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Abstract: This project deals with the questions: What is TQM? Why TQM? It describes TQM philosophies all the way through Deming's 14 points, Juran's Breakthrough sequence, and Crosby's 14-Point Program. Examples are given from the industry. TQM is given a specific description. Resources for implementation of a TQM program are also discussed.

Justification for Total Quality Management

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**Justification for Total Quality Management
Presentation by Graydon Hansen**

1. What is TQM?

TQM is an acronym for "Total Quality Management". It is a philosophy that is based on the understanding that every facet of an organization has an impact on quality, and that these effects have to be managed. Total Quality Management does not refer to the total quality of a company's management, but the total management of a company's quality.

In the trade guilds of medieval times, TQM was firmly in place in the fact that the craftsman dealt directly with the customer, understanding the customer's needs and fulfilling them to the customer's satisfaction. With industrialization, communication within organizations suffered, and the customer's needs and expectations became less clear to the people doing the work. In 1951, A. V. Feigenbaum published the book "Total Quality Control", which introduced the concept that the entire organization affects, and should take responsibility for, quality. Kaoru Ishikawa's CWQC (Company-Wide Quality Control), adopted by the Japanese in the 1950's and which acknowledged and capitalised on the concept that the entire organization affects quality, was based on Feigenbaum's ideas.

One basic point needs to be made here. There is no specific list of requirements to be a TQM company. Every specific application is chosen by a company or organization based on a more abstract concept, and therefore is different in each example. Examples in this presentation are of specific, successful applications.

2. Why TQM?

According to Dr. Steven Smith, "43 out of 45 companies that have doubled in size in the last 5 years feel that they have done so through quality."³

In addition, according to Philip Crosby, most companies have quality costs (prevention, appraisal, internal and external failures) of 15 to 20% of their sales dollars. He goes on to say that a company with a well-run quality program can reduce these costs to less than 2.5% of sales.¹ Also, Evans and Lindsay state that "...the cost due to poor quality can range as high as 40% of total sales with the industry average running close to 25%."² They also go on to say, in agreement with Philip Crosby, that these costs should be about 2.5%. IBM agrees with Evans & Lindsay as far as cost of quality, indicating that their own is 40% of revenues.⁶

It is important to note here that until quality costs are truly known, a company cannot make a valid assessment of its need for quality improvement and, hence, TQM. A judgment can certainly be made based on the concept that improved quality improves market share, sales, costs and profit. However, in order to make a truly responsible business decision to determine just how much to invest in TQM, where to invest those resources and the return to expect, quality costs need to be articulated.

According to a study done in 1990 of Illinois manufacturers, the average company's perception of its cost of quality (before implementing a cost of quality information system) is that cost of quality is 6% of total sales. Subsequently, after a cost of quality system was put in place, it was determined to be 25%; a margin of error 300%. This 300% error (19% of sales) is the "hidden cost of quality". Furthermore, if a company has no cost of quality system, its hidden cost of quality is its entire cost of quality, since such a company isn't aware of any cost of quality initially. The old adage-you can't manage what you can't measure- is still true.⁶

Therefore, TQM is a method of addressing and reducing hidden costs, in this case quality costs, and facilitating growth.

Finally, if competitors are adopting TQM (and many companies are), then customers may come to expect their suppliers to have active TQM programs. In addition, exceeding customer expectations is becoming more prevalent in industry as a whole, and TQM provides a method to institute that philosophy.

3. TQM Philosophies:

There are many TQM (and other) buzz words floating around industry lately. Some examples (in addition to TQM) are SPC, JIT, TQC, DFM, EI, World Class Manufacturing, Flexible Manufacturing, Malcolm Baldrige National Quality Award, the Deming Prize and ISO 9000, just to name a few. Most of these acronyms refer to specific quality tools. The Malcolm Baldrige National Quality Award (MBNQA) and the Deming Prize are both awards based on quality.

The Deming Prize was started in 1951 by the Japanese Union of Scientists and Engineers (JUSE). It is given each year to the company or companies that most exemplify Company-Wide-Quality-Control (CWQC).

The MBNQA was started in 1987 and was designed to be "very similar to the Deming Prize..." It is also awarded annually to the company or companies that best exemplify quality excellence and can serve as role models to other companies.

All of these and their specifics are not as important as understanding what is best applied to a particular situation, and then applying it. However, some basic explanation needs to be made with reference to some of these in order to continue with this discussion.

There is a basic difference between TQM and ISO 9000:

ISO 9000 stresses (and is limited to) *compliance*. That is, a registrar certifying a company under ISO 9000 requirements simply looks for a quality system that ensures product compliance with customer expectations.

TQM is a broader application of a quality system to every part of an organization. TQM is a philosophy of continuous improvement and the exceeding of customer expectations.

In order to help understand continuous improvement and the concept of exceeding customer expectations, a discussion of the Taguchi Loss Function is attached. Taguchi states that the old method of conformance to specifications is an inadequate model of true costs. That is, that the extent to which a product meets specification has an impact on cost, not just whether its in or out of specification. He goes on to say that the optimal level is exactly at target, with the "cost to society" (and, eventually, to the company), increasing quadratically with deviation from nominal. The "pass-fail" concept used in the past did not take this into account.² Continuous improvement, and a constant effort to exceed customer expectations, allows a company to minimize total cost of product and, hence, maximize profits.

In many cases, a company designs a quality system based on ISO 9000 criteria, and later (or simultaneously) applies its own TQM concepts within the framework of that ISO 9000 system.

In addition, awards such as the Malcolm Baldrige National Quality Award have specific guidelines for quality systems that a company may choose to adopt. In fact, many companies use the MBNQA criteria simply to benchmark their own company and implement TQM, with no intention of applying for the award itself.

¹²Asbai, April 17, 1979; cited in L. P. Sullivan, "Reducing Variability: A New Approach to Quality," *Quality Progress*, Vol. 17, No. 7, July 1984, pp. 15-21.

FIGURE 3.4 Traditional Conformance-to-Specification Loss Function

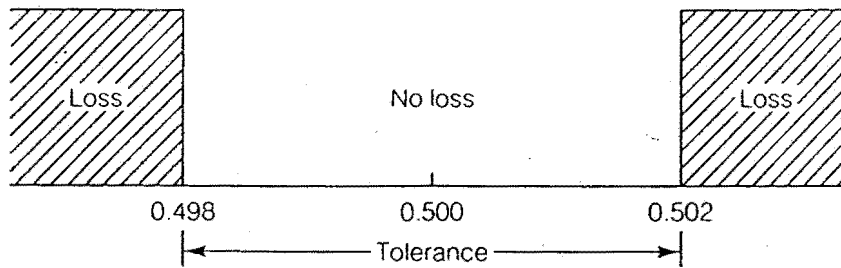


FIGURE 3.5 Taguchi Loss Function

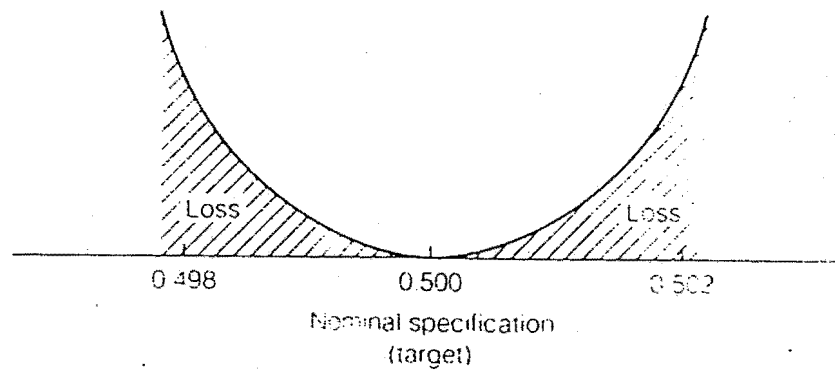


FIGURE 3.6 Color Density of TV Sets

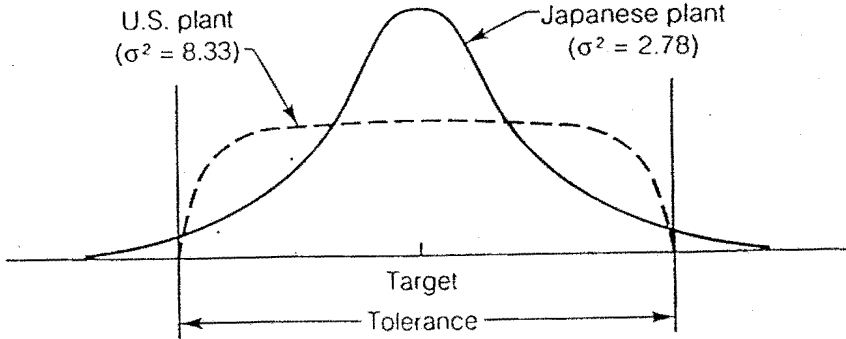
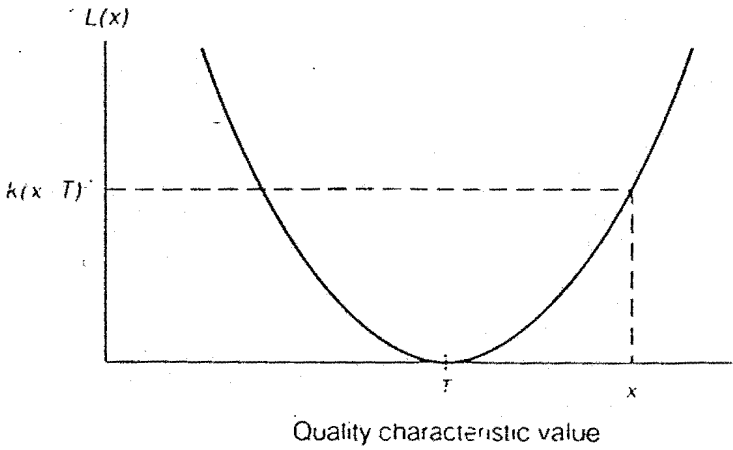


FIGURE 3.7 Nominal-Is-Best Loss Function



When a company makes the decision to become a TQM company, they usually start by adopting one of the philosophies promoted by top quality consultants. Some of the more well-known are:

Deming's 14 Points

Juran's Breakthrough Sequence

Crosby's 14-Point Program

Each of these, and others, have merit, since there are many examples of their successful application. There are a few differences, but many more similarities. Summaries of each are listed here for reference.

It should be noted, however, that not every TQM company adopts one of the listed philosophies. Some companies have literally created their own TQM philosophies.

Deming's 14 Points

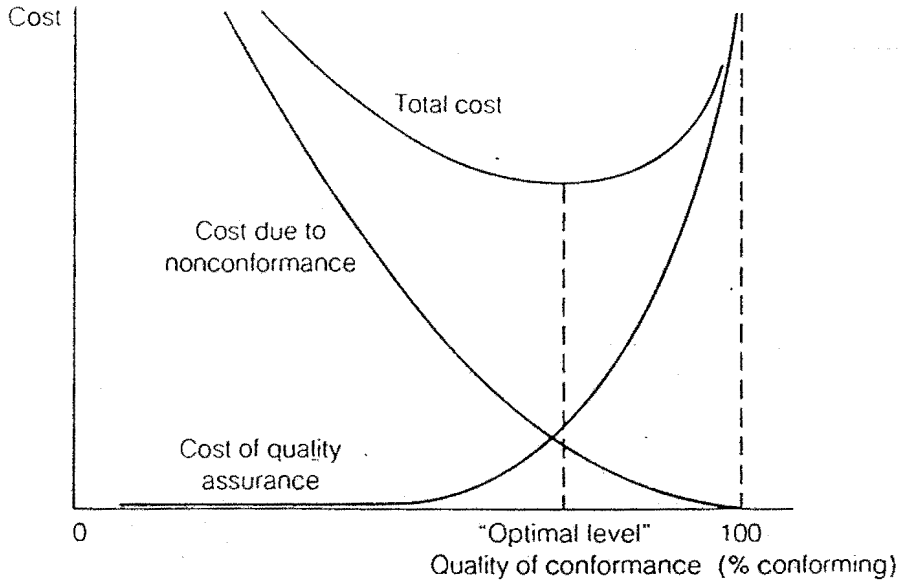
1. Create constancy of purpose for improvements of product and service.
2. Adopt the new philosophy.
3. Cease dependence on mass inspection.
4. End the practice of awarding business on price tag alone.
5. Constantly and forever improve the system of production and service.
6. Institute modern methods of training on the job.
7. Institute modern methods of leadership. (Empowerment)
8. Drive out fear.
9. Break down barriers between departments; teamwork.
10. Eliminate slogans, posters and exhortations for the work force.
11. Eliminate work standards and numerical quotas.
12. Remove barriers that hinder the hourly workers.
13. Institute a vigorous program of education and training.
14. Create a structure in top management that will push every day on the above 13 points.⁴

Juran's Breakthrough Sequence

1. Breakthrough in attitudes.
2. Identify the vital few projects.
3. Organize for breakthrough in knowledge.
4. Conduct the analysis.
5. Determine how to overcome resistance to change.
6. Institute the change.
7. Institute controls.²

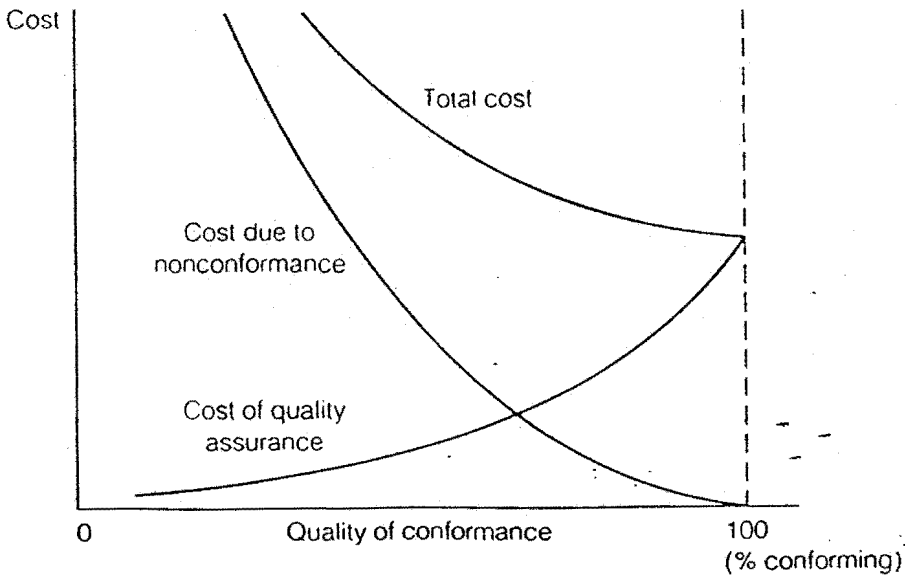
Juran's "Optimal Conformance Level" is attached, and a modification of it proposed by Hsiang and Lee.²

FIGURE 3.2 Classic Economic Model of Quality of Conformance



¹⁰T. C. Hsiang and L. Lee, "Zero Defects: A Quality Costs Approach," *Communications in Statistics—Theory and Methods*, Vol. 14, No. 11, 1985, pp. 2641–2655.

FIGURE 3.3 Modern Economic Model of Quality of Conformance



Crosby's 14-Point Program

1. Management commitment.
2. Quality improvement team.
3. Quality measurement.
4. Cost of quality evaluation.
5. Quality awareness.
6. Corrective action.
7. Zero defects planning.
8. Supervisor training.
9. Zero defects day.
10. Goal setting.
11. Error cause removal.
12. Recognition.
13. Quality councils.
14. Do it all over again.¹

Some comparisons between these three philosophies are in order:

Juran specifies a detailed program of quality improvement, whereas Deming and Crosby are more abstract and philosophical.

Juran's system, like Crosby's, requires (usually) less fundamental cultural change than Deming's, which makes their systems more attractive to some organizations.

Deming stresses statistical techniques as a "language" for virtually everything, whereas Juran stresses that the language of communication depends on the levels of people involved; i.e., "things for production workers, money for managers, and both for middle managers.

Deming requires the driving out of fear, but Juran says, "Fear can bring out the best in people."²

Both Deming and Juran state that variation is mostly built into the system, and should be reduced by optimizing the system. However, Crosby stresses behavioral modification at all levels of the organization as a fundamental solution to quality problems. This is in direct contrast with Deming's Point 10.

All three agree on several points, some of which are top management commitment to quality, every part of the organization affects quality, quality is "free" in the long-term (i.e., its return on investment is positive), and that Western industry is in a "quality crisis".

Some key points about quality and TQM: -----

Key Point #1: Quality is a race without a finish line.

Our product and service is never good enough. We need to continuously strive for exploitation of quality improvement opportunities that will return improvements in profits, both short-term and long-term. Statistical tools need to be applied to quantify these opportunities. In addition, the value of a dissatisfied customer cannot be quantified, so the only standard of quality should be 100% conformance.

According to Dr. Steven Smith, "TQM, more than anything, should be aimed at creating an organizational climate where people feel empowered to be innovative about satisfying their customers."³

Key Point #2: TQM is customer driven.

TQM should be implemented with the sole purpose of systematically bringing every ounce of intelligence to bear on providing a continuously improving product and/or service to the customer.

Key Point #3: When implementing TQM, never do anything to hurt the customer.

Key Point #4: There's no substitute for information.

Improvement, problem solving and change need to be based on statistically analyzed data, showing the return on investment of quality improvements.

4. TQM in Industry

There are many examples of successful implementation of TQM programs throughout industry. Some companies have used TQM to earn the MBNQA. Outlined here are a few examples.

Wallace Co., Inc. (Equipment for petrochemical industry): Used the MBNQA criteria as their model and won the award in 1990.

Results (1987 to 1990):

69% increase in sales

Market share increased from 10 to 18%⁵

Ford: Used Deming's 14 Points (and hired Deming as a consultant).

Results:

Improved quality by 60%.

CEO Donald Petersen stated: "I dare say we would not have predicted that much improvement in that short a time."²

Zytec (Power supply manufacturer): Used Deming's 14 Points as basis for TQM and won 1991 MBNQA.

Results:

Out-of-box product quality improved from 99.0% to 99.7%

Warranty costs reduced by 48%

Design cycle times reduced by 51%

Product costs cut by 30 to 40%⁵

5. TQM: A Specific Description

A TQM framework is based on the underlying goal of total communication of customer needs and expectations throughout the organization. That communication system is for the purpose of optimizing each individual's effort toward fulfilling those needs. Its implementation usually starts with a mission statement.

According to a survey of Illinois manufacturers conducted in 1990, the majority of companies that did not understand their true costs of quality also considered quality to be "something that happens on the shop floor". In addition, the report went on to say that "Quality was more a function of techniques like statistical process control and quality charts, and not a result of a total company commitment to quality management."⁶ Therefore, the concept of every individual in a company having an impact on quality, and that impact being managed by a TQM program, requires a major cultural change for most manufacturers. This is why "Top Management Commitment" is cited by Evans & Lindsay and many other TQM articles and texts. Top management commitment is required for any cultural change.²

5.1 Aggressive Approach

According to Evans and Lindsay, the basic characteristics of a TQM program are:

- Long-term Perspective
- Customer Focus
- Top Management Commitment
- Systems Thinking
- Training and Tools
- Participation
- Measurement and Reporting Systems
- Communication
- Strong Leadership²

An outline of a possible TQM implementation strategy made up of some of the common strategies used by TQM companies, and which addresses the above characteristics, along with probable gains, is outlined below:

i) Mission Statement: A Corporate Mission Statement, outlining why the company is in business and what it expects to accomplish over the long-term.

Gain: Alignment of effort from top to bottom. Also, as work the force is empowered (discussed below), each individual is able to make decisions that are best for the company in unforeseen situations.

ii) Strategic Quality Plan: Strategic Quality Plan is developed, usually annually. This outlines in operational detail the corporate plan for quality and each organization's contribution to the plan. In addition, each individual in each organization develops a plan which details their contribution. The plan is checked and optimized and updated as needed and is used as a communication vehicle to the whole organization.

Gain: Each individual understands what their specific contributions are expected to be. In addition, if concerns arise about opportunities to fulfill expectations, these concerns are raised immediately (in the planning phase), and dealt with as deemed appropriate.

iii) Performance Indicators: Performance indicators are developed for each level of the Strategic Plan including, if appropriate, individual performance indicators. Some examples are: turnaround time on documentation changes, inventory turns, sales forecast accuracy, productivity improvement, scrap reduction, new product development time, product manufacturing cycle time and reduction in time standard of one of an individual's process specialties. These are numerical indicators, which are measurable and can be monitored periodically, guiding the need for management's involvement in problem areas.

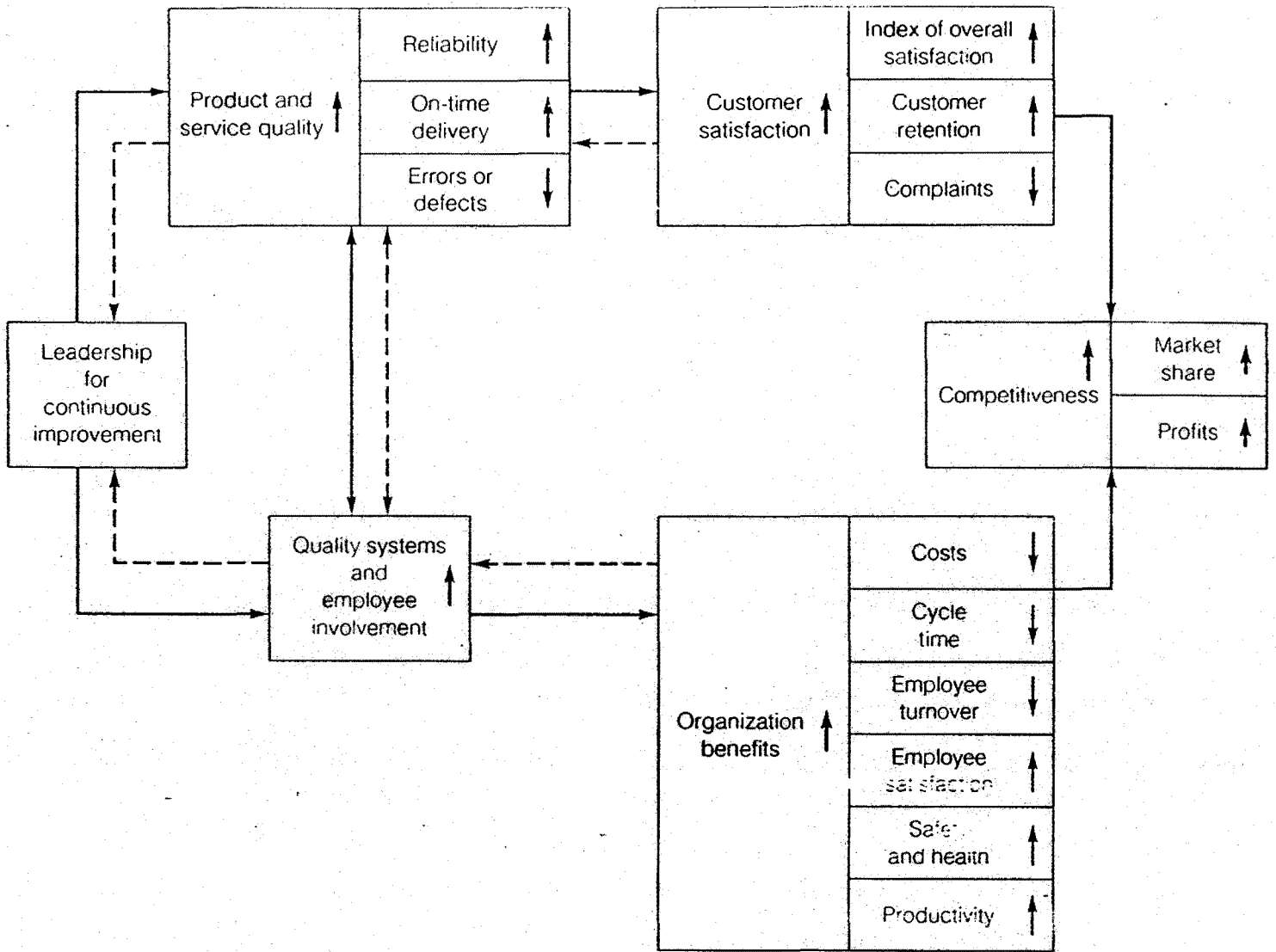
Gain: The company's performance as per the Strategic Plan is continuously monitored and management's involvement in problem areas is based on hard data, which makes management more effective, applying resources where the greatest return can be made.

An example of performance indicators from Evans & Lindsay and their preferred direction of movement is attached.²

iv) Statistical Thinking and Techniques: - Statistical techniques are used for the monitoring of performance indicators. The statistical capability of a process is used for its actual planning. For instance, if a process, such as order entry, was, under the strategic plan, required to enter customer orders into the system in a certain maximum time, the capability (statistical capability index) would be calculated using past data. If a process were not capable of meeting the strategic plan ($C_{PK} < 1.0$), then one of two things would happen; a) The strategic plan would be adjusted, reflecting the true capability of that process, or b) the process would be optimized, using basic statistical tools for improvement. These statistical techniques can be used on virtually all repetitive processes, both in production and in administration. The best users of SPC are the operators of the process themselves.

Note: C_{PK} is a statistical term that refers to the ability to meet a specification.

FIGURE 5.1 Total Quality Management Model



Gains:

- 1) The true process outputs, based on natural laws, as they relate to the strategic plan, are well understood.
- 2) Individuals can make responsible predictions for their contributions to the Strategic Plan, making it more accurate.
- 3) Where a process limitation is unacceptable, tools are applied to improve it.
- 4) After applying these tools to each process while developing the strategic plan, the critical processes (administrative, service and production) are control charted. The times to act on a process are statistically determined, taking any guess-work out of the problem solving process.

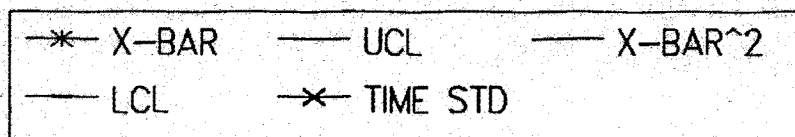
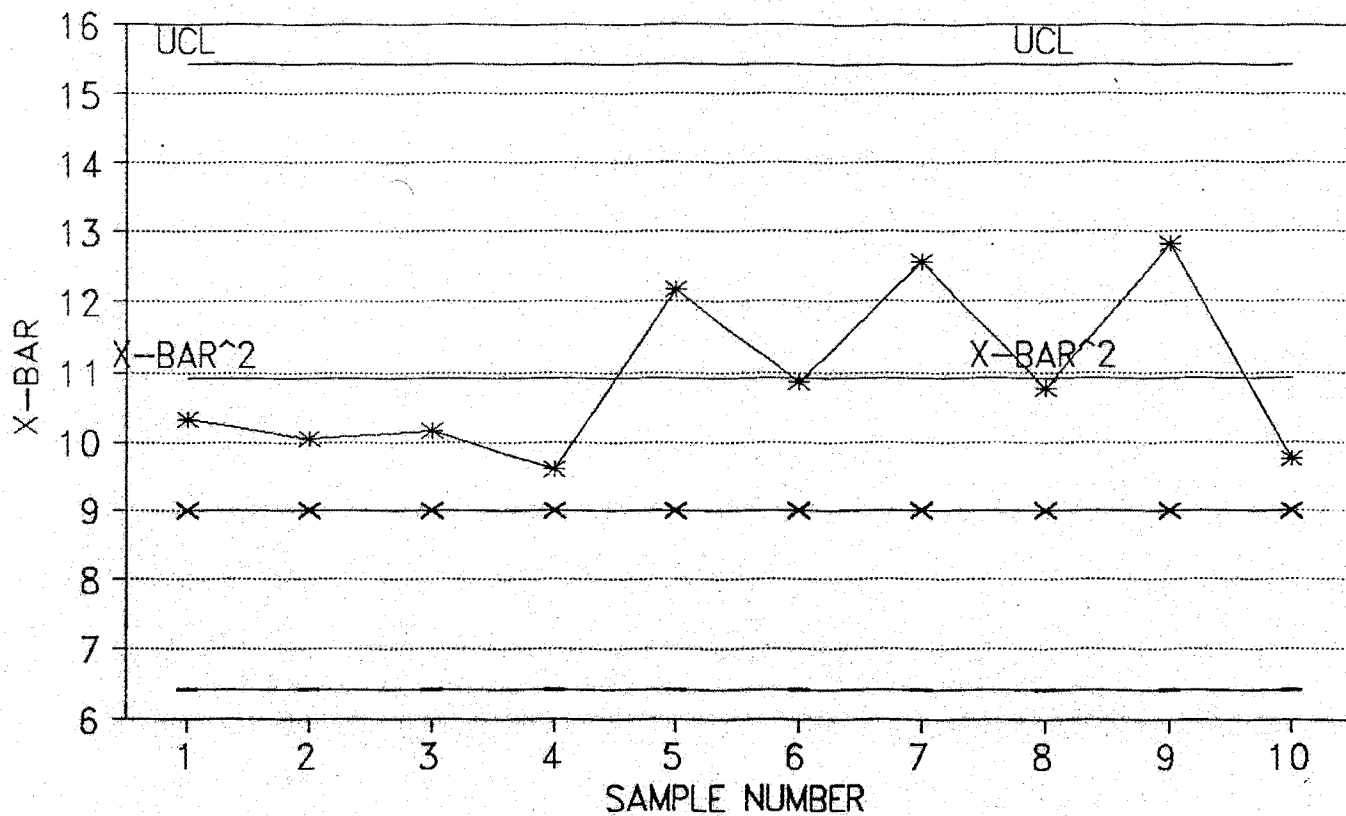
An example of productivity analyzed statistically is attached for reference.

v) Benchmarking: Benchmarking is used to compare our organization to other successful organizations. This benchmarking includes not just our output (other battery pack manufacturers), but any part of any organization that we wish to emulate.

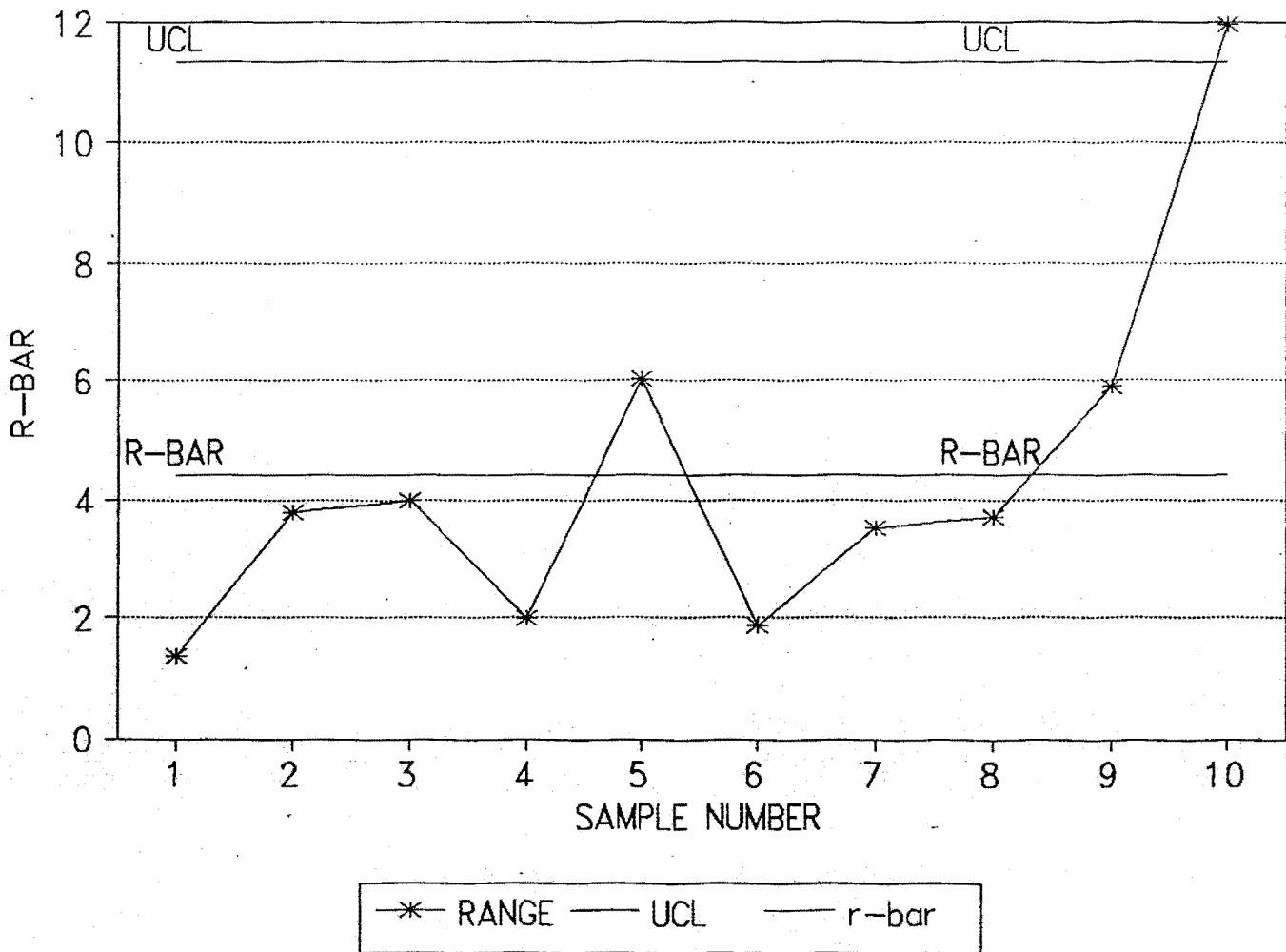
Gain: The most successful competitors and non-competitors are emulated.

vi) Empowerment: If each individual is going to perform based on their planned contribution to the Strategic Plan and the Mission Statement, then these individuals need be empowered to do so. This constitutes reducing the decision making process to its appropriate level. The appropriate level depends on the type of decision to be made. The basic concept of empowerment is as follows: There is a commitment to the employee to provide the proper tools, training, methods, equipment, opportunity and information to perform a task. If these are not in place, the employee cannot, and should not, perform that task.

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As Deming's Point 4 states, "End the practice of awarding business on price tag alone." What is meant by this is that a purchased material or subassembly should be evaluated using *total* cost. That is, in addition to price tag, cost of scrap or rework caused by that commodity, difficulty (or ease) of assembly and use, service from the supplier, etc. If one accepts that premise for materials, then it follows that the same argument can be applied to employees. What is the cost of an employee who can't respond to an auditor's question? What is the cost of an employee who can't read a document written in English? Empowerment articulates our expectations of each employee, but it also allows (and expects) that each employee will clearly define the tools needed to perform a task, including reading and writing skills, verbal skills, mathematical skills and other technical skills. It also follows that, for empowerment to be successful, Deming's Point 8, "Drive out fear", becomes very important.

In addition, ISO 9000 simply requires that documents are controlled and available, but it doesn't require that they be clear, concise and optimal. Empowerment, does accomplish this over the long-term, since employees will require clear, concise documents and will be involved in the continual optimization of them.

Finally, empowerment requires that employees be given a capable process with which to work ($C_{PK} \geq 1.0$).

Gains:

- 1) As employees become empowered, they become more productive, since they are able and expected to continuously improve their processes.
- 2) Management is freed from decision making of certain types (better made at the employee level), there is more time and opportunity to work on improvements to the system that we all work in.
- 3) The employees, like customers, come to expect that all tools will be in place for performing a task. Eventually, all tools, fixtures, documentation, etc. are in order, providing the best opportunity for producing quality products.

4) An empowered work force is more flexible, which paves the way for the implementation of modern manufacturing practices, such as flexible manufacturing and JIT.

5) An empowered work force applies statistical tools to quality improvement and to productivity improvement. (These frequently go hand in hand.) Using SPC, processes are improved, with that improvement being driven by the operators themselves, using their knowledge of the process.

Some examples of successes of flexible manufacturing and/or JIT are:

OECO: On one product line (magnetics), Increased throughput by 35%, reduced WIP by 90%, reduced scrap by 20% in one year.

Synectron: Improved productivity by 400% in one year on a product line (Disk Drives). Improved yield from 70 to 85%.

Sentrol: On a smoke alarm line, improved throughput by 30% (without JIT).

vii) Quality Cost System: A Quality Cost System is developed. The costs of quality are broken down into four categories; Prevention, Appraisal, Internal Failure External Failure.^{2,6}

Gain: These data are used to facilitate problem solving of quality issues that will realize the greatest return on investment. The goal is to minimize total quality costs, with the majority of costs (preferably all) to be in prevention and appraisal. In addition, investments in quality improvements can be analyzed just as any other business decision is analyzed.

5.2 Conservative Approach

If there is a certain level of uncertainty about whether to implement a TQM program, a company may choose to begin by taking a few initial steps:

i) Before making any changes to the quality cost reporting system already in place, determine quality costs based on the present data.

ii) Ask the management team to give (under certain criteria) an estimate of their perception of quality costs.

iii) Develop a complete quality costs reporting system, based on accepted criteria (see 5.1, vii).

iv) Compare actual quality costs, determined in step iii, with costs determined in steps i and ii.

The results of this will answer several questions:

What is our true cost of quality?

Is a TQM program worth the investment?

How well did our original quality cost reporting system work?

Is the management team's perception of quality costs accurate, and if not, why?

Finally, from these data a cost benefit analysis can be prepared, and the decision whether or not to implement a TQM program is made just as any other business decision is made.

Using this approach, a TQM program will take a little longer to implement, but it might be a reasonable method if there is some uncertainty about the need for TQM.

6. Financial Estimates

The cost to implement such a plan is difficult to estimate at this introductory phase. Once a Mission Statement and a Strategic Plan are developed, each department will have to evaluate its own needs based on its required contribution.

Some basic costs can be estimated:

i) Retreat: In many cases, the management team hires a consultant and/or uses a retreat of some kind to begin the program.

ii) TQM Training (SPC, Empowerment, TQM Philosophy, etc.):

Examples:

Milliken (1989 MBNQA winner):	\$1900/yr./employee
Motorola (1988 MBNQA winner):	40 hrs./yr./employee

At MPE, with an estimated incremental cost per employee of \$9.00/hr:

40 hrs.yr./employee =	\$360/yr./employee
Materials, etc.=	\$200/yr./employee
Seminars, etc.=	<u>\$200/yr./employee</u>
Total:	\$760/yr./employee

Averaging with Milliken (\$1900/yr./employee): \$1330/yr./employee

With an estimated 70 employees:

Total: **\$100k/yr.**

iii) Administration of the TQM Program: This is a time issue, and a rough estimate of weekly time commitment is:

Managers:	4-8 hrs. week
Supervisors:	4-5 hrs./week
Individuals:	2-3 hrs./week

Total: \$3800/wk. = **\$200k/yr.**

iv) Other Costs: Other costs will include consulting fees, costs of particular projects, equipment, etc. The main point here, though, is that any of these investments would be decided upon using hard data and would, hence, be profitable.

A summary of the estimate of the costs of starting a TQM program are as follows:

Training: \$100k/yr.
TQM Admin: \$200k/yr.
Total: ≈\$300k/yr. minimum

In order to determine the potential gain of a TQM program, the potential savings must be calculated. An example of opportunities for cost reduction are made by Atkinson in the Illinois study from Section 2. The average costs of quality of the manufactures studied in detail were as follows:

<u>Category</u>	<u>(in millions)</u>	<u>%</u>
Prevention Costs	\$0.71	12%
Appraisal Costs	\$2.2	39%
Internal Failure Costs	\$1.9	34%
External Failure Costs	<u>\$0.9</u>	<u>15%</u>
Total Cost of Quality	\$5.7	100% ⁶

(Total Cost of Quality is 25% of sales)

These costs would fit into a model of a typical company's quality costs using Crosby's value¹ as a low estimate of (15%) of sales, and using Evans & Lindsay's and IBM's estimate^{2,6} as a maximum (40% of sales). If this typical model applies to MPE, MPE's quality costs would be between \$1.5M and \$4.8M for FY 94 (at \$10M-\$12M in sales).

Atkinson states, "The payback from investing in prevention to reduce failure costs can be as high as 15 to 1. The payback from investing in appraisal to reduce failure costs can be as high as 9 to 1." These paybacks are over the first year.⁶

Using this typical model, for MPE:

Cost of Quality:	\$1.5M to \$4.8M per year
Cost of TQM:	\$300k per year + specific investments

Quality costs need to be quantified so that they can be reduced and/or eliminated. As with any other investment, the return on each project should be evaluated based on its financial merits. A Cost of Quality reporting system provides the information basis for making those decisions, and TQM provides the framework for making specific improvements as determined.

A possible way for these savings to manifest themselves, rather than a reduction in actual dollars spent to operate, might be a scenario similar to the one that took place at Wallace Co., Inc. (see Section 4). According to Carl Anderson, vice president and general operations manager, "In 1981, we were doing \$100 million in business with 450 people... Now, we are doing \$90 million with 280 people."⁵ The point here is not the level of sales (Wallace experienced significant reductions in sales initially, before implementing TQM), but that TQM allowed them to do the same amount with less resources. In a growing company, the increases in sales might not require similar increases in people. With similar increases in efficiencies as Wallace experienced, a company could almost double in size and hire very few new people.

TQM, like any other investment, has a return over time. One possible return is the ability to do more with less, as outlined above. Not included in the above analysis, however, is the value of a more satisfied customer. Just as the cost of a dissatisfied customer is difficult to calculate, the value to MPE of an increasingly satisfied customer, as well as the improvement in customer perception, is difficult to determine.

7. Summary and Conclusions

TQM provides a framework for evaluating and reducing hidden and unhidden quality costs. The evaluation is done with the cost of quality system, and the tools used for reducing these costs are empowerment, statistical thinking and methods, planning and communications.

In order to implement a TQM program, whether an aggressive or a conservative approach is taken, the commitment of top management is critical. A significant amount of resources need to be allocated if the program is to be successful. In addition, top management commitment ensures that the program will "stay its course" over the long-term, which also adds to buy-in from the rest of the organization.

Another reason that top management commitment is necessary is that, in most cases, TQM requires a major cultural change. Many companies operate under a paradigm that quality is limited to the shop floor and that quality can somehow be dictated or specified. There is a prevailing belief that a certain level of quality is adequate, that some level of defects is acceptable. The proper implementation of TQM requires that these philosophies are changed from the top down.

The Asian Dragons, Japan, Taiwan, South Korea, Hong Kong and Singapore have virtually no resources, except for human brainpower. According to Dr. Richard Deckro of the Engineering Management Program at PSU, "U.S. companies spend \$1 for every \$10 the Japanese spend (on training) and \$5 to \$6 the Europeans spend. 95% of the training dollars spent in the U.S. go to 1% of the organization."

TQM gives us a system and a philosophy to make better use of the available brain power we have in our midst. By training, empowerment, education, communication and partnership, we can develop a relationship with every individual in our organization, from top to bottom, that will enable us to mobilization of every ounce of intelligence. According to Konosuke Matsushita, "...For us, management is the entire work force's intellectual commitment at the service of the company...without self-imposed functional or class barriers...Only the intellects of all employees can permit a company to live with the ups and downs and requirements of its new environment."² Empowerment is the ideal tool for a company to mobilize all of its intelligence.

Herein lies the basic goal of TQM, and lays the foundation for this author's own definition of TQM:

TQM is the sytemization of the day to day, total mobilization of all of the intelligence available to an organization in order to provide a continuously improving product and/or service to the customer.

Once a TQM environment is developed, we should ask ourselves daily whether or not we are truly fulfilling the above goal. If there is one brain not being fully utilized to improve our business, we should ask ourselves how to change that situation now and in the future, and then systematize that change. Every problem we solve should be with that end in mind. Whether the solution of a particular problem is a small step toward that goal or a complete change in a system, we should always strive to go in the same direction.

Companies that strive to do this every day will be most likely to stay in business and prosper in the future.

This ends this presentation. Thank you.

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