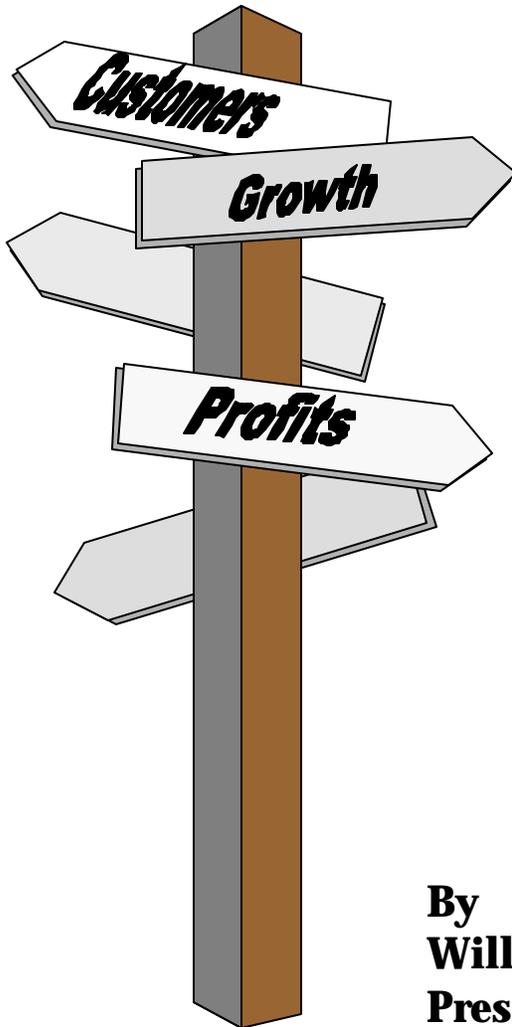# THE NEW
MANAGEMENT AND PLANNING
TOTAL QUALITY CONTROL TOOLS
(TQC2)

By
William A. Sandras, Jr.
President
Productivity Centers International
E-mail: pciconsulting@att.net
Web-site: http://pciconsulting.home.att.net

THE NEW MANAGEMENT AND PLANNING
TOTAL QUALITY CONTROL TOOLS
(TQC2)

Many organizations have banners and slogans flying about promoting customers, quality, people, growth, profits, or projects. Regardless of the banner or slogan, most are quite commendable. Unfortunately, most are just banners and slogans to whip up enthusiasm. But, enthusiasm is not enough. We must have a plan to make the vision happen. As the late Dr. Deming was fond of saying, "It is not enough to work hard. We must know what to do."

Picture yourself in a meeting to discuss the strategic direction of your organization. Or, perhaps the meeting is to decide how best to tackle a complex project or problem, or how to develop a new product, service, or information system. You know how these meetings progress. They drag on hour after hour and meeting after meeting. The most aggressive get most say. Those with pet peeves and pet projects constantly take us off on tangents. Eventually, the last one standing wins, or the senior person simply dictates a solution, or worse yet, no consensus is reached so the status quo is the strategy by default. *(I know that I exaggerated some here, but not by much for many organizations).*

With more traditional planning approaches, it is very common to see a confusing list of goals for the organization that contains a mixture of broad, detailed, and overlapping initiatives – all expressed as equals. Often the conclusions have gaps and inconsistencies, and the required actions remain unclear.

What has been lacking until recently is a *process* to translate these worthy visions, objectives, projects, or problems into clear action items to ensure that the vision happens. We now have that process. It is composed of the *Seven New Management and Planning Total Quality Control Tools* that I call TQC2 for short.

With a few exceptions, the original TQC tools (TQC1) use *numbers* for data (e.g., check sheets, histograms, control charts). The *New*Management and Planning TQC tools (TQC2) use *words* and *ideas* as data. While the original TQC1 techniques are useful for most problems, they are not particularly effective for the complex and unquantifiable problems frequently faced by today's managers and professionals. Therefore in the 1970's and 80's, The Japanese Federation of Science and Technology, and later the Tokyo Industrial University, gathered and refined a set of tools designed to deal with this previously unaddressed category of problems.

In essence, these TQC2 tools provide an effective methodology to reengineer the strategic planning process to address the changing characteristics of competition and quality.

Make your Customer Successful

For most organizations today, quality is *not* a competitive weapon. If you do not have it, don't bother trying to sell to me. If you do have it, we will talk about something else: What is the price of your product or service? What is its overall value? What are your lead times? How will you help to make me, your customer, successful? Forget yourself. Your job is to make your customer successful. Your success will follow that. Don't misunderstand. Quality is still very important -- however now it is just expected.

Most of us have multiple customers. Your customer may be the person within your organization that receives the output of your process. Another is the person outside of your organization that uses your product or service. Customers also include the ultimate end user and shareholders. Some people call this collection of customers "stakeholders." A "stakeholder" is anyone that has a vested interest in the success of your company or organization.

Traditionally, the quality focus was on inspections and audits, meeting the specifications, and more recently on ISO-9000 certification. Tomorrow's thinking includes the thinking of the past, but also adds a new emphasis – a focus on the customer.
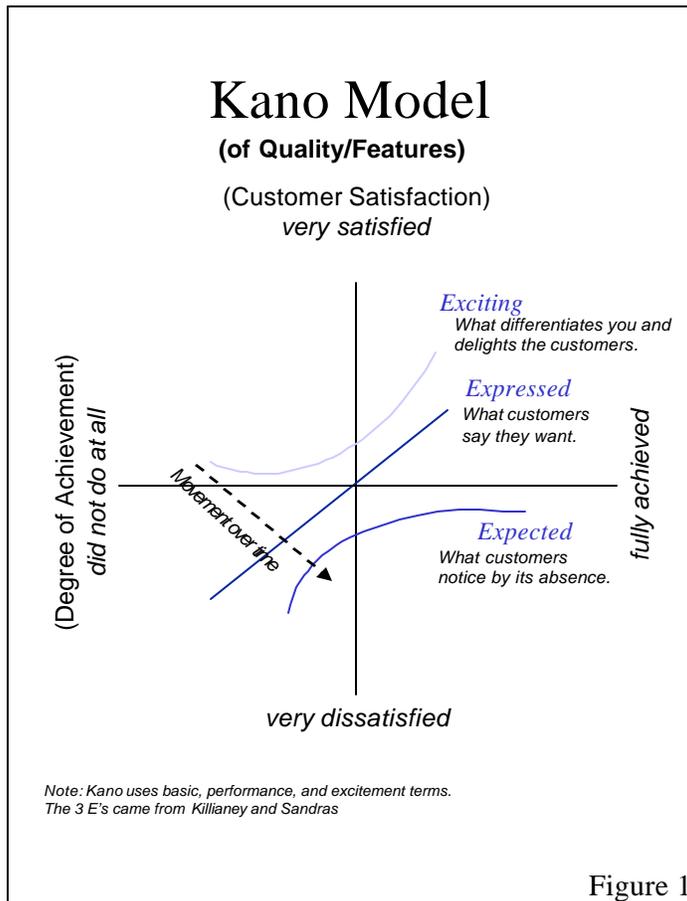
New quality thinking is well illustrated by the Kano Model (See Figure 1). At the top of the vertical axis the customer is very satisfied; at the bottom very dissatisfied. On the horizontal axis at the left we did not try to satisfy the customer; on the right we made a good effort.

We usually work hard to do what the customer asks for. These *Expressed* requests are usually only a handful in number. We tend to get into trouble by not providing what is *Expected*. When you purchase a car, what do you ask for? Roominess?

Kano Model

(of Quality/Features)

(Customer Satisfaction)
very satisfied

Exciting
What differentiates you and
delights the customers.

Expressed
What customers
say they want.

(Degree of Achievement)
did not do at all

Movement over the

fully achieved

Expected
What customers
notice by its absence.

very dissatisfied

Note: Kano uses basic, performance, and excitement terms.
The 3 E's came from Killianey and Sandras

Figure 1

Horsepower? Styling? These items you asked for are *Expressed* characteristics. What if the car you purchased did not have an electric starter, or brakes? You would be upset although you did not ask for them. We tend to notice the *Expected* characteristics by their absence. We often disappoint the customer because we did not understand what was expected. But what if an automobile manufacturer could provide, at a reasonable price, a global positioning system in a car. That feature would be very exciting for some buyers. *Exciting* characteristics are the ones that differentiate you from your competitors.

Early in the 19th century, the automobile electric starter was developed. Quickly it became an Exciting characteristic, a competitive differentiator, for those manufacturers that offered it on their cars.   Soon everyone was asking for it (Expressed characteristic). Today, having an electric starter in a car is so common, it is Expected. The same pattern occurred more recently in the evolvement of auto-focus and auto-exposure in cameras. Ideas tend to progress from Exciting, to Expressed, to Expected. The Expected category of items continues to grow year after year in an industry. However, people only tend to ask for a handful of Expressed characteristics at a time. But, the numbers of Exciting characteristics are infinite – limited only by your ability to discover them.

What are the Exciting, Expressed, and Expected characteristics currently in your industry?

Benefits

The TQC2 techniques enable the discovery of Exciting, Expressed, and Expected customer characteristics. They use rigorous processes to explore opportunities in complex and fuzzy situations where no quantifiable data exists. They tap and synthesize the intuition and knowledge of diverse experts by employing different thinking techniques. They use *thoughts* as data to create breakthrough strategies that other processes would likely miss.
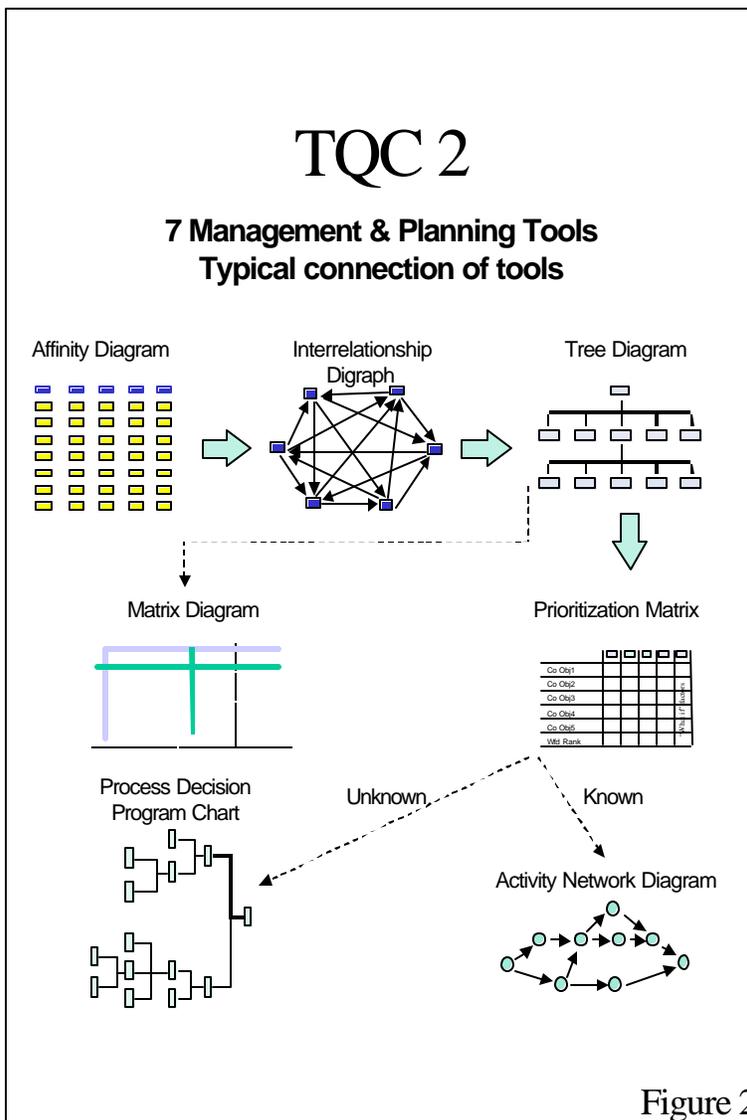
Many organizations have lofty visions, but do not have a step-by-step plan to ensure that the vision becomes reality. The TQC2 techniques enable the strategy or vision to be translated into prioritized, assignable, and executable items. An executable item is one that can be given to someone to complete, as is. It is not ambiguous or fuzzy. It can be implemented and measured as stated.

A side benefit also occurs during the TQC2 process. While working through the plan using the TQC2 tools, a significant team building experience occurs. We each understand how the other thinks and feels. We all understand how each of our thoughts fit into the bigger picture. When we are finished, we realize another important benefit. We are all able to consistently articulate the vision and the plan to make it happen. We understand the origin of each element, how it fits, and the reason for its priority in the entire plan.

Applications

The TQC2 tools apply in all industries and types of organizations where complex and fuzzy problems exist. Examples of applications of the TQC2 tools include:

- Discovering how to prosper in rapidly growing, declining, or changing environments,
- Developing a world class organization (e.g., manufacturing, political, health care, etc.) and agreeing on what that means,
- Constructing a customer strategy (e.g., getting new customers, or keeping existing customers during bad times, during a lull in new product development, or after an unsuccessful or late product launch),
- Establishing an international strategy (i.e., for manufacturing, marketing, distribution), and
- Developing vision for any organization, and then creating a strategic plan with executable items help to ensure the vision occurs.

TQC 2

**7 Management & Planning Tools
Typical connection of tools**

Affinity Diagram

Interrelationship Digraph

Tree Diagram

Matrix Diagram

Prioritization Matrix

Process Decision Program Chart

Unknown

Known

Activity Network Diagram

Figure 2

Each of the TQC1 tools is powerful on its own, but enhanced power comes when they are linked together. The same applies to the TQC2 tools (see Figure 2). Each is useful independently, but linked together they provide a powerful breakthrough *process* to deal with the complex and fuzzy issues typical for today's executives and professionals.

Let's briefly examine each of the seven TQC2 tools or techniques. Two of them are the Affinity Diagram and the Interrelationship Digraph. These are typically the first two techniques to be used when multiple techniques are linked to translate a higher level strategic plan into executable items.
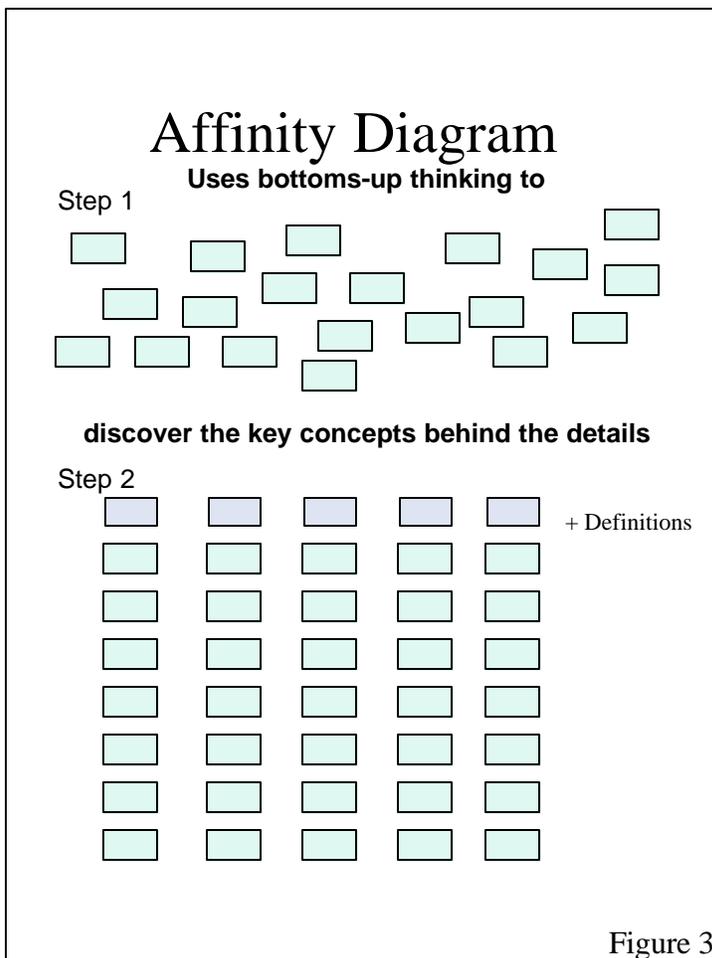
Affinity Diagram

(See Figure 3)

Affinity diagrams are useful when we want to discover breakthrough insights into a complex or ambiguous situation. We begin with a question. For example, the question may be:

In order to be perceived by our customers as having the best customer service, and do it cost effectively, we must . . .

Or

In order for our company to grow by (x)% in the next (y) years, we must support our customers by . . .

Affinity Diagram
Uses bottoms-up thinking to

Step 1

discover the key concepts behind the details

Step 2

+ Definitions

Figure 3

It is usually best if the question can be phrased with the customer in mind. Try to phrase it with an external focus more than an internal one. Most people see the details surrounding an issue much easier than they see the key principles behind the details. We see the trees in the forest easier than we do the ecological system of the entire forest. By using "bottoms up" thinking the Affinity Diagram process capitalizes on our ability to see the details. It then helps us discover the concepts behind them.

First the Affinity technique helps us to generate a large amount of language data (e.g., ideas, thoughts, and opinions). It explodes or expands our thinking about the subject. There is an element of brainstorming in this first step, but it is not true brainstorming, since it is more controlled.

The next step has us "affinitize" the thoughts from the first step. During the process of discovering the affinity, we are required to consider the thoughts and logic of others. Finally, we capture the definition and the "spirit" of each higher level theme to ensure we all understand it the same way.

The Affinity process is very robust. It even benefits from exact opposite ideas. For example, one person may think centralized purchasing is necessary, and another that decentralized purchasing is required. It is not the detailed thought that the Affinity process seeks; it is the higher level concept. Both the central and decentral details may trigger the same overriding theme.

The process also is a rank leveler. Everyone's idea is treated equally. Once contributed, the idea belongs to the group. Again, it is not the detailed idea that even matters; it is the higher level principle. This greatly aids in avoiding endless debates on personal "hot-buttons."
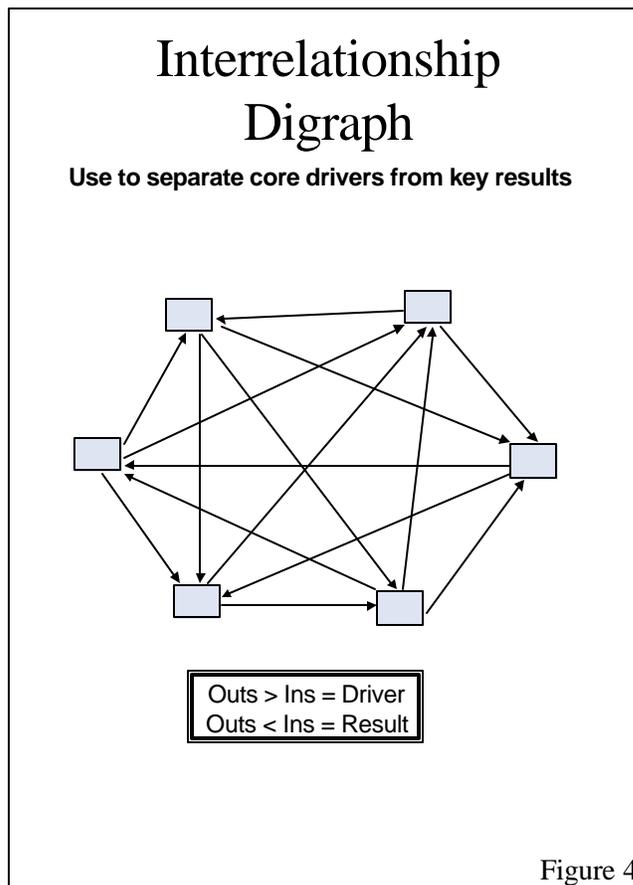
The Affinity Diagram process significantly enhances our ability to process the ideas of diverse experts to discover breakthrough themes in complex and fuzzy problem areas.

The next step is the sequence of techniques is usually the Interrelationship Digraph.

Interrelationship Digraph
(See Figure 4)

The Interrelationship Digraph is useful when ideas and words are available to describe the problem or situation, but numerical data is not available for root cause identification. Also, it is useful when the number of higher level themes that we need to address is large. This is often the case if the Affinity Diagram process is feeding the Interrelationship Digraph. When resources are scarce compared with the number of tasks at hand, we need to be certain that we are working on those tasks that will have the greatest impact toward the desired results.

Interrelationship Digraph

Use to separate core drivers from key results

Outs > Ins = Driver
Outs < Ins = Result

Figure 4

After the Affinity Diagram discovery process, the Interrelationship Digraph focuses our thinking back down to a few key items. It makes use of lateral thinking. It will enable us identify the core drivers and the key results. Drivers are those themes that will most immediately lead to the desired result. Results are those themes that emanate from other actions. Often, until we do the Interrelationship Digraph, it is difficult to distinguish the drivers from the results. Without the insight provided by the Interrelationship Digraph process, it is very easy to unwittingly begin effort on tasks that require prerequisite activities. If we want to make something happen, we typically need to focus on the drivers that will cause the desired results.

When the process begins with a lower level problem statement (i.e., a statement that is not very broad), the output of the Affinity Diagram and Interrelationship Digraph processes may yield executable items. When this is the case, there may be no need to continue with the other TQC2 tools. However for loftier problems, such as identifying action items to achieve a company wide strategic plan, some output may still be fuzzy after these two techniques are completed. Fuzzy issues are not yet executable. For these items, the Tree Diagram is necessary.

Tree Diagrams
(See Figure 5)

Tree Diagrams are useful when it is not obvious how to carry out the issue in question. When breaking down a high corporate vision into assignable action items, there may be intermediate levels of items that are still ambiguous. These fuzzy items may be outputs of the Affinity Diagram process, or key drivers from Interrelationship Digraph process. These fuzzy items may break down into still more items that are not yet executable. But, if we continue the Tree Diagram process, we will eventually have items that someone can actually do.

Tree Diagram
Uses tops-down thinking to develop actionable items

+ Definitions of each

Figure 5
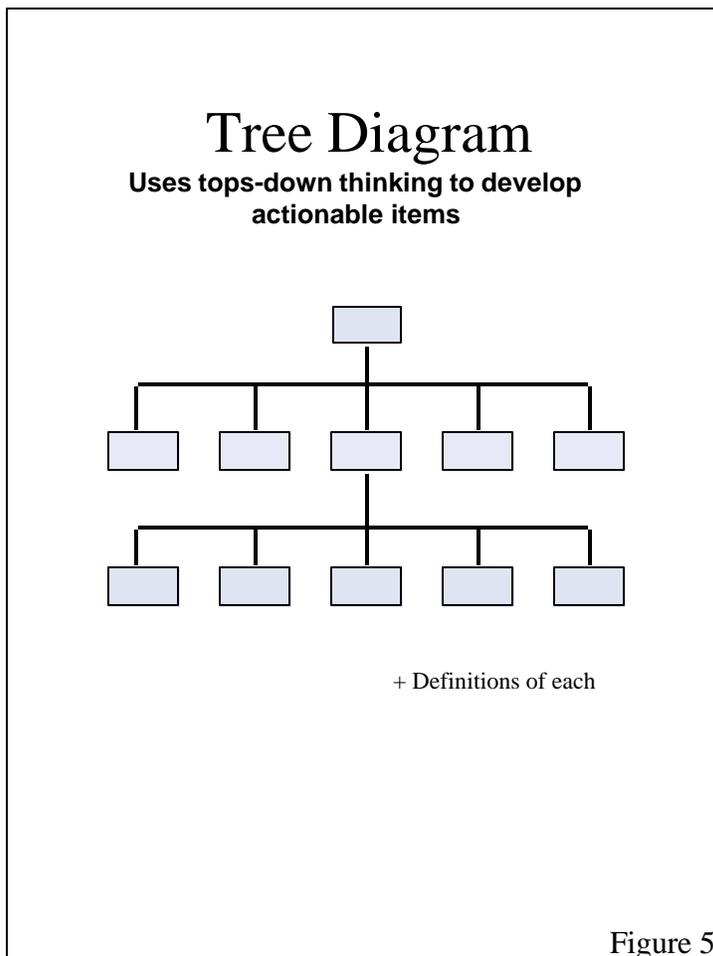
For example, suppose a key driver from the Interrelationship Digraph process shows the need to reduce our internal manufacturing lead-times. We may decide that Just-In-Time is the process we will use. Since the process for implementing LEAN is well defined, there *may* be no need to use Tree Diagrams to make this item more executable. The person we assign to complete these action items may consult with an expert and further define the steps, but the item is executable as it stands.

However, suppose the key driver suggests that we need to develop better leaders. The process for doing that *may not* be so clear. What do we mean by "develop better leaders?" For example, *develop better leaders* is fuzzy because how to do that is unclear. However, *develop a process for upward communication*, which the Tree Diagram process can help us discover is a part of developing better leaders, is more executable, or actionable as it stands.

Tree diagrams use "tops down" thinking. They expand our thinking. They take higher level items and cause us to break them down into smaller pieces. The process of developing tree diagrams forces us to think level by level. It forces us to

keep our thoughts consistent by level. We continue breaking down higher level thoughts until each is executable, that is until the action required is relatively clear. Tree diagrams cause us to methodically explore all of the implementation details. Throughout the Tree Diagram process we define each element and capture the "spirit" of it. Tree Diagrams also help to develop completeness to the plan. They uncover possible gaps from the affinity process.

When all of the fuzzy items are broken down into definable action items, we inevitably find that we have more to do than we have resources to apply. Now the question is "Where should we focus our resources for the most benefit?" The Prioritization Matrix helps us answer that question.

Prioritization Matrix
(See Figure 6)

The Prioritization Matrix is a version of a matrix diagram that is useful when we need to identify implementation options. In other words, the technique is useful when the options must be narrowed due to limited resources. Prioritization Matrices focus our thinking back down.

Prioritization Matrix

Sources of Thoughts

Co Obj 1					
Co Obj 2					"What if" factors
Co Obj 3					
Co Obj 4					
Co Obj 5					
Wt'd Rank					

Sources may also include thoughts directly from the Affinity Diagram or the Interrelationship Digraph

Figure 6

The "Pareto-like" output of this matrix is also useful to quantify the relative importance of each action item. All of us have our "pet projects." The Prioritization Matrix will help us put each action item in perspective by weighing each against the goals of the entire organization. This will show us where to focus limited resources to obtain the biggest payback for the entire organization.

The output of this process is numeric, not words. Using the numbers, we can now develop various plan scenarios. Sometimes, senior management may want to weight some corporate objectives higher than others. In other instances, we may want to examine the impact on the plan if we eliminate a specific objective. Suppose, no matter what scenarios we simulate, two of the top five items always remain in the plan? It would appear that these items might be universally valid. We are probably safe in committing to them regardless of the actual scenario that eventually develops. Exercising the plan with these "VIP weights" and "What-if" scenarios will allow us to create a very robust strategic plan.

The Prioritization Matrix is a special version of a broader category called Matrix Diagrams.

Matrix Diagrams
(See Figure 7)

Often, the process of breaking down a high level vision into an executable strategy stops with the Prioritization Matrix, but not always. Sometimes we need to use one of two other techniques to complete the process, or to show the relationships among the decisions we have made.

Matrix Diagram
Use to organize and compare information

——— "L" matrix column and row data

——— "T" matrix columns and row data

Figure 7

Matrix diagrams are very widely used. They are useful for comparing large amounts of language data. The diagrams can also show the strength of each relationship.

There are simple "L" matrices, or spread sheets, where items down the left side are compared to items across the top row. There are also T, Y, C, X (or cross or plus), and various three dimensional matrices.

One Visioning use of an X-Matrix Diagram shows the relationships among customer satisfaction, internal strategies to satisfy the customer, tactics to achieve the strategies, and measures of progress.

Activity Network Diagram
(See Figure 8)

Use the Activity Network Diagram to plan the most appropriate schedule for complex tasks and sub-tasks. Versions of this technique are also known as Arrow Diagrams, PERT Charts, or CPM Charts. It applies for implementations with *known* tasks, or when you can figure out the primary tasks in advance.

Activity Network Diagram

Use to plan the most appropriate schedule for complex tasks and sub-tasks

(also called PERT, CPM, Arrow Diagram)

Figure 8
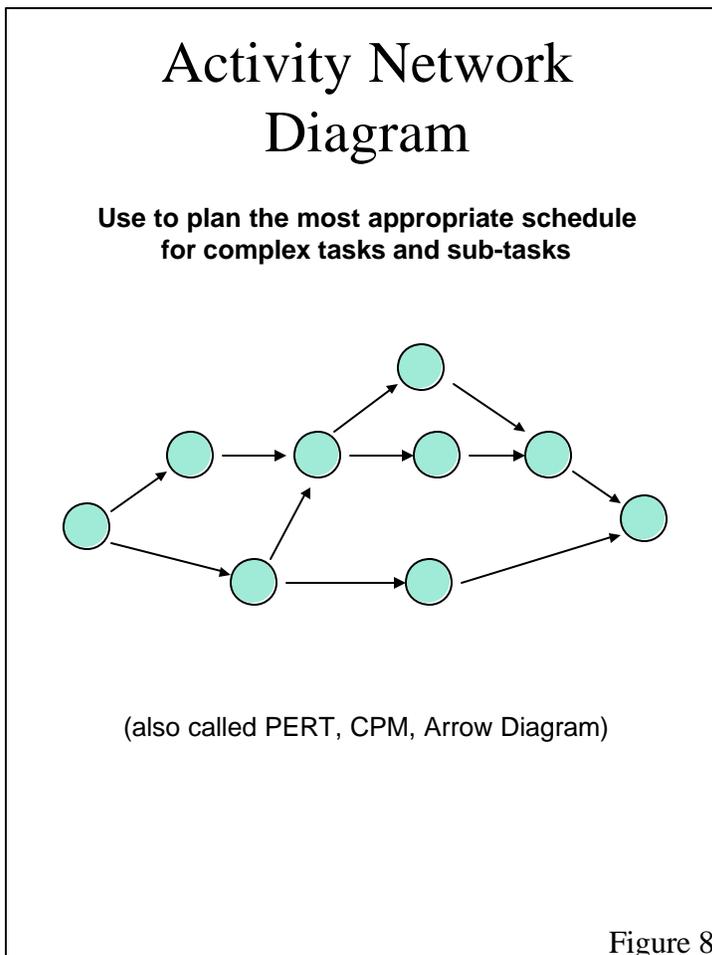
The Activity Network Diagram shows the sequence and linkage of tasks. Versions like PERT and CPM can show the duration of each task, and calculate resource requirements, slack times, and the critical path. Computerized versions are very helpful for project management. They can show the impact of schedule slips, and provide insight for getting back on schedule. The Activity Network Diagram is most used when the implementation process is familiar or determinable.

Process Decision Program Chart
(See Figure 9)

In contrast to the Activity Network Diagram, we should use the Process Decision Program Charts when the implementation process is unknown and indeterminable. The resulting diagram shows the chain of conceivable events that might occur during a complex implementation.

Process Decision
Program Chart

Use for new or unique complex tasks
(Pre-planned or Real-time)

Figure 9
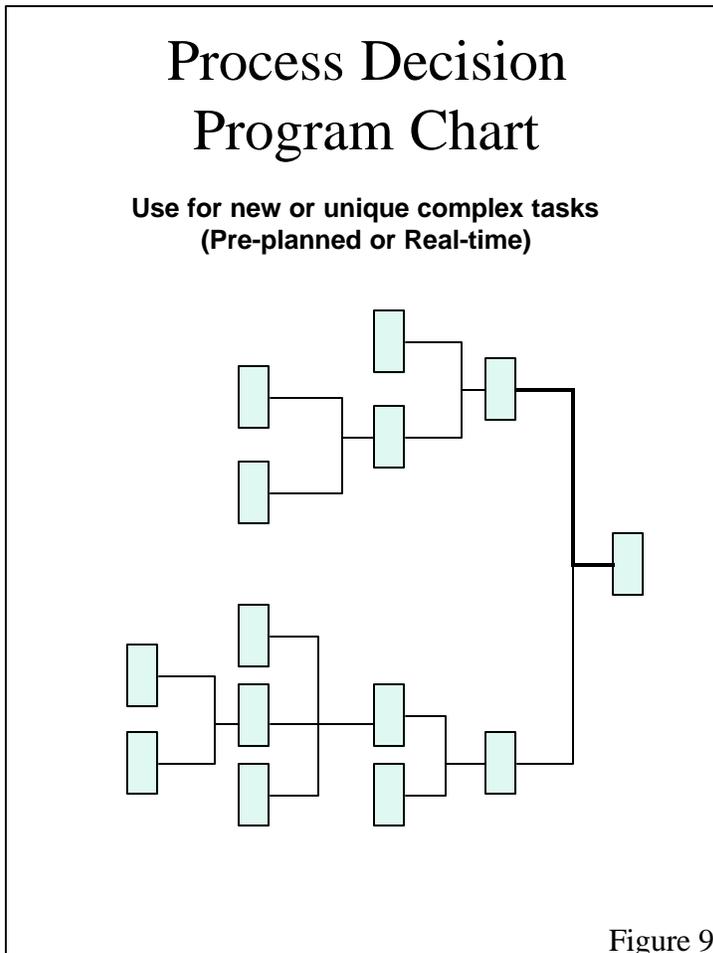
One widely used application of the Process Decision Program Chart is for contingency planning. Potential problems or events are outlined. Then countermeasures are developed in response to possible events.

If events unfold slowly, as in urban sprawl or changes to the competition, each level of the Chart can be developed as the need arises.

If events unfold rapidly, such as the effects of experiencing a Y2K problem or a terrorist attack, all levels of the Chart should be developed to define immediate responses.

When not to use the TQC2 techniques

It is just as important to know where to use tools, as where not to use them. A hammer can be used to cut a piece of wood, but that is not its purpose and it won't do the job very elegantly.

The TQC2 tools are for complex and fuzzy problems. If the problem is reasonably well defined, and the steps to a solution are fairly well understood, don't use the Affinity or Tree Diagrams. They will take too much time to help you discover an approach that you already know. The Interrelationship Digraph and Prioritization Matrix are not usually necessary for problems when we have numerical data. In these instances the original TQC1 tools, such as Pareto charts, will probably apply best.

Also, the TQC2 tools are not recommended for large groups of people. A team of 5-8 knowledgeable people with diverse perspectives is ideal. More people results in exponentially more time being taken to process the thoughts, but seldom is more insight gained into the problem.

Finally, if the senior manager wants to control the output of the process or course of action, do not use these tools. If the manager knows what he or she wants to do and does not want further ideas, then say so. Perhaps time does not allow development of a comprehensive plan. Dictating a course of action is not necessarily bad, in limited situations.

Getting started

Perhaps you are a leader that frequently commands the course of action. If this is because you do not have faith in your management team, try these tools to see how they can tap the collective wisdom of your organization. Or, your may command the course of action because you have never had faith in a formal process to synthesize the best plan from diverse perspectives. You may have experienced problems with traditional strategic planning approaches. If this is the case, then also try the TQC2 tools. They will give you a chance to change to a better approach. No hardware or software is required, only brainpower. The TQC2 tools put faith in people. They thrive on diverse perspectives; they build consensus; and they yield a better strategic plan.

On the surface, each of these seven tools is easy to use. Mechanically they are quite simple. However, since we are dealing with ideas, and how to stimulate and capture them, practice is required to perfect these techniques. A superficial approach to a strategically important problem could lead to disastrous results. My advice is to use a very experienced facilitator for your first three issues or problems. Once you have participated in the entire process three times, you probably can facilitate sessions on your own. However, make certain you are not the facilitator on issues where you have important contributions to make to the strategic plan.

Simple Matrix Diagrams are the easiest to learn and are the most common. Of the commonly linked strategic planning tools, the Affinity Diagrams and Interrelationship Digraphs are the easiest to learn. However, the subtleties in how to use these techniques are not obvious, so even these techniques require initial guidance and practice. Tree Diagrams are the most difficult. They force us to think in an unfamiliar manner. The thinking process for Trees is different from Affinity Diagrams. Practice here is essential. The Prioritization Matrix also requires practice to calculate, accurately and efficiently, the weights for each pair of elements. Failure to create adequate definitions along the way can result in a large amount of rework. A little experience will also help you to see how to create a robust plan using "VIP" and "What-if" calculations.

To the inexperienced, riding a bicycle seems quite simple. That perception is quickly changed when the novice climbs on one for the first time. However, with a little good coaching and lots of practice, the act of riding a bicycle gets easier and easier. There is an initial learning curve, but quickly we learn that for many situations, the bicycle is a much more efficient and reliable mode of transportation than our previous tricycle method.

Becoming proficient with TQC2 is not much different. It is not difficult. A few early lessons by a good coach, and then practice on your own, is all that is required for proficiency. It is interesting that one can become competent in the TQC2 set of tools faster than for the TQC1 set. This is because with TQC2 there is no need to wait for number data to slowly develop. With TQC2 we are only limited by the time it takes to think.

Because the TQC2 techniques put a process around the strategic planning activities, proficiency in these techniques can be formidable for you and devastating for the competition. Those that learn to effectively apply these techniques first, and best, will have a distinct competitive edge.

Bibliography

Brassard, Michael, The Memory Jogger Plus +, GOAL/QPC, 1989.

Mizuno, Shigeru (editor), Management for Quality Improvement (The 7 New QC Tools), Productivity Press, 1979 (English 1988).

Sandras, William A., Jr., Just-In-Time: Making It Happen (Unleashing the Power of Continuous Improvement), 1989, John Wiley & Sons, Inc., (versions available in English (ISBN 0-471-13266-7), Spanish (ISBN 84-87736-16-5), and French (no ISBN#)).