing paradigm, think instead of a people-oriented service industry – say, hotels. While there are many sub-products in that industry, its ultimate goal is to produce satisfied customers. In the end there is no other tangible product.

Thus producing a satisfied customer under this scenario is a function of inherently unmeasurable subtleties, such that one must conclude that objective quantification of quality is not possible. Without metrics, one cannot define standards against which quality can be measured.

In an environment (either manufacturing or service) where the company’s product or service is a standard item that is numerously replicated, isolating the qualities in the product that are valued by the customer is achievable, even if it might be difficult or expensive. In the SETA environment, however, most products are individual.

Furthermore, quality in one customer environment is not necessarily quality in another. The interaction between support contractor and Government personnel is critical, and the perceived quality of services delivered is highly dependent on a good contractor/customer ‘fit.’ One, then, cannot develop a standard against which to measure, which leaves one without an objective metric.

To a person working in a manufacturing industry, lack of objectivity is hard to understand. For example, the president of a TRW automotive parts manufacturing subsidiary was amazed that a SETA contract would specify quarterly Government customer grading of performance, with company profit tied to that grade. “Isn’t that subjective,” he asked incredulously?

No real metrics. Subjective quality. No way to quantify a process or processes objectively so that an overall statistic relates to the quality of service provided. In the manufacture of widgets, there are many well-known, statistically-sound tools that can be employed to manage the processes: X̄ and R charts, CUSUM charts, Design of Experiments, etc. These don’t apply to SETA work. Even standard TQM tools – Pareto charts, cause and effect diagrams, etc. – are difficult, at best, to put into practice.

In manufacturing, one has customers who have requirements, but those requirements are usually well defined dimensions, tolerances and delivery dates. Satisfy the specific requirements and quality is provided. Improve the product’s performance characteristics and quality is improved. This is not necessarily so in the SETA environment.

Of course, one could argue that beyond the issue of metrics, there still must exist processes in the SETA business that can be improved through the application of Total Quality Management principles and practices. There are many internal processes that the SETA contractor can control and improve. However, these processes are obscured and confounded by a number of factors.

It would be quite reasonable to say that the average SETA employee feels a bit schizophrenic in his or her job. On one hand, the person is an employee of a particular company contracting with the Government. But, on the other hand, that person usually works virtually immersed in the customer’s culture, systems, and environment. It shouldn’t be surprising, then, when this person is encouraged to put TQM into daily practice at work that confusion arises regarding the “hows and wheres”. Some common complaints:

- “We can’t change most of the processes.” Under the manufacturing paradigm, the Government owns the “production line” and its processes are only used by the SETA employee in his/her day-to-day activities. As such, the SETA employee does not have control over most of the processes. That is, the processes are by-and-large the responsibility of the Government agency – and many times they are beyond the control of the contracting Government program office. So, when SETA employees are TQM-empowered to find and improve processes, they face immediate frustration because they cannot influence many of the major processes they work with
day-to-day.

- "TQM is not high on my customer's list of priorities." In a very real sense the Government program office personnel are a project's managers. That is, the Government personnel define the tasks to be accomplished, set the priorities, make the higher level decisions, and direct the important work-flow processes. SETA personnel then accomplish the tasks. The result of this arrangement is that if the Government agency is not interested in TQM per se, the SETA employee has a difficult time understanding how his/her customer will benefit from its implementation and use. Further, overzealous pursuit of TQM in this situation could be detrimental to the contractor's working relationship.

- "It's part of the contracting requirements." We previously discussed the lack of control that a SETA employee has over the processes that he/she must use in day-to-day work. This difficulty similarly extends to the company staff level as a result of federal contract regulations. In the process of mastering and meeting the complex contracting regulations, companies usually end up creating a bureaucracy dedicated to crossing t's and dotting i's. That is, most Government contractors employ sizable staffs of contracts specialists and financial managers that are absolutely necessary for a company to navigate the Government requirements successfully. The result is an organization which exists to rigidly meet and follow the myriad government contract regulations – an organization that does not feel free to make process changes.

The end result is that employees can easily become confused as to how and where to apply TQM. And, focusing the employee on that which is changeable can be difficult.

TQM Success

"I often hear this comment: 'My company is in a different category of business, so it is difficult to engage in QC [Quality Control] or TQC [Total Quality Control]. We cannot do it.' My answer has remained the same: 'Instead of thinking about the reasons you cannot do, why not discover what you can do.' "[3]

Kaoru Ishikawa

TRW Inc., headquartered in Cleveland, Ohio, is an international company that provides high technology products and services to the space and defense, automotive, and information systems markets. The company's mission and values statement says, "TRW is a global company focused on providing superior products and services to customers... Quality is important in everything we do. Quality is everyone's responsibility and is achieved through continuous improvement. We routinely seek ways to do things better."

As a large corporation, TRW has implemented many types and varieties of total quality management programs tailored to meet the needs of specific business areas. In fact, in an effort to fully understand the success of the Japanese, TRW has entered into a number of joint ventures with Japanese companies, including:

- **TRW Koyo Steering Systems Company**, which produces 3,500 automotive power, rack and pinion steering gears a day using just-in-time methods. TRW Koyo's customers include Toyota, Nissan, and other Japanese nameplates, as well as U.S. manufacturers.

- **TRW Fuji Valve, Inc.**, which produces high-quality automotive valves in a very automated environment, utilizing computer-assisted Statistical Process Control to produce approximately two million valves a month.

TRW Vehicle Safety Systems, Inc. (TRW VSSI), a wholly-owned TRW subsidiary, has implemented TQM practices throughout its plants. The TRW VSSI Cookeville, Tennessee plant was recently cited the best facility for mistake proofing by Ford's Director of Quality.

Moreover, TRW's TQM initiatives are not strictly restricted to manufacturing. TRW Information Systems and Services' TQM approach includes identifying customer requirements and using metrics to regularly assess progress. For example, TQM procedures have been used to:

- "upgrade the system search logic used in creating credit reports to reduce the incidence of consumer complaints due to mixed files by 44 percent," and,

- "reduced cycle time for consumer dispute resolution from 35 to 25 days. The current target is 20 days."[2]

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[2] As reported by D. Van Skilling, Executive Vice President & General Manager in the March 1993 edition of Leader, an internal TRW publication.
With such varied experience in implementing TQM programs, and with the obvious support and emphasis senior management has placed on TQM, one might jump to the conclusion that tailoring and implementing a TQM program to the SETA environment should be easy. Not true. The difficulties previously described, so simple to list, are not trivial to overcome – and the usual TQM tools and approaches just don’t fit.

Before this was understood, TQM was naively introduced to the SETA workplace as a package of standard tools that are universally applicable. Strangely enough, during the introductory sessions on one TRW SETA project a few years back, the overwhelming response of project employees was, “we already do that,” meaning that the SETA project had mechanisms in place to look after and ensure customer satisfaction. Sadly, the way TQM was introduced created quite a bit of resentment because the implicit message was that “you must change and you must use these TQM tools.”

How is it that they could be using TQM, particularly after all of the difficulties previously discussed? It turns out that this project has a “cost plus award-fee” contract. Under this contracting arrangement, the project bills for actual expenses incurred. The customer then evaluates the project performance and assigns a numerical score every quarter. Based on a predetermined formula, the numerical grade is converted into a monetary “award-fee” which is profit for the company.¹

This is a metric! In fact it is almost a perfect¹ metric for the SETA environment. Of course, it doesn’t require fishbone diagrams, or process flow analysis, or any of the other TQM/statistical tools the TQM instructors were trying to persuade the project to use. But, it is the perfect metric in that it provides direct feedback from the customer every quarter on the quality of services provided. The feedback includes detailed notes on things done well, and on things done less than well. So, the project management has explicit information on what to improve.

Some would argue that this metric is results oriented and not process oriented. This is true for any given quarter, since the feedback comes after the quarter is complete. But, in terms of a five-year contract cycle, evaluation on a quarterly basis is a process metric. Feedback for one quarter can be used to make improvements for the next quarter.

On this particular project, the classic TQM tools were missing, the buzzwords were unknown, but because of the award-fee type of contract the quality attitude is there. And, as one Japanese executive said, “....total quality management is ninety percent attitude.” [4] This approach has worked so well that TRW GSD now has non-award-fee SETA contracts in which formal quarterly reviews are conducted with the Government customer, even though there is no direct financial connection.

Additional Success. As was previously discussed, the SETA contractor does not own most of the processes. But with customer interest, the contractor can bring TQM and process improvement to bear in some situations. For example, one successful joint effort with the FAA involved the processing of a particular type of report from the FAA’s primary contractor. The driving force to implement change was the realization that the actual processing time by the FAA exceeded the contractually-allowed review period by over 50 percent. In a combined effort, TRW and the FAA conducted a TQM exercise that included flowcharting techniques and the establishment of metrics. The result was a process that reduced the processing cycle time to within the contractual review time and implemented the use of ongoing metrics analysis to begin a continuous improvement process. The success of this process improvement effort was directly attributable to the involvement and interest of both the SETA contractor and the Government agency.

The discussion up to this point has specifically addressed TQM from the SETA “line” employee’s perspective. But there are many other employees within any given company fulfilling staff functions. For these staff employees, the usual TQM tools and approaches certainly apply. All of the difficulties previously described essentially vanish because these employees deal largely with internal company processes and internal customers.

From a company management perspective, and under the hypothesis that the SETA product is the people supplied to work on a project, one internal process that is ripe for the application of TQM is employee hiring, promotion, training and general job satisfaction. There is currently a great deal of effort towards implementing continuous improvement in these areas at TRW Government Information Services Division.

¹The customer’s evaluation is a very explicit procedure (agreed to by both parties as part of the original contract) in which they rate TRW on such things as: timeliness, quality, integration, cost, and small business subcontracting. Grades and the definition of performance requirements to achieve each grade are contractually agreed upon.

²Not in a numeric sense, but in the sense that it provides accurate information on the perceived quality of the product delivered.
Recommendations. Statisticians are trained to work with numbers. Lord Kelvin said: "When you can measure what you are speaking about, and express it in numbers, you know something about it. But, when you cannot measure it, cannot express it in numbers, your knowledge is a meagre and unsatisfactory kind." [5] Yet, in the SETA case, concrete numbers – meaningful quantification – are hard to come by. Control charts don’t apply. Metrics are few and far between. The cost conscious environment doesn’t permit fancy or detailed analyses. One is stuck with ‘meagre and unsatisfactory.’ But this doesn’t necessarily spell defeat.

The one thing that is always measurable (whether it is subjective or not) is customer satisfaction. All the other metrics and TQM methodologies are simply ways of measuring system performance to effect improvements and thereby ensure customer satisfaction.

The current TQM paradigm looks at the world from a manufacturing perspective. Measure the product, optimize the processes that govern the product, make them better and faster and the customers will beat a path to the shop door. But, if the process is inherently unmeasurable, tie TQM to a customer satisfaction metric.

Success in this service environment requires reversing the TQM paradigm. Start by measuring customer satisfaction. On a routine basis gather information on how the customer feels about the product or service he or she is receiving. Then challenge the organization to improve the customer satisfaction metric through the application of TQM.

Of course this puts the organization in the position of trying to optimize a subjective metric that is bound to be full of “noise.” This approach is fraught with the possibilities for overcontrol, as the organization tries to correct for every little subjective blip in the metric and this is the downside.

The upside is that a customer-oriented organization will result.

The challenge is to build another TQM paradigm. The manufacturing paradigm works from the bottom-up. Optimize the product through the application of TQM and the customer satisfaction will follow. This paradigm has many well-known, supporting tools: Pareto charts, fishbone diagrams, histograms, etcetera. TQM courses cover these in great detail. For service businesses such as SETA, these tools tend not to apply very well. This bottoms-up approach may be "too hard."

There should be a second TQM implementation paradigm, with supporting statistical tools, that can be applied in a top-down fashion. The tools should be in the form of surveys and survey analyses. This is done all the time in many industries, but it is not known as a TQM tool. The top-down implementation paradigm says that, if all else fails, measure your customer's satisfaction. Quantify it regardless of its subjectivity. Then work within the organization to identify and optimize those items and processes that improve customer satisfaction.

At first glance this may seem like a trivial reformulation of existing ideas and procedures. But to be effective the ideas must be compiled into cookbook programs that can be readily understood and applied by technicians and practitioners.

The use of award-fee contracts is an excellent tool for encouraging customer orientation in the SETA workplace (or any other). Even when an award-fee contract is not in place, the use of periodic formal reviews with the customer is perhaps the only way to generate real, meaningful metrics for a SETA project. This is the top-down paradigm at work.

From an internal TRW report, “...this SETA organization is a result of years of living under an award-fee contract. From a TQM point of view, [it] is a classic model... That is, the product TRW provides to [the Government] is not engineering, nor letters, nor trial cards, etc., but people. And the quarterly [Government] evaluation is the ultimate metric for TRW’s product. After 10 years, the behavior of employees on the project reflects what is necessary to maximize that quarterly grade – and [the Government] uses those grades to accurately reflect their opinions regarding TRW’s performance."

The award-fee contract is also an excellent way to manage the long-term cost(s) of a SETA contractor (or any other type of contractor, for that matter). Cost can be used as a grading factor. And, as such, it can be used to influence the contractor to manage personnel and other costs as effectively as a five-year recompetition cycle.

Whether one is in the Government or private industry, consideration should be given to employment of the award-fee style of contracting. As previously discussed, this form is particularly desirable in service organizations and service situations, though it can be used just as effectively in a hardware/procurement situation. In both cases such a contracting arrangement will promote customer orientation in the contractor.

Conclusion. Implementation of Total Quality Management practices is not uniformly easy. While TQM is, theoretically, universally applicable, the practical aspects of some businesses make the application of standard TQM tools and the
usual bottom-up approach "hard." As statisticians trained to work with solid data, situations in which such data is unavailable are challenging and seemingly impassable.

But if the standard TQM tools don't seem to fit, don't give up on TQM. Rather, as Ishikawa said, "Discover what you can do." At the very least, customer satisfaction should be measurable in some way. The beginnings of a TQM program can be formed around such a measurement.

Reversing the implementation paradigm means starting with the overall customer metric and working down to the other metrics and process improvements. Decide what's vital to improving the customer metric and then go to work "TQMing" those things. In manufacturing this is an automatic step. Employees can look at a widget's performance/cost statistics, decide on a particular improvement, and then identify and work to improve the associated process(es).

In some service industries, such as SETA, it's not so obvious. And when employees are simply turned loose to 'improve things' there can be a distinct lack of focus. An overall customer metric provides a specific objective - a performance statistic. Award fee contracting provides this automatically, though other types of customer satisfaction metrics may also be satisfactory.

Such a metric is not a substitute for management leadership, however. And care must be exercised not to create a results oriented metric. Rather, the idea is that if an industry does not lend itself to ready identification of processes and metrics from the bottom-up, start from the top-down. Even if such an approach does not result in the rampant spread of TQM through the organization, it will result in a customer and quality oriented organization.

References


