

Reducing Deming's 14 Points to Practice

Observations by
MYRON TRIBUS, Director
Center for Advanced Engineering Study
Massachusetts Institute of Technology

and

Chairman, Technology Task Force
National Society of Professional Engineers
Alexandria, VA

June 1984

Introduction

In his videotapes and book Dr. Deming cites 14 points for managements to follow to increase quality, productivity and competitive position. In May of 1983 a visit was made to six Japanese companies which had won the Deming prize and interviews were conducted to determine how closely they followed these points and to learn what they had done to implement them. The companies were selected to represent as wide a range of activities as possible. They were:

Fuji Xerox (office copiers)

Nippon Kokan KK (steel)

Kajima Company (construction)

Rhythm Watch Company (small company)

Komatsu (tractors, earth movers)

Yokogawa Hewlett-Packard (electronics)

Sessions of the International Productivity Symposium (Tokyo, May 12-14) were attended and visits were made to the Japanese Union of Science and Engineering (JUSE), the Japanese Productivity Center (JPC) and Sophia University. Discussions were held with several scholars specializing in productivity and quality.

In general, Deming's teachings were confirmed. Due to the educational efforts of JUSE and JPC, a very large number of people know about and apply Deming's teachings.

Of course the people interviewed represent the very best competitors. They are by no means the average performers. They are not "typical" Japanese managers. Rather they illustrate what can be done when the 14 points are implemented in their totality. When the 14 points are put together they make for an astonishingly well run company. In several cases their financial records showed dramatic changes in profitability from the previous era, despite increasingly adverse external circumstances.

In the following paragraphs the principle lessons learned will be summarized in four categories, though it should be emphasized at the outset that it is the total picture that counts, not the individual categories. The whole is much more than the sum of the parts.

The four categories of observations are:

ORGANIZATION

OPERATIONS

EDUCATION AND TRAINING

HOW TO CHANGE A CORPORATE CULTURE

Before visiting each company a questionnaire was sent ahead. In it the following types of questions were asked.

1. How do you regard the 14 points cited by Deming? How do you apply them? What did you have to do to get your employees to follow them?
2. Why did your company decide to compete for the Deming Prize?
3. How did you go about changing the "corporate culture?"

The answers given were remarkably similar. There were differences, of course, between, say a small company like Rhythm Watch and a giant like Nippon Kokan KK, but these were merely matters of size. The principles remained the same.

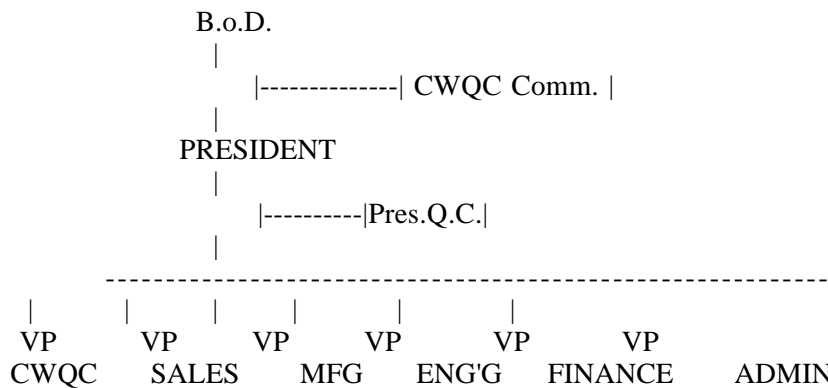
In the following distillation of their replies I describe no one company but rather a composite of them all. The descriptions which follow represent recommendations to those who would like to put the 14 points to work.

Organization

Although the different companies have different names for what they do, the phrase "Company Wide Quality Control" (CWQC) is most descriptive. Some companies call it "TQC" (Total Quality Control) and emphasize that the "T" also stands for "top".

It is best to begin the description by discussing what happens at the top, at the level of the Board of Directors. In most Boards of Directors there will be several committees, such as a finance committee, a committee on compensation, a committee on capital investments, and so forth. In addition the companies that won the Deming Prize had as part of their Board of Directors a committee which we shall call the CWQC Committee. The purpose of this committee is similar to that of the other committees of the Board, i.e., to evaluate the functioning of the management in this important area and to give advice. How they actually do this will be discussed under OPERATIONS.

Typically, the President reporting to the Board has reporting to him several Vice Presidents who have specialized functions. A typical organization chart, displaying only the top management, might look something like the following figure.



Two entities should be noted in the above figure. The first is the Presidential Quality Committee ("Quality Circle at the Top"). Just as the President is likely to call on the Vice Presidents to form special committees to deal with financial aspects of the company (i.e., the finance committee, the committee on capital expenditure, the long range planning committee, etc., etc.), the Vice Presidents and the President form the PQC which is concerned with top level planning for the improvement of quality in all aspects of the business.

It should be remarked here that in every case the people at all levels of the company understand that the only way to increase the productivity and lower the costs is to increase the quality. This principle is so taken for granted that it was never discussed in any of the interviews. It is fundamental to Deming's teachings.

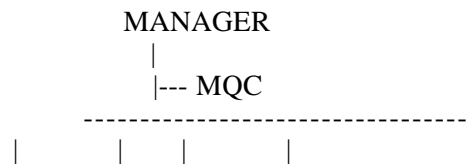
There were, therefore, no high level cost reduction task forces, special task forces on productivity improvement, etc., etc. If cost, delivery time, reliability, etc., become targets, they are all handled via the PQC and the CWQC approach using organizational units and procedures to be described next.

Also shown is a box to the left of the chart representing the Vice President for Quality. (In some cases it was called the TQC Promotion Office, in others the VP for CWQC. The names vary; the function remains constant.) This office plays a role relative to quality similar to that of the VP for Finance in

respect to financial reporting. That is, it is a small office charged with developing and enforcing standard methods of analysis and reporting and for consolidating the outputs of the other offices. As will be seen, an important aspect of CWQC is to develop a method of reporting that reveals to each layer of management how well plans are being followed and what to do when they are not. These procedures will also be discussed under OPERATIONS.

Each manager, going down the chain of authority, is expected to have a formal CWQC committee or staff operation (depending upon the size of his activity). At the level of a supervisor it is expected that the workers will be formed into QUALITY CIRCLES.

If the organization chart of the company were to be examined in finer detail, it would be found that in each operating division it would look something like this:



Typical organizational at middle levels
 MQC = Manager's Quality Circle

The Vice President for CWQC has a small staff which consists of a statistician, or two, and several people who provide secretariat service to the CWQC Committee of the Board, the Presidential Quality Control Committee and to the Committees of the several divisions. They also keep track of what is done in the lower level quality circles (whether managerial or at the lowest levels). One of the more important functions they serve is to develop the reporting format and to consolidate the reports at each level so that a comprehensive picture is available to each manager concerning what is going on in the organization for which he is responsible.

So much for organization.

Operation

To begin with, everyone, and that means everyone, in the company, from the top to the bottom is familiar with the seven statistical methods. Every company had different ways to remind people of them. Some companies issued little pocket summaries. (e.g. like the little pocket diaries put out by General Electric Company or professional societies which contain, in addition to a place to record daily appointments, data on the census, on physical constants, etc. In these companies the little booklets describe Ishikawa diagrams, Pareto diagrams, X-bar and R-bar charts, histograms, scatter plots, etc.) Everyone, and again, they mean everyone, is trained in statistical analysis.

In addition, everyone learns a common method of attacking and describing problems. This commonality of method is essential if different people from different parts of the company are to work together on quality improvement. The method is referred to as the "P-D-C-A" approach. This method of problem solving is usually represented as the Deming Circle and is portrayed as follows:

(A circle with arrows drawn around the following)

```

A | P
-----
C | D

```

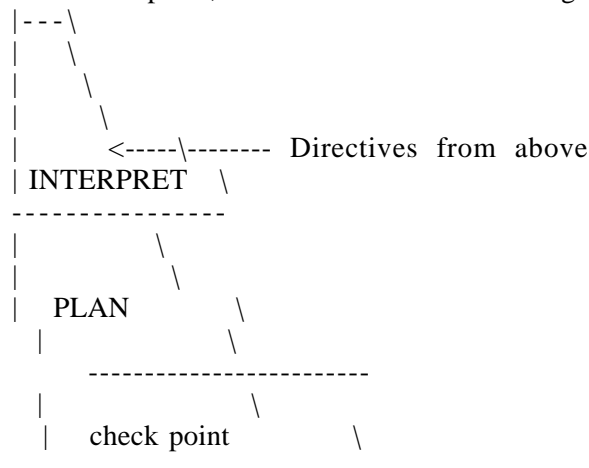
"P - D - C - A - "

The activity is considered to be carried on in a never ending cycle. It is called the "PLAN-DO-CHECK-ANALYZE AND ACT" cycle. Each level carries out the cycle in the same way.

PLAN

At the beginning of the planning cycle, the President announces the goals for the company for the coming year. These goals are determined by the President in consultation with the PQC after a study of the consolidated CWQC reports for the previous year. The president and vice-presidents have learned how to read CWQC responses with the same ease as they read financial reports. (Of course the methods were not developed overnight. The different companies were at different stages of development of their methods. The methods also varied with the size of the company. Later in this report we shall consider the problem of converting the corporate culture.)

The Presidential Goals Statement is analyzed by each manager and converted into goal statements for the organization reporting to him. Thus, at every level, the same kind of activity takes place. At each level the planning activity is divided into three parts, as indicated in the diagram below:



Planning

The first part of the planning activity is to interpret the requests from above. The second part is to translate the request into a plan of action for the activities below. The third part of the plan is to identify the "control points" or the "check points" that should be watched to see that the activities are carried out with high quality.

To identify these control points an Ishikawa diagram is drawn. This diagram reveals what the ingredients must be for a successful operation of the plan. Based on previous experience, especially statistical data gathered the year before, the manager indicates the bounds to be expected on each important variable if the quality of the activity is to be maintained.

Depending upon the size of the organization, the method of identification of check points can be very elaborate or simple. In a very large organization, where the check point of a particular activity may be under the control of a different part of the company, the method of reporting is apt to be quite formal. For example, a sales office may indicate that the opportunity to make repeat sales (a goal for the year) is influenced by the speed of delivery of spare parts, a matter over which it has no control, but which, based on the previous year's analysis, was an important variable in determining performance. If this is so, that variable is identified and will be indicated as a check point in the plan. As the plan is sent forward to be consolidated with other plans, the VP for CWQC will see that the importance of that variable is brought to the attention of the division most likely to be involved in it and made a priority item in their plan.

DO

After the plans have been made, they are forwarded to higher levels. These plans become the basis for the budgetary cycle and the managers begin to fulfill them. As they roll forward with their plans (many companies picture the "A-P-D-C" cycle as a wheel rolling up "improvement hill") the third phase begins, "check".

CHECK

The control points identified in the planning cycle are tracked, statistically, of course, and deviations observed. The variations in each quantity are predicted for the year and the actual, observations are plotted and shown against the predicted curves. There is an important difference between this kind of portrayal of results compared to what is the normal practice in companies not using CWQC. For example, most Western companies will present a projected sales volume versus calendar date and then show the "budget vs actual". In the CWQC -system not only are the figures for "budget versus actual" shown, but also the significant variables, determined by use of an Ishikawa diagram, are also displayed to show why the deviation occurred. Thus, any deviation from the "targets" is discussed in terms of the deviation of the "control points" from what was expected, not the performance of individual managers. Everyone understands the general rule: "85% of the time the problem is in the system, not the people." This analysis pinpoints the cause of the unexpected results (good or bad) and is the basis for action by the persons most involved. It often leads to improvement in the system.

Another way of describing the CWQC system is to say it provides an "audit trail" for quality.

ANALYZE AND ACT

The last two parts of the cycle involve the use of the various statistical techniques to determine what are the causes of unexpected behavior and what to do about them.

It may be said that in the first two quadrants (PLAN and DO) the Ishikawa diagram and the Pareto diagram play the largest role, since the targets and sense of what is important play the central role in planning. In the last two quadrants (CHECK and ANALYZE/ACT) the other statistical methods are most often used, since they help pinpoint statistical significance and statistical dependence.

Because everyone understands statistics and because the President has issued clear statements of goals, when people come together to decide what to do about a problem, there is much less tendency to quarrel. Several people described this as "fact based" decision making.

One president described CWQC this way: CWQC is a technique of management. The objective is to alter the attitude of managers to people and people to the organization in a favorable way. CWQC is the embodiment of this purpose. All members participate voluntarily. They find CWQC worthwhile because it is backed up by a theory--statistical treatment of data. This provides a logical basis for action and for the theory itself.

The Presidential Quality Audit

One of the most important aspects of the CWQC approach is the Presidential Quality Audit. In the latter half of the year the President makes a Quality Audit by examining the detailed performance of each of the units and comparing them with the objectives announced at the start of the year. The consolidated report not only indicates which goals were missed or exceeded, it also indicates, based upon the control points, why the results were obtained. The president visits the various operations of the company and discusses their performance, using the plans and performance as a basis for the discussion. By reading the "P-D-C-A" information ahead of time the President comes prepared to discuss intelligently with each operation how it is doing and what he and the other managers can do to improve the system. This approach is to be contrasted with the usual "management by exception" approach in which, when things go sour, the manager then tries to figure out what is wrong and what to do about it.

Education and Training

To make a system such as CWQC work, it is necessary to train each person appropriately. Each level of management must be taught how to execute the P-D-C-A cycle as applied to managerial problems. In the office the instruction focuses on a different set of problems. On the factory floor the emphasis is on problems of manufacture, and so on. Of course everyone must be taught statistics. The engineers are given a more advanced treatment than the workers. As managers rise in responsibility, they are expected to become

more proficient in statistics. For example, they must become more capable in the design and interpretation of experiments.

At this point it is useful to say something about the functioning of the Japanese Union of Science and Engineering (JUSE). This independent not-for-profit organization is devoted to education and training in all aspects of management for quality. They present year round courses of instruction at all levels from the Board of Directors to the factory floor in statistics, management and care of quality circles, design of experiments, etc., etc. They are ever on the lookout for things to do to enhance the ability of the country to compete. JUSE represents an important element of infrastructure for the country. If a president wants to convert his operation, JUSE is ready to help by providing in-plant training, consultation services, seminars, conferences, educational materials of proven value, etc., etc. When a company is involved with JUSE it is known that they are going to get results. This means that investments in education with JUSE can be interpreted by investors as a sign of a healthy company and one that is going to become more competitive. Nothing like JUSE now exists in America. It should be created.

Evaluations of the capabilities of the staff to do the work required in the P-D-C-A cycle are made by the VP for CWQC and used as the basis for directing the educational activities of the company. His report on evaluation of worker capabilities and effectiveness of educational activities is read by the CWQC Committee of the Board of Directors.

The VP/CWQC also has a "promotional" responsibility. For example, in many companies the "CWQC Promotion Office" arranges contests for:

QC Circles in the company (Quality Circles started in Japan in 1962. By 1982 there were 140,000 circles with 1.5 million members. In 1963 there was one conference of 149 people. In 1979 there were 107 conferences, i e., one every three days, involving 23,552 people discussing 1685 cases.) Winners of these contests get prizes. In some cases they attend the "Floating University", a cruise ship for winners from different companies. The QC Circle winners cruise together for a week and discuss their experiences.

QC activities in suppliers. The larger companies give plaques, flags, other recognitions.

QC activities in affiliated companies (e g., sales representatives, agencies).

The VP/CWQC is responsible to oversee and report on these activities which are aimed at making the company's relations with customers of high quality, even when they are through intermediates.

The VP/CWQC either runs the educational activities or oversees these activities as carried out by a Manager for Human Resources. Statistical methods are used to determine who might need more training.

Changing the Corporate Culture

When asked how they managed to change the corporate culture the managers gave more or less the same answers. First of all, each CEO decided to change his company because he recognized the company had a survival problem. For Komatsu it was because their tractors simply were not in a class with Caterpillar. Rhythm Watch company was faced with quartz technology which introduced concepts of accuracy previously unheard of in the industry. Kajima Construction faced the results of the "Nixon-Shock" at a time when the powerful leader of the company had just died. Fuji Xerox found that it was losing rentals faster than it was making placements. Therefore, the first requirement for change was the recognition by the top management that they were in deep trouble.

In each case, thanks to the work of JUSE, the Presidents were aware of Deming's work and what could be done through CWQC. There were well publicized examples for them. However, within each company there was much resistance to change. The Fuji Xerox prescription was simple:

- Create an office, reporting directly to the President, to oversee the process of change.

- Hire consultant statisticians to guide the management.

- Identify sympathetic managers.

- Help these managers to make applications

- Publicize the results within the company widely. For example, hold management meetings to hear progress reports

- The President should make an assessment of the quality of company operations and publicize his findings

In each case a permanent office was established. Each executive said the same thing: "This is not a program. It is the start of a way of life." Therefore, the office was not called the "Program Office" (which would imply a finite life). The name "TQC Promotion Office" was used several times. It describes what was to be done, namely promote the concept everywhere in the company. The VP/CWQC provided the staff support for the President in the area of quality in the same way that the VP/FINANCE provides support in the financial area.

Another President indicated that there were three aims:

- To change the way people think about the company and relate to it.

- To change the way they think about each other.

- To change the way to solve problems.

Views of The Corporation

It is often said that the Japanese culture makes a difference. Certainly there are differences, but some of the differences are in the "corporate culture", which is determined to a large extent by the leadership inside the company, rather than the culture outside the company. Company cultures do not change overnight. One CEO put it this way: "The President should not be fainthearted."

Another influence is the economic climate outside the company. That, too, is important, especially the way the company is or is not strongly dependent upon the stock market.

One important difference between Japan and the West lies in the way the company is regarded by the public, the stockholders, the managers and the workers. In the Western world the company's physical assets are considered to be the "company" and to belong to the stockholders. In this view the company is an economic unit. The managers and workers are "hired hands" who are put on the payroll to enhance the value of the stockholders' investment. Therefore, whenever a project is considered, a calculation of the return on investment (ROI) is made. Unless the ROI is high enough to compete with alternative investments that could be made by the stockholders, the company is reluctant to make the investment.

In Japan, in contrast, the stockholders are considered to be silent "partners" of the managers and workers. The company is considered to be the managers and workers, not the equipment. The value added by the company is computed according to the simple equation:

$$\text{value added} = \begin{array}{l} \text{value of} \\ \text{all goods} \\ \text{and services} \\ \text{sold} \end{array} - \begin{array}{l} \text{cost of} \\ \text{all goods and} \\ \text{services} \\ \text{purchased} \end{array}$$

This value added is available to be shared by the partners. One of the speakers at the symposium suggested the division 1/3 to the shareholders, 1/3 to be reinvested in the company and 1/3 for the managers and workers.

Using the "added value" concept, the marginal change in added value is computed and the value of the new investment is considered in respect to the longevity and competitive position of the company, not stockholders' equity.

It makes a difference to worker attitude if he or she is considered a "hired hand" or a "partner". This difference shows up in a survey of a German firm. When asked "Is an increase in productivity good for you personally? "

72.5 % of German workers said "No"
87.2 % of Japanese workers said "Yes"

"Does an improvement in Company profitability benefit you personally?"

73.5 % of German workers said "No"
93.6 % of Japanese workers said "Yes"

This difference in accounting and in viewing the purpose of the corporation affects the decisions to invest in technology. Since the stockholder is less important to the management, and since the people are the company, much more concern is expressed over the future of the company (i.e., their own jobs) than over profitability. Another factor making it easier for the management is that take-over bids are forbidden by law. Therefore, if the price of the stock goes down, there are no pressures on the management to do something immediately to enhance the stock value. As is well known, they borrow more from banks and rely less on the stock market. None of these differences in business operations represent differences in general cultural values.

The Deming Prize

In response to the question, "Why did you try to win the Deming prize?", the Presidents gave surprisingly similar answers. They were in trouble and they needed a rallying cause for the company. They found that the exercise of getting ready to win the prize was expensive and time consuming, but it produced an alignment of purpose within the company difficult to get any other way. One President said, "The effect carried over into other activities. We all knew we could do it. It made people believe that the company was capable of doing anything it set out to do."

The Deming Prize is administered by JUSE and involves a large committee of investigators, mostly from academia. There are actually 4 Deming Prizes and one award:

- Deming Award for an individual contributor.
- Deming Application Prize--Large Enterprise.
- Deming Application Prize--Small Enterprise.
- Deming Application Prize--Division Enterprise.
- Deming Application Prize--Factory.

There is also a "Japan QC Prize" which can be won only by a company that has won the Deming Prize 5 years before. The company nominates itself by submitting an extensive report which deals with ten issues:

1. Policy. . what does top management say and do? Are these consistent?
2. Organization and Management. . .how is the CWQC organized, promoted, managed?
3. Education and Dissemination. . .how are people informed and educated? How are statistical methods taught?
4. Information Accumulation and Utilization. . .how are internal and external data gathered and used?
5. Analysis of problems. . .how are efforts prioritized?
6. Standardization. . .of procedures and practices, how effected?
7. Control. . .how are QC charts, QC information used?

8. Quality Assurance. . .how utilized in product development, in process control, in maintenance?

9. Effectiveness what's it all worth? How measured? Increased profits? Increased market share? Greater customer satisfaction?

10. Future Planning. . .is it factually based? Are long and short range plans consistent?

If the report submitted appears to be satisfactory, the Deming Prize committee dispatches an investigatory team which visits the plant for several days. Part of each day is devoted to presentations by the plant personnel and part to questions and probings by the committee. Because so much hinges on the outcome, the committees are very tough. Only winners are reported. Those that apply and do not win are just quietly forgotten, without publicity.

When asked to suggest better methods of deciding who won the prize, the winning companies declined to suggest how to improve the process.

**Reducing
Deming's 14 Points
to Practice
(Part II)**

Observations by
MYRON TRIBUS, Director
Center for Advanced Engineering Study
Massachusetts Institute of Technology

and

Chairman, Technology Task Force
National Society of Professional Engineers

December 1984

Introduction

A visit was made to Japan, from 20 July to 4 August, 1984, at the institution of Professor Yoshikazu Tsuda of Rikkyo (St Paul's) University in Tokyo. Professor Tsuda is a member of the Deming Prize Committee, a lecturer for JUSE (The Japanese Union of Scientists and Engineers), a teacher-lecturer for AOTS (Association of Overseas Technical Scholars), and a very busy consultant to numerous companies in Japan, Bulgaria, USA, Belgium, and elsewhere. His specialty is "Quality Management".

During an earlier visit by Professor Tsuda to the Center, we had proposed that he give a short course for CABS. Professor Tsuda suggested that before we attempted to design the course, it would be helpful to observe first-hand how he does his work.

2. Professor Tsuda arranged a schedule in which the visits were "graded" that is, to companies with increasing levels of competence and experience in quality management. The companies visited were:

- July 25 - Taiyo Kogyo (supplier of tents for large meetings) [just starting TQC]
- July 26 - Toyo Rubber Products [some experience in TQC - moderate level]
- July 27 - IBM Japan [discuss with Exec. Dir. only]
- July 30 - Nissan Oppama Plant [very advanced TQC]
- July 30 - Ohoi Mfg Co., supplier to Nissan [very advanced TQC]
- July 31 - HQ, Texas Inst. of Japan
- July 31 - TI Japan, Ohio Plant [preparing to apply for Deming Prize]
- Aug. 3 - Komatsu Tractor Co., Maoka Plant [Deming Prize winner 20 years ago]

July 20 to August 4 are probably the worst days for visiting Tokyo because the weather is so hot and sultry. Nevertheless, all schedules were kept and all meetings were fruitful.

3. At each plant I observed Professor Tsuda in action. Rather than describing in detail what happened during each visit, I shall give a composite view of the visits to Taiyo Kogyo, Toyo Rubber, Ohoi, T.I., and Komatsu. In these companies Professor Tsuda has been a consultant for some time. The top management convenes a QC meeting at which Professor Tsuda presides. Different managers make reports of progress on their TQC activities. The relation between "sensei" (teacher) and pupils in Japan is very different than in America. At these plants Professor Tsuda was clearly the "sensei" who did not hesitate to speak very harshly to his students, rebuking them for not following up obvious leads, etc. In one plant, he said, "If you have incorrect data in a report, how can I believe the other reports you will prepare?" The students accepted his comments in good grace and promised to try harder and to do better. I do not believe such tactics would be accepted if an American professor used them while consulting with an American company. He would be considered rude and would not be invited again.

Too bad, for there are many bad habits to be corrected!

4. Professor Tsuda's examination of their reports was very thorough. It followed a pattern:

(a) What was the quality improvement objective? How had it been set? By whom? Was it appropriate to that level of decision?

(b) How had they analyzed the data? How had data been gathered? What did the raw data look like? Did it reflect the customer's perspective?

(c) Were they concerned with removal of "abnormalities", "quality" improvement, or "quality maintenance"? In each case, how did this relate to work standards (i. e., procedures--not quotas)? What were the educational implications? What changes were required with respect to the system? Were new standards to be developed? How would the same problem be prevented in the future?

(d) What follow-up actions were taken to check that the expected improvements were obtained?

(e) Were the people who were doing the work also learning to improve their own processes for improvement? (i.e., improve the quality of the quality improvement process)

(f) Were hard data available to back up any assertions made?

(g) [During factory tours] Was there an evident safety program in place? What did the records show? Where were the control charts? What actions had they caused? By whom? What results? Was housekeeping a high priority? Were workers using the appropriate SQC tools? How much material in stock? How many idle machines? Why? What countermeasures proposed?

(h) What are the product and process quality measures used in all parts of the company (CWQC)? What are their trends over time?

5. Here are a few vignettes, not related to specific companies (We were expected to respect their proprietary concerns.)

A. It was reported that there had been a mistake in a delivery. One item had been omitted from the truck. Professor Tsuda asked what kind of form was provided to the person loading the truck. Was it a "check list" or a "manifest"? What was the procedure used by the loaders? Did they check an item off the list after or before loading it? Is there a standard procedure? Do the drivers follow the procedures? How do you know? Is the form always legible? How many errors have they had? What do the people doing the loading think of the form? What pressures are they under? When the form was provided to Professor Tsuda, it was not as described by the manager making the report. Why had he not known about the form? Should he not have investigated before reporting?

Professor Tsuda commented "What you did was determine if the man made an error. You did not investigate the process. You did not try to improve the system. Having found that an error was made, you only asked the man if he followed procedures. You did not try to understand how to redesign the procedures to reduce the probability of an error."

B. One company was exploring what new products to add to their existing line. Professor Tsuda asked What criteria were used? Were they written? Who set them? [Should not the President have been consulted?] What products were proposed? [They all turned out to be not new but rather a shift of the "make-or-buy" decision from "buy" to "make"] Why had the decision process not started with economics of market needs? What would the future require? What company did they want to become? [Ask for the President's input.] Why were they so risk averse?

C. Although Dr Deming advised against the setting of numerical targets for quality and cost of quality calculations, Professor Tsuda does not hesitate to use them. At one company they had prepared an elaborate set of interconnected matrices (as three faces of a cube, see Figure 1). As the figure shows, in each entry they showed the target vs "actuals". The manner in which these "targets" as used is somewhat different from place to place. In one company, the President set an overall "target" for cost reduction which amounted to getting the "cost of poor quality" (as computed the previous year) equal to zero. This translated into "targets" for each division and section. The targets were not imposed; they represented natural consequences of an analysis. In another case, a QC Circle analyzed a certain defect and found from a Pareto chart that 98% of the defects were of a certain type. They set for themselves the target of reducing defects by 98 %, i e., controlling the biggest one. (They actually reduced all three to zero) In each case, it was my conclusion that the targets played no real role, other than psychological, in what was done. In every place we visited, target setting, encouraged by Professor Tsuda, was accepted as normal and proper.

D. Proper housekeeping and cleanliness were stressed in every plant visit. In the case of the OHI SEISAICUSHO CO, LTD, a large supplier of automotive hardware (locks, hinges, window mechanisms, etc), each area of the shop had a person designated to keep it clean (a supervised job rotation in keeping it clean). In a small lounge set aside for workers QC meetings and relaxation, there was a table with 12-oz paper cups, each marked for a day of the month. In the cups were stray items found on the floor for the day. No cup was over 1/4 full, although the factory had at least 100 people working with as many tools! The floors were immaculate, despite the punch presses, drills, reamers, welders, etc.

E. Professor Tsuda observed: "You can tell the state of health of a company by observing what and how topics are discussed in their management meetings."

A sick company --Only things favorable to the speaker are reported

A not-so-sick company--Unfavorable news is reported only in reply to a question. The source of the trouble is said to be not with the speaker.

An ill company--The speaker voluntarily gives bad news and an explanation. The management accepts the information.

A weak company-- The board accepts the "givens" in the situation and tries to see what to do.

A healthy company --Speakers report good and bad news. Give explanations and data freely. Present an analysis of potentials to improve the system. Review the "givens" in the situation. Board questions the "givens" and tries to develop creative alternatives.

F. Professor Tsuda said that there was a natural evolution of a company from the old to the new way to manage.

Stage	Characteristic
0	Concerned about volume, profit and share value.
1	Concerned about quality of product. Begins to emphasize product QC.
2	Emphasizes QC for production process.
3	Emphasizes quality management as a means to improve production processes
4	Applies quality management to all departments related to production (i e, purchasing, manufacturing, warehousing, transportation)
5	Applies QC concepts and quality management to research, development, and engineering

*

The aforementioned three sided cube diagram would go here, but the scanner spit it out like a bad grape.

*

6. Applies quality management to all departments of the company.
7. Proclaims CWQC as THE company management style. In particular,

- (a) Quality is first priority.
- (b) Customer-oriented decision criteria.
- (c) Personnel policies based on respect for humans.
- (d) All departments are able to and do coordinate and cooperate.
- (e) All employees participate in improvement.
- (f) There is good communication based on factual data treated and interpreted by SQC.

G. In conventional management systems, the duties of the quality assurance department are fairly well understood. However, in CWQC, with everyone involved in the improvement of quality, some people were unsure how to define the duties of QA (We noticed that in several factories there were QRA Departments [Quality and Reliability Assurance]) Professor Tsuda proposed the following list of duties:

- (a) To be an information source for aspects of quality and reliability. QRA should maintain an active data base for all measures, such as:
 - customer quality definitions;
 - measures of customer dissatisfaction;
 - quality measures for processes (definitions);
 - quality measurements of processes (over time);
 - quality measures for suppliers (definitions);
 - quality measurements for suppliers (over time).
- (b) To provide quality approval for all new products.
- (c) To provide an evaluation of all quality efforts in CWQC (graphical representation of progress).
- (d) Approve quality level for all products shipped.
- (e) Participate in "quality building" (i.e., promotion) of all aspects of CWQC.
- (f) Provide secretarial service to the various CWQC committees.

Professor Tsuda suggested that the QRA Department not be considered responsible for quality and reliability. That should be the responsibility of the line managers, to be coordinated in CWQC committees, led by the strongest department manager (i.e., sales or manufacturing, whichever had the greatest interest). QRA should support this work with data and analyses.

6. Mr. Hiromasa Nohmura, Taiyo Kogyo, Co, Ltd.: "We rent tents for special occasions. The tents are getting larger and larger, over 50,000 square feet. We sold a pneumatic tent to a fairground. It collapsed due to negligence of the fair owner We were involved in a legal dispute. We won, proving it was not our fault That taught us a lesson. As our tents have become larger, the risk grow. If a tent for two people falls down, no one notices; if it collapses on a thousand people, it makes headlines. We also had a case where flexible container of one ton fell from a hoist due to a broken rope and injured an employee."

"I was told by the President of Ricoh about the TQC (or CWQC) concept. I and the VP's went to JUSE courses for top management, for 'brainwashing' JUSE sent instructors to the company. The greatest resistance occurred in middle management QC circles started at the bottom. Middle-management felt the President was 'doing something funny'. They felt too squeezed by the competition to stop and learn something new But the employees found that the President persevered."

"Initially we did not know what to do We learned the basic principles from JUSE but did not know how to apply them. We expected people to show us what to do; now we know we have to teach ourselves. We have about 800 people and a gross revenue of 35 billion Yen (\$140 million)."

"Now that we have developed a pride in the quality of our product, It is showing up in increased sales. After seven years, I am not yet assured about our status in regard to product liability. I believe If we had not practiced TQC in the past 7 years, we would not have survived."

7. Mr. Ichiro Kajiyama, President, Ohi Seisakusho Co., Ltd. (automotive hardware, supplier to Nissan): "About two years ago, when auto production began to turn down, we felt we were in a crisis and had to find a way to survive. We turned to CWQC. Ohi Seisakusho had already been emphasizing safety and housekeeping. They already had been using SQC. So the change to CWQC was relatively rapid." (Note by MT: Ohi had to learn quality management. Most of the techniques were in place; their integration into a new way to manage was only two years old and incomplete.)

"The survival strategy involves both the development of new products and CWQC. Nissan established a QC prize. This was a motivation. Ohi produces 3.2 million parts per month. They had relied on industrial engineering for 30 years. They had used SQC for ten years. When they used CWQC, it involved coordinating all these approaches: SQC, ie, product improvement. That's the challenge-- coordination of all these activities in one management style. Now, 'Quality is our first priority. Once the President understood that you cannot achieve low cost and productivity without quality, it provided a unifying theme"

Ohi has productivity plans, cost plans, safety plans They develop "fail safe" mechanisms and procedures (hardware and software). [Examples Safety devices on machines, interlocks on inspection devices, color coding, etc.]

The company has developed about 21 measures of quality performance for which targets are developed by consensus. There are three stages of consensus building:

- Executive committee meeting;
- Middle management meeting;
- Lowest level meetings.

Example: Measure number of customer claims against Nissan which involve Ohi parts. Although the results of their actions left them 27% under target: they could explain this by the time delay in flow of improved products through Nissan to customers.

8. Mr. Hideshi Nakano, Personnel Director, Texas Instruments, Japan "TI is forced into CWQC by the fierce competition in integrated circuits"

On July 3 and 4, the President of TI Japan made a QC diagnosis addressed to

- (a) The overall site;
- (b) Personnel;
- (c) QC;
- (d) Computers;
- (e) Facilities;
- (f) Q&R Assurance;
- (g) Product Engineering;
- (h) Front-end" (i e., chip manufacturing);
- (i) Assembly;
- (j) Test.

This diagnosis was assisted by the staff.

Mr. Nakano described a unique way to develop a job description: Invite all your in-plant "customers" to describe what they expect you to do.

9. In the various presentations, I found a wide variety of graphical presentations, too numerous to reproduce in this report. Apparently the practice of having meetings devoted to problem analysis and solution has generated a need for better communications. One example is given in Figure 1, which permits the President to comprehend very quickly the overall quality situation in a multi-divisional company.

10. Of greater significance is the flow chart depicting how the total plan of quality management is to be carried out.

CONCLUSION

It is impossible to sum up impressions from so many intensive interviews. The best I can do is describe the general algorithm that seems to be followed by those doing the best job of quality management.

- A. Define the objective of your company.**
- B. Define the quality of your goods and services from a customer's perspective.**
- C. Translate these into measurables.**
- D. Develop a plan to measure, monitor, and improve these measurables.**
- E. Relate these measurables to the processes and inputs.**
- F. Develop a procedure to improve and maintain the improvements.**
- G. Coordinate these improvement activities among all departments.**
- H. Use R&D to provide improvements in product and process technologies.**
- I. Integrate these into a "management style"**